Teaching and learning chinese as a foreign or second language: The educational psychology perspective,

2nd Edition

Edited by
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Teaching and learning chinese as a foreign or second language: The educational psychology perspective, 2nd Edition

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Editorial: Teaching and learning Chinese as a foreign or second language: the educational psychology perspective

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Editorial on the Research Topic
Teaching and learning Chinese as a foreign or second language: the educational psychology perspective

1 Introduction

Chinese, as a globally significant language widely used both within and outside of China, has witnessed a remarkable increase in the number of learners worldwide (Gong et al., 2018, 2020). By the end of 2021, the number of people outside China learning Chinese as a second/foreign language (CSL/CFL) had exceeded 25 million, with over 200 million individuals learning and using the language (Ministry of Education, 2023). Understanding how CSL/CFL learners acquire and develop the language and helping them overcome learning difficulties and challenges through effective strategies are hence essential. Educational psychology provides useful lenses to shed light on these issues. There is a growing number of studies that adopt psychological perspectives to investigate CSL/CFL learning and teaching across the world. These studies have explored the psychological issues and mechanisms behind learners' acquisition of Chinese characters, phonology, vocabulary, and grammar, adopted a cultural psychological lens to unravel the role of Chinese cultural contexts in influencing learners' Chinese language acquisition and development, and examined the motivational sources that drive student learning and the factors that contribute to teachers' professional development (Ma et al., 2017; Gong et al., 2020). To enrich this body of literature, this Frontiers Research Topic collects a series of studies that examine various aspects of CSL/CFL teaching and learning from an educational psychology perspective.

2 Research on CSL/CFL teaching and learning from an educational psychology perspective

Psychological perspectives provide valuable insights into second language acquisition. Studies adopting the educational psychology perspective have shed light on various psychological issues, such as language aptitude, motivation, learning strategies, and identity

(Dörnyei, 2014; An et al., 2024), that are critical to successful language learning, and conceptualized and tested models of psychological mechanisms behind the development of language learning outcomes, such as phonology, vocabulary, and grammar/sequence rules (Wen et al., 2017). These studies have also revealed how learners' cognitive constraints, strategy choices, and learning experience construction influence their language proficiency (Shen, 2013; Liu et al., 2017; Szyszka, 2017). By understanding these factors, educators and researchers can better facilitate learners in their language learning and development journey.

However, most of these studies have been conducted on the acquisition of anglophone languages. However, the characteristics of the languages and culturally-shaped learning experiences influence the neuro-psychological mechanisms activated for language processing and acquisition (e.g., Zhang et al., 2023). Scholars have also underscored cultural specificity in various psychological constructs, such as motivation (e.g., Wang et al., 2020), and its impact on learning. Therefore, further research from an educational psychology perspective is necessary to enhance our understanding of CSL/CFL development. Such research can contribute to expanding our knowledge of psychological issues in language acquisition more broadly by providing language- and culture-specific insights. Moreover, the development of technology and associated shift or expansion of language learning contexts also demands research into psychological issues in these new learning contexts. Take research on engagement, anxiety, and motivation as an example. The effects of these psychological factors on language proficiency have been widely acknowledged in the traditional offline classroom setting (Basith et al., 2019; Gong et al., 2020; Hiver et al., 2021). However, the COVID-19 pandemic has necessitated a shift to online instruction in language classes, which creates a different research context for CSL/CFL education (Chen, 2021). In light of this shift, collaborative efforts are needed to attain a more comprehensive understanding of CSL/CFL learners' anxiety, motivation, and ability to maintain engagement and learning stickiness in online learning environments. In addition, CSL/CFL teachers not only face challenges regarding facilitating learners' Chinese acquisition and development but also the reformation of their professional identity. Teacher identity, which is influenced by a global mindset and intercultural competence, needs to be renegotiated in diverse social-cultural contexts (Gong et al., 2022). Thus, further studies are required to explore how CSL/CFL teachers can effectively navigate the socio-cultural landscape, foster meaningful interactions in social networks, and enhance their professional development and CSL/CFL teaching quality.

3 This Research Topic

We received 60 abstracts and 59 manuscript submissions in total, and there are 23 articles finally published through rigorous peer review. In other words, the overall acceptance rate of this Research Topic is 19.3%, which indicates it is one of the most high-quality Frontiers Research Topic. The published articles featured in this Research Topic cover a wide range of topics, being classified into three main categories based on their research themes: (1) psychological factors in CSL/CFL acquisition, (2) learners' anxiety,

motivation, and strategy related to CSL/CFL learning, and (3) teacher training and teachers' agency and identity concerned with CSL/CFL teaching. One common thread among all the papers is the recognition of the significance of integrating the psychology perspective into CSL/CFL education research.

3.1 Psychological factors in CSL/CFL language acquisition (11 articles)

The 11 articles in this category focus on the influence of psychological factors on CSL/CFL acquisition of linguistic aspects and skills, with a particular emphasis on learners' awareness and strategies in the acquisition process as well as teachers' instructional strategies.

Regarding lexicology acquisition difficulties, researchers tend to concentrate on learners' lexical reasoning abilities in their CSL/CFL learning. Zhang H. et al. analyzed a vocabulary assessment and a lexical inference task and revealed that vocabulary knowledge contributed to Chinese lexical reasoning skills of 419 heritage learners at different proficiency levels. The influence of heritage background on morphological awareness and lexical inference was stronger than that of the Chinese language proficiency level. Considering the early exposure of heritage learners to spoken language, it is recommended that they can enhance their lexical inference abilities by explicit instruction on the segmentation bimorphemic and multi-morphemic words. Jin et al. also paid attention to Chinese heritage language speakers. Implementing an online language acceptability judgment task, they examined learners' ability to accurately process and understand different types of nominal expressions in Chinese in actual time that were regulated by syntax-semantics and syntax-discourse interfaces. This study suggested that language-external interface properties were not necessarily destined for prolonged difficulties for these learners. Along this research line, Zheng et al. pointed out that the Chinese proficiency level impacted the accuracy and speed of processing Chinese idioms vs. non-idiomatic formulaic sequences, and in particular, learners' ability to resolve difficulties in the use of idioms improved with the level of Chinese language proficiency. They also suggested some classroom teaching approaches to improve students' ability to utilize idioms according to learners' cognitive characteristics. In terms of Chinese semantics, Fang and Xu compared online sentence-picture matching to offline translation tasks between 31 English learners and 29 native Mandarin Chinese speakers and demonstrated a prototypical effect, indicating that CSL learners found it easier to comprehend the associations between aspect markers and specific predicate types. A study by Liu and Ning on 20 Cantonese native speakers, 18 Cantonese-dominants, and 18 Urdu-dominants showed that Urdu-dominant speakers did not pay as much attention to tones and did not exhibit greater perceptual flexibility than Cantonese-dominant bilinguals when processing Cantonese stimuli. Studies pertinent to language skills have emphasized the importance of reading comprehension, writing, and pragmatics skills in Chinese language learning. Researchers investigated CSL/CFL learners' language skills in terms of character, vocabulary, and discourse, incorporating both their input and output. Liao et al. conducted

two assessments focusing on Chinese character reading and reading comprehension with secondary school students in Hong Kong SAR and found that both lexical orthographic choice itself and lexical orthographic choice in context played a mediating role in reading comprehension, but the latter was more crucial. Concerning vocabulary use, Zhang L. et al. focused on connective errors in CSL learners' writing. By ranking the most common error types, they found that intralingual transfer significantly led to such errors and suggested that Chinese language teachers could use appropriate teaching strategies to help students reduce errors. Moving to individual differences and self-regulation of CSL/CFL learners at mainland Chinese universities, studies conducted by Lv et al. and by Zhang J. et al. focused on students' discourse output abilities and beliefs. They revealed an association between perceived communicative competence and increased pragmatic comprehension. However, they found there was no significant relationship between willingness to communicate in a second language (L2) and self-perceived communicative competence. At the same time, Zhang J. et al. reported that students' beliefs about corrective feedback were associated with their language accuracy. They suggested that language teaching methods derived from research on EFL/ESL learners' corrective feedback were similarly applicable to CSL/CFL learning.

Two studies explored form-focused instruction (FFI). In Chen and Li's study, they found that both focus-on-forms (FonFs) and focus-on-form (FonF) could enhance CSL learners' verbal communication skills. FonFs was more effective in improving fluency for students with low language competence, whereas FonF was more effective in increasing accuracy for students with high language proficiency. Regarding Chinese writing, Zhou and Lü found that FFI on thematic chains had a positive and long-lasting impact on participants' syntactic complexity. The effectiveness and durability of FFI were related to the intensity of instruction and the type of feedback given. Therefore, FFIs played a crucial role in teaching students to improve their speaking and writing skills.

Based on the above-mentioned discussions of psychological factors influencing CSL/CFL education, it is evident that integrating psychological perspectives and approaches into language education can effectively understand learners' learning experience and outcomes.

3.2 Learners' anxiety, motivation, and strategy (six articles)

Previous studies have provided valuable insights into CSL/CFL learners' anxiety, motivation, and strategy, with a focus on context-specific learning dilemmas and solutions. In a systematic review study, Yao et al. reported that international researchers showed a growing interest in Research Topics related to CSL/CFL learning anxiety compared to scholars in mainland China. The latter had limited practice of qualitative approaches, such as interviews and class observations, indicating the need for mainland Chinese researchers to keep abreast of the latest theories and methodologies in the field.

Researchers have paid attention to examining the psychological attributes associated with CSL/CFL learners' learning process in

the online instructional context during the COVID-19 pandemic. Xu et al. focused on online Chinese language learners and analyzed their self-reports and vocabulary knowledge. The findings showed that anxiety had a greater impact on student performance than motivation and learning strategies. However, all three factors were only correlated with self-assessed Chinese language proficiency, not performance in Chinese vocabulary assessment. This study contributed to the comprehension of the link between L2 learning performance and individual discrepancy in online learning contexts. Lin, Gong et al. conducted a study with 378 international students who were enrolled in online Chinese language classes, to investigate their profiles of self-regulated learning (SRL) using a person-centered approach. The study employed a learning motivation assessment that encompassed students' learning anxiety, goal orientation, task value, and learning strategy scale. The findings of this study provided evidence in support of the situational constraints on SRL. They emphasized that L2 teachers should implement more effective classroom practices to facilitate students' SRL according to the discrepancy.

The social context has a significant influence on learners' engagement and strategy use in language learning. Chen found that engagement in online Chinese classes was influenced by learning expectations, academic and social environments, and educational technology readiness. In these factors, social environments were observed as a significant predictor, and thus teachers were advised to have more social interaction online with students, which is usually overlooked and unnecessary in offline classes. The social contextual nature together with learners' agency were found to impact learners' strategy choices and use in the study of Li et al.. Teachers, as a mediating role, were suggested to fully understand students' learning strategies and integrate online Chinese language learning resources to create and adapt appropriate social-cultural experiences for students. In line with the role of social-cultural contexts, Lin, Lam et al. used a reading assessment and questionnaire to analyze learners' motivation and learning strategies and their comprehension skills. Learning strategies employed by CSL/CFL students were impacted by the socio-cultural context and learning motivation strategies had both indirect and direct effects on comprehension performance. This study could guide the teachers in selecting the group of developmental strategies to instruct students appropriately to respond to specific reading tasks.

The above-mentioned findings suggest that environmental constraints in online learning impact CSL/CFL learners' anxiety and engagement and individual learners can adapt to contextual challenges by employing diverse learning strategies under the instruction.

3.3 Teacher training, teacher agency and identity, and teacher development (six articles)

Researchers explored CSL/CFL teacher training, teacher agency and identity, and teacher professional development from a

psychological perspective, focusing on their interaction with the socio-cultural context. Gong et al. examined preservice CSL teachers' understanding of culture and intercultural teaching and found their teaching objectives were mainly attitude-oriented, lacking the orientation toward knowledge and skills. This research calls for a more innovative curriculum to train preservice CSL teachers. Gu et al. explored the agency of Chinese language teachers in constructing their professional identity and compared the experiences of native and non-native Chinese language teachers with regard to various factors related to professional motivation. The study discovered noteworthy disparities in the perceived extrinsic value and social influence between the two participant groups, with only minor variations observed in terms of cultural, intrinsic, and altruistic value as well as future career development choices. These findings highlight the unique nature of professional motivation among L2 teachers. Chen et al. investigated the teachers' identity in terms of interacting with students. The study showed teachers' intergroup uniqueness (identity attributes) remained unchanged although they faced complicated cultural backgrounds of students. It is agreed that the identity construction of CFL teachers was influenced by their self-identification and social integration. Yang and Han conducted a study using retrospective narrative inquiry to document the 10-year experiences of a CFL teacher and indicated that teacher agency influenced the implementation of identity-oriented instructional practices. Similar findings are also reported in the study of Han and Ji, which examined the interaction between three pre-service CFL teachers and their new sociocultural context from a Chinese-Australian bilateral provincial master's degree program. CSL teachers in Australia faced challenges in professional identity development, which were affected by self-identification and their interaction with others in the community. Such difficulties could lead to uncertainty and confusion and hinder the teacher's ability to perform their duties effectively. In addition, Yang et al. revealed that CSL teachers' personal networks played a significant role in their agency enactment. These personal networks guided their values, provided emotional and academic support, and helped them become effective agents in the face of diverse educational challenges. In this regard, networking is a crucial means for teachers to enhance their academic and professional competency and broaden their learning opportunities throughout their careers. The findings of these studies highlight the importance of adopting the psychological perspective in research on CFL/CSL teachers' motivation and identity reformation in diverse cultural contexts.

4 Future directions: where shall we go?

This special edition draws attention to the understanding and examination of CSL/CFL teaching and learning from an educational psychology perspective. Overall, the 23 articles included in this Research Topic address various research issues with different foci. Their common aim is to explain and analyze the psychological factors or processes related to students' second/foreign language acquisition, learning strategies as well as

teachers' instructional practices and professional development. In this regard, the findings from this special edition provides an opportunity for language education researchers and practitioners to reconsider their understanding of second/foreign language education, which has been primarily based on inquiries into commonly taught English (Gao and Zheng, 2019; Gong et al., 2020). To support the growth of multilingual and intercultural education, we hope that these publications can inspire education stakeholders to reflect on the application of psychology into authentic CSL/CFL teaching and learning, and encourage them to make conceptual or theoretical contributions to second/foreign language education. At the same time, researchers need to consider using psychological perspectives to address issues and promote the quality of CSL/CFL teaching and learning in different educational contexts. In other words, CSL/CFL research should be encouraged and expanded to examine a broader range of Chinese language learners, both in and outside of China, who learn and use Chinese in diverse contexts. For instance, researchers need to pay more attention to the inheritance and maintenance of Chinese as a heritage language (CHL) and CHL learners' interaction with the social, cultural, and political context of Chinese learning (Mu, 2016).

Author contributions

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The Effect of Language Dominance on the Selective Attention of Segments and Tones in Urdu-Cantonese Speakers

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To perceive a second language (L2), non-native speakers not only have to focus on phonological, lexical, and grammatical knowledge, but also need to develop a good mastery of L2 strategic knowledge, including selective attention and language planning. Previous research has found that non-tonal speakers are overtly attentive to segments, while tonal language speakers give more attention to tones. However, it is unclear how different dominant language speakers distribute their attention while processing segments or tones and segments and tones stimuli in non-native speeches. The present study also aims to examine the roles of language dominance play in the designed perceptual tasks. In the current study 20 Cantonese native speakers, 18 Cantonese-dominants, and 18 Urdu-dominants participated in an attention distribution experiment in Cantonese. The results show that the Urdu-dominants retain their L1 attentional strategy in the processing of Cantonese stimuli, classifying the stimuli along segments, while the Cantonese native speakers are more attentive to tones. Moreover, the Cantonese-dominants show a perceptual flexibility as highly proficient and experienced listeners. The results reveal that language dominance plays a vital role in listeners' attention distribution. The research also supports PAM-L2 theory on bilingual. The findings of the current study can be applied to Chinese language learning and teaching and language acquisition studies.

Keywords: attention distribution, Cantonese tones, segments, bilingual, language dominance

INTRODUCTION

From a psycholinguistic perspective, language perception is the process of selecting, organizing, and interpreting information. Selective attention refers to a sensory skill in a cognitive process where listeners make a selection of certain sub-syllabic dimensions while ignoring the irrelevant information (Treisman, 1964). To perceive L2 sounds, listeners not only need a large store of L2 language knowledge (e.g., phonology, lexicon, grammar), but also have to master L2 strategic knowledge, including selective attention and language planning (Treffers-Daller, 2019). Recently, there has been an increasing interest in the way tonal and non-tonal speakers distribute their selective attention toward segment and tone (Braun and Johnson, 2011; Zou et al., 2017). When perceiving a speech sound, tonal speakers pay simultaneous attention to both segmental and tonal

dimensions, as they tend to use pitch information as the primary cue in lexical and sentential meaning (Zou et al., 2017). When processing a non-native tonal language, non-tonal speakers may find it hard to give attention to tone due to the absence of a sensitivity toward tone (Braun and Johnson, 2011; Zou et al., 2017). Moreover, it has been reported that tonal sensitivity is expected to be gradually acquired by non-tonal speakers as tonal L2 experiences and proficiency improve (White et al., 2017; Zou et al., 2017). But it is still unclear how sensitively and automatically non-tonal speakers will be able to allocate their attention to a tonal L2, even when they have developed into highly proficient and fluent target language users. As an extension of Perceptual Assimilation Model (PAM, Best, 1995), PAM-L2 (Best and Tyler, 2007) proposed that non-native language learners may assimilate L2 sounds into their L1 categories, or establish new categories for the unassimilated L2 contrasts. The current study adopts the framework of selective attention and PAM-L2 to unveil the attention distribution of different dominant language speakers on perceiving Cantonese segments and tones.

According to Grosjean (1998), bilinguals were the population who use more than (include) two languages in their everyday lives. The two languages of bilingual speakers are usually imbalanced, with the language more frequently used serving as a base language, and called a stronger or a dominant language, while the other one becomes a weaker language (Pavlenko, 2014; Treffers-Daller, 2019). This suggests that bilinguals do not generally have exactly the same competencies or skills in their native and target languages. More researchers see bilingual speakers as unique and configured language users, rather than a population of two monolingual speakers (Sebastián-Gallés and Soto-Faraco, 1999; Pallier et al., 2001; Nicoladis, 2006).

The current study examines how bilingual listeners accommodate language systems, when distributing their attention between non-native segments and tones. Since previous studies have focused on how bilingual speakers acquire L2 phonetic knowledge, the current study will provide more evidence on language-specific selective attention of bilingual speakers when processing non-native segments and suprasegments. Moreover, the present research investigates the role that language dominance plays in the bilingual speakers' attention distribution of L2 tones and segments. Tonal Cantonese native speakers and bilinguals whose L1 is the non-tonal language of Urdu were employed to participate in the Cantonese attention distribution tasks. The bilinguals were middle-school students, who were exposed to Urdu first and started learning Cantonese between the ages of two to thirteen, and were dominant in either Cantonese or Urdu. In the current study, Urdu was L1 for these bilinguals, and Cantonese was considered as L2.

The significance of the current study is to reveal Cantonese-dominants and Urdu-dominants' attention allocation when they process Cantonese segments and tones, and further discuss the role that language dominance plays in the perceiving of non-native sounds. The observation obtained from the study can contribute to Chinese language learning and teaching and second or foreign language acquisition research.

LITERATURE REVIEW

Distribution of Attention to Segmental and Tonal Information

Based on the previous studies, the acquisition of Chinese involves various aspects (Ma et al., 2017; Gong et al., 2018, 2020a,b,c, 2021). Perceptual performance of new categories in non-native listeners incorporates the development of perceptual sensitivities to new acoustic dimensions (Goldstone, 1993). Lexical tone is a new acoustic dimension for non-tonal language speakers. In learning a tone language, non-tonal speakers not only have to develop phonological categories for tones, but must also redistribute their selective attention to both segmental and tonal dimensions (Zou et al., 2017). According to Strange and Shafer (2008) and Strange (2011), speech perception is a "purposeful and information-seeking" activity, where adult listeners can use a "highly over-learned" and highly automatic program (the selective perceptual routine), referring to their L1 systems. With the assistance of such a selective perceptual routine, listeners can automatically extract enough information through various linguistic conditions. According to Treffers-Daller (2019), the selective perceptual routine proposed by Strange and other scholars can be regarded as one type of strategical knowledge. As one of the executive functions, Selective attention influences listeners' perceptions at a higher-ordered and abstract level (Diamond, 2013). Strange and Shafer (2008) claimed that only native speakers could automatically utilize the selective perceptual routine, whereas late adult learners had only a slim chance of developing an exact L2-like selective perceptual routine. Strange (2011) posited that even when native speakers are exposed to "sub-optimal listening conditions" or distracted by another task, they can still phonologically discriminate different native phonetic contrasts in a rapid and robust way. For late adult learners, as some L2 phonetic contrasts do not occur in their L1, much greater cognitive resources are required to extract sufficient information in L2 perception (Strange, 2011).

Some neurocognitive and behavior studies on selective attention suggest that when more L2 proficiency is accumulated for non-native learners, they are able to access a more automatic attentional strategy, specific to L2 (Steinhauer, 2014; White et al., 2017; Zou et al., 2017). Francis and Nusbaum's (2002) study showed that after training, English listeners redistributed their attention to different perceptual dimensions for the establishment of new L2 phonetic categories, and were able to approximate the behavior of native Korean listeners in the post-test. Zou et al. (2017) invited native tonal Mandarin adult speakers, non-tonal Dutch speakers (who had never learned Mandarin), and Dutch-speaking learners of Mandarin to participate in an ABX task in which the target syllable in disyllabic non-words varied along tonal or segmental dimensions. Their results supported the findings of Braun and Johnson (2011), demonstrating that Mandarin speakers were attentive to both segmental and tonal information in the processing of Mandarin stimuli, whereas native Dutch speakers mainly depended on the segmental dimension. A developmental trajectory of L2-specific selective attention for learners was revealed, showing that

beginners were more likely to ignore tonal information compared with advanced learners (Zou et al., 2017).

Prior studies on selective attention have focused on whether L2-specific attentional strategy could be acquired by less experienced learners or by adult learners (Strange, 2011). However, it is still unclear whether the learners are able to acquire an L2-like attentional strategy on achieving a high L2 proficiency and becoming bilingual.

Research on Language Dominance

Snape and Kupisch (2016) defined the dominant language as the "more proficient" or "further developed" language for bilinguals. The dominant language of bilinguals can be either their L1 (Sebastián-Gallés et al., 2005; Amengual, 2016) or their L2 (Antoniou et al., 2012), whichever have been primarily and regularly utilized by language speakers in daily conversations. The two main underlying dimensions of the language dominance are language proficiency and language use (Luk and Bialystok, 2013; Treffers-Daller, 2019). Language proficiency shows how well languages are known, and language use illustrates how frequently bilinguals use their languages (Treffers-Daller, 2019).

Personal and experiential factors also play important roles in constructing listeners' language dominance. For instance, according to Piske et al. (2001), the age of onset learning (AOL) and the age of arrival in the target language-speaking area (AOA) correlate tightly in the performance of bilingual speakers, illustrating a cumulative exposure to L2 for bilinguals. Moreover, success in L2 acquisition also depends heavily on personal factors such as educational level (Hamann et al., 2018), and length of residence (LOR) in the target language-speaking area (Flege and Fletcher, 1992).

Previous studies have focused on the role that language dominance plays in the processing of L2 phonetic contrasts, such as vowels and consonants. It has been reported that bilinguals show strong bias toward their dominant language in speech perception tasks (Antoniou et al., 2012; Molnar et al., 2016). Molnar et al. (2016) assessed the non-linguistic tone grouping biases of Spanish monolinguals, and three groups of Basque-Spanish bilinguals with different levels of Basque experience. Participants' non-linguistic rhythm preferences were assessed in response to non-linguistic tones alternating in either intensity (intensity condition) or in duration (duration condition). In the intensity condition, all groups showed a trochaic grouping bias, as predicted by the iambic-trochaic law. The two other bilingual groups showed no significant bias. Overall, the results indicated that duration-based grouping mechanisms are biased toward the phrasal prosody of the native and dominant language.

Concerning how to define language dominance and classify participants in experimental task, an integrated perspective has been proposed. Birdsong et al. (2012) suggested that language dominance can be interpreted through dominance scores according to the questionnaire survey of the Bilingual Language Profile (BLP). The BLP allows us to access bilinguals' dominance on the following aspects: age of acquisition of L1 and L2 (language history); frequency and context of use (language use); competence in different skills (language proficiency), and attitudes toward each language (language attitudes). These factors are organized into four modules with equal weightings. The BLP method has been widely introduced in bilingual studies and in empirical and laboratory linguistic studies (e.g., Amengual, 2016).

Views vary as to how bilinguals accommodate their weaker and stronger languages. The "one-activation" view suggests that speakers' weaker and stronger languages are separately activated, without interfering with each other (Amengual, 2016; Blanco et al., 2016). Amengual (2016) investigated the perception and processing of mid-vowel contrasts in Majorcan Catalan by early Spanish-Catalan bilinguals. Participants were required to identify the target vowel in a binary forced choice identification task, and to discriminate between vowel pairs in an AX discrimination task. In the third experiment, those bilingual speakers were asked to distinguish words and non-words, encoding the target vowels, from a large stimuli pool. The result showed that early Spanish-Catalan bilinguals in Majorca could categorically perceive the Catalan vowels in a native-like way. And the bilinguals had great difficulty distinguishing between words and non-words that differed in the Catalan vowel contrasts.

In contrast, the "co-activation" view suggests that bilinguals show simultaneous activation of both languages even when processing only one (Nicoladis, 2006). According to a longitudinal study of French-Swedish bilingual children, Schlyter (1993) found that the stronger language was well-developed by non-native speakers, whereas the weaker language would be incompletely acquired. Some bilingual studies referred to this "incomplete acquisition" as "interference, transfer, or crosslinguistic influence" (see in Grosjean, 2012a). Grosjean (2012a) proposed that the weaker language is comparatively less activated compared to the strong language, and listeners may not completely inhibit the interference from the weaker language, especially in a bilingual language mode, where bilinguals are exposed to both strong and weaker languages.

Sebastián-Gallés and Soto-Faraco (1999) explored whether highly experienced early bilinguals, who have already mastered L2 categories, can perform as well as native speakers. Catalan-dominant Catalan/Spanish bilinguals as well as early Spanish-dominant Spanish/Catalan bilinguals (who were exposed to only Spanish or Catalan before the age of four and were proficient in both languages at the time), took part in the experiment. The results showed that Spanish-dominant bilinguals showed worse perceptual results than the group of Catalan-dominant bilinguals. This suggested that an early exposure to a new language is not sufficient to overcome the influence of L1 when perceiving L2 categories.

Antoniou et al. (2012) emphasizes the "flexible" role in language dominance of bilingual speakers in speech processing. Grosjean (1989) states that "a bilingual speaker is not two monolinguals in one," and that bilinguals should be considered as an unique and configured population very different from a monolingual one (Antoniou et al., 2012). It is posited that such bilingual "flexibility" allows listeners to perform as a monolingual speaker or a bilingual speaker according to their tasks (Antoniou et al., 2012), or the language mode in which they are immersed (Grosjean, 2012b), and that

bilingual speakers would perform differently in terms of different experimental tasks.

Language mode is the state of activation of the bilingual languages and language processing mechanisms at a given point in time (Grosjean, 2012b). The language mode framework (Grosjean, 1998, 2012b) illustrates that if only one language mode (e.g., L2) is provided in the experiment process, L1-related memories will not be activated (or only slightly) for early bilinguals, and they will perform exactly like a native speaker of L2; and vice versa when only L1 is provided. On the contrary, in a mixed language mode where both L1 and L2 are provided, listeners' weaker and stronger languages will be activated, but the weaker language will not be activated as strongly as the dominant one. In the mixed language mode, listeners are expected to perform as bilingual speakers. Listeners are able to shift their roles in different language modes, thus showing "flexibility" of bilingual speakers.

PAM Family and Its Application to Bilingualism

In the domain of second language acquisition, PAM has been proposed in accounting for L2 users' perception of speech segments. Perceptual Assimilation Model proposes that language learners are likely to refer to their L1 phonology system when discriminating between L2 phonetic contrasts, and to make a perceptual assimilation between the two phonology systems (Best, 1995). The Perceptual Assimilation Model for Suprasegmentals (PAM-S) suggests that language learners tend to assimilate L2 prosodic contrasts to L1 prosodic categories (So and Best, 2011).

An extension to L2 perceptual learning, PAM-L2 (Best and Tyler, 2007) predicts that non-native listeners may assimilate L2 contrasts into L1 categories, or establish new categories for the unassimilated L2 sounds. Antoniou et al. (2012) attempted to extend the L2 acquisition models to account for the case of bilingual speakers, proposing that L1 and L2 systems are both well-developed, but it is not excluded that there exist a L1/L2 overlap, within which some phonetic properties are shared between L1 and L2. In other words, for early bilinguals, L1 can affect L2 since both the L1 and L2 can be activated in the common L1/L2 overlap. In Antoniou et al. (2012), the L2-dominant bilinguals whose L1 was Greek and L2 was English categorized, rated, and discriminated stop-voicing in both English and Greek. The results showed that the bilinguals biased to their dominant language when distinguishing phonetic contrasts, while they were influenced significantly by the language mode when making goodness-of-fit ratings between L1 and L2 phonetic categories. The bilinguals in Antoniou et al. (2012) thus showed flexibility to perform like monolinguals in the discrimination task and behave in a bilingual-like way in the categorization task.

Antoniou et al. (2012) examined the effectiveness of PAM-L2 in predicting the perceptual performance by bilingual speakers on a segmental level. The current study focuses on tones and selective attention to attest whether PAM-L2 theory and Antoniou et al.'s observations on bilinguals can predict how the Urdu-dominant and Cantonese-dominant Urdu/Cantonese

bilinguals distribute their selective attention to segments and tones when processing L2 speech.

Current Study

In relation to how bilingual speakers accommodate their stronger and weaker languages, previous findings that listeners' L1 phonology did not influence the perception of L2 consonants or vowels (Amengual, 2016; Blanco et al., 2016) evidenced the view of "one-activation." Other researchers supported the view of "co-activation" by reporting L1 phonology interference when perceiving L2 segment contrasts (Schlyter, 1993; Sebastián-Gallés and Soto-Faraco, 1999; Pallier et al., 2001; Nicoladis, 2006). The viewpoint of "flexibility," much less discussed by previous studies than the former two views, focuses on the flexible and shifting roles of L1 and L2 when bilinguals are processing speech in different tasks (Antoniou et al., 2012) and language modes (Grosjean, 2012b). As most research has mainly focused on the interference of phonology, it remains unclear how L1 and L2 are activated when bilinguals are processing cognitively demanding perception tasks in which language-specific attentional strategies are needed. To look more closely at this issue, three research questions are addressed: (1) How do language dominance speakers allocate their selective attention to segmental or tonal dimensions when processing L2 contrasts? (2) How do language dominance speakers distribute their selective attention to segmental and tonal dimensions while processing L2 stimuli? (3) What is the role that language dominance plays in the perceptual process?

Native Cantonese speakers, Cantonese-dominant and Urdu-dominant bilingual speakers are invited to undertake a revised ABX task from Zou et al. (2017). The bilingual speakers are immigrants to Hong Kong, with Urdu as L1 and Cantonese as L2. In the task the subjects are required to identify whether target X sounds closer to the preceding stimulus A or B, which has the same segment and/or tone as X. In the task of segment-and-tone, listeners are provided with an accurate segment and tone in A or B. In the task of segment-or-tone, A or B contains only one correct dimension of segment or tone. For example, an accurate tone appears in A, and an accurate segment appears in B. The task of segment-or-tone allows the listeners to choose only one dimension, being forced to neglect the other. Two pairs of CVCV nonce words were stimuli for the perceptual tasks. On the initial syllables, Cantonese Tone 2 (low-rising) or Tone 4 (low-falling) were carried by the syllable, and the second syllable for each disyllabic nonce word was neutralized as the Cantonese high-level tone. The second syllable for each disyllabic nonce word was neutralized as Cantonese high-level tones (Tone 1), which is the most stable tone in Cantonese that can facilitate the discrimination of the preceding or the following tones (Qin and Mok, 2011). Comparison of the results of the two tasks will enable examination of how bilingual and Cantonese native speakers distribute their attention between tonal and segmental dimensions.

As illustrated by Strange and Shafer (2008) and Strange (2011), native tonal speakers are able to distribute their limited attention to both tonal and segmental dimensions, automatically driven by their native attentional strategy. Whereas, the way tonal

speakers distribute their selective attention is distinct from that of Urdu speakers (non-tonal). For Urdu native speakers, who only depend on the segmental dimension, the tonal dimension would appear to be a new L2 category for them. Thus, it is predicted that where only a L2-specific attentional strategy is allowed, Urdu-Cantonese bilinguals might retain their L1 (Urdu) attentional strategy and rely heavily on segmental dimension, even though they are processing L2 (Cantonese) speeches. In addition, a phonological influence may co-occur with such L1 attentional interference. according to PAM-S, bilingual speakers may assimilate the high-rising Cantonese tone as Urdu question intonation, since they share rising pitch contours (So and Best, 2011), while the Cantonese low-falling tone may be assimilated as Urdu statement intonation due to the overall descending pitch tendency in a statement sentence (So and Best, 2011). Therefore, discrimination difficulty is predicted to be relatively low. If the phonology impact exists for bilingual speakers, it will facilitate the L2 processing, rather than impede it in the process. Hence, if the bilinguals classify L2 contrasts overtly along segments, it is predicted that this will be interfered by their L1 attentional strategy, which supports "co-activation." If the bilinguals automatically adopt a L2-like strategy and focus more on tones, they could be considered as Cantonese monolinguals under a Cantonese mode, which supports "one-activation." Furthermore, there is a possibility that the bilinguals will behave like Cantonese natives in the task of "segment-and-tone," whilst performing like unique L1–L2 bilinguals in the task of "segment-or-tone." This is because the latter task has a low memory demand, while the former one requires listeners to use comparatively more cognitive resources to make responses. If so, the results will suggest that bilingual speakers are able to flexibly shift their roles according to task conditions. This would also support Antoniou et al.'s (2012) claim on PAM-L2, positing that if an independent L2 system is fully established for bilinguals, L1 and L2 still interfere with each other in a language overlap. Since Antoniou et al. (2012) attested PAM-L2 on a segmental level, the current study will provide more evidence from the perspective of the higher-ordered executive level and the suprasegmental level.

METHODS

Participants

Taking part in the experiment were 36 bilingual speakers with Urdu as L1 and 20 native Cantonese speakers (10 female, 10 male). Both the bilingual participants (mean age = 12.1 years, $SD = 3.2$) and native Cantonese speakers (mean age = 13.3 years, $SD = 2.1$) were year one students, studying in local Hong Kong secondary schools. According to the self-reports, in the first 1 or 2 years of their lives, the bilingual participants had been exposed only to Urdu. They spoke Urdu at home and the medium of instruction for school classes was Cantonese. All the participants were healthy, right-handed and did not suffer from any hearing difficulties.

Each participant was required to complete the BLP questionnaire (Birdsong et al., 2012), provided in either Urdu or Cantonese, depending on participant preference. The BLP is an instrument for assessing language dominance, and

includes the following four modules: subjects' language history; language use; language proficiency, and language attitude. We made revisions to BLP questionnaires designed for adult bilingual speakers, to be more suitable to middle school aged bilinguals. For example, we substituted the "work" language domain to a "school" occasion, a more common environment for middle-school students.

The participants were further classified as Urdu-dominant or Cantonese-dominant based on their self-reporting of the BLP questionnaires, which generated Urdu and Cantonese particular scores for the four modules. And a global language dominance scores (LDSs) were generated for each bilingual speaker, with the Urdu score subtracted from the Cantonese score. According to the four modules of the BLP, the participants gave self-rating on a 20-point scale for language history, a 10-point scale for language use, and a 6-point scale for the other two modules. The coefficients were multiplied for each module score in order to weigh the four dimensions equally. This gave the sum of the four revised module scores for L1 and L2 in separation. The LDS were then calculated by subtracting the total scores of L1 from L2 for each bilingual speaker.

Participants with negative scores were classified as Urdu/L2 dominant, while participants with positive scores were classified as Cantonese/L2 dominant. Eighteen Urdu-dominants (11 female and 7 male) and 18 Cantonese-dominants (10 female and 8 male) were selected as participants in the experiment. The 36 bilingual participants emigrated to Hong Kong between the ages of one and ten, and commenced their Cantonese learning between the ages of two and thirteen. In comparison with the Urdu-dominant speakers, the Cantonese-dominant subjects had a much lower AOA and AOL, and a significantly longer LOR (illustrated in **Table 1**). Also, the Cantonese-dominant speakers used Cantonese far more frequently than the Urdu-dominants did on most occasions (in class, and after class, etc.), regarding the Cantonese to Urdu ratio of language use (see **Table 1**).

Language dominance scores ranged largely from −55.4 (strongly L1 dominant) to 121 (strongly L2 dominant), illustrating that the subjects exhibited different degrees of language dominance. Hence, it is interesting to examine how the non-native learners with different overall LDSs showed variances in their ABX performances. **Figure 1** illustrates the distribution of LDSs of the bilingual speakers.

Stimuli

Revised from the experimental materials in Zou et al. (2017), who studied listeners' attention distribution and integration of Mandarin segments and tones, two pairs of CVCV nonce words /kasu/-/tafu/ and /biso/-/diso/ were selected to avoid the lexical interference in Cantonese. Two female and one male Cantonese native speakers recorded the disyllables with CoolEdit 2.0 on a Lenovo ThinkCentre desktop computer (i5 core, USB interface: 3.0) with a Boom microphone, in the audio booth at Hong Kong Polytechnic University. The speakers were shuffled in each ABX combination instead of it being produced by the same speaker, in order to increase phonetic variability and listeners' memory load (Zou et al., 2017). Roman script with Cantonese tone marks of the nonce words was provided to the speakers, who had been trained

	Age-related information (in years)			The Cantonese to Urdu ratio of language use		
	AOA	**AOL**	**LOR**	**In the class class**	**After class**	**Others**
Cantonese-dominants	4.3	4.9	11.3	3.1	1.9	2.1
	1–6	*2–6*	*9–15*	*1.2–4.0*	*0.9–2.3*	*1.3–2.9*
Urdu-dominants	7.7	8.1	4.4	0.9	0.7	1.1
	5–10	*5–13*	*2–6*	*0.5–1.2*	*0.4–1.0*	*0.5–1.3*
T-pair (in 2 tails)						
t	35.2	40.2	54.6	67.5	44.5	47.8
p	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

T-pair test (in two tails) results are shown at the bottom of the table to compare the differences of the variables between the two language dominant groups.

FIGURE 1 | The distribution of language dominance scores according to the Bilingual Language Profile.
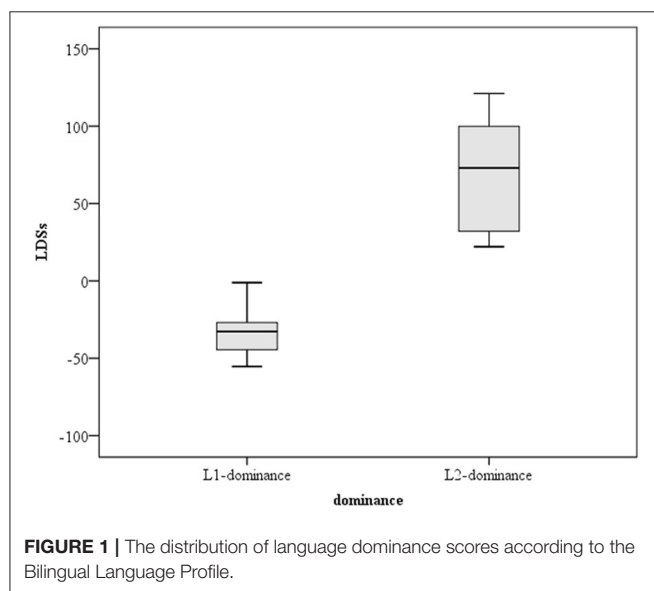
in the pronunciation and the Cantonese scripts of the nonce words. The native speakers were asked to produce the disyllabic pairs with an interval of around one second in a natural speaking speed and the files were sampled at 44,100 Hz.

The pitch contours, which were averaged across different disyllables for each speaker were depicted in **Figure 2**. The stimuli showed phonetic variability with the pitch range of the three speakers were distinct from each other (female 1: 100–250 Hz; female 2: 132–225 Hz; male: 63–155 Hz). The Tone 2 in the first syllable raised from a low point of the pitch scale to a much higher pitch for each native speaker (female 1: 188–250 Hz; female 2: 158–225 Hz; male: 88–155 Hz). The Tone 4 in the first syllable fell from a low pitch to a lower one, exhibiting a falling contour for each speaker (female 1: 143–100 Hz; female 2: 155–132 Hz; male: 93–63 Hz). The Tone 1 in the second syllable showed stable high pitch contours when it was preceded by Tone 2 (female 1: 241–248 Hz; female 2: 216–220 Hz; male: 146–152 Hz), or Tone 4 (female 1: 192–202 Hz; female 2: 216–220 Hz; male: 142–152 Hz). The pitch contours obtained in the tokens correspond

with the description of Cantonese tones in Hao (2012), with tone transcription of 25, 21 and 55 for Tone 2, Tone 4, and Tone 1, respectively. The tone transcription suggested by Chao (1930) is a method to mark tone pitch values with 1 stands for the lowest pitch and 5 for the highest.

Two ABX tests were conducted with segment-and-tone and segment-or-tone conditions (see Zou et al., 2017). In the segment-and-tone task, participants were asked to decide whether target X matched either A or B. In the segment-or-tone task, target X matched either the segmental or tonal dimension with A or B. The nonce word pairs were arranged for each ABX task according to the following criteria: (1) the target X contained the same tone and/or segment as A or B, (2) the stimuli order could be ABX or BAX, and (3) the speakers were shuffled in each ABX combination instead of being produced by the same speaker, in order to increase phonetic variability and listeners' memory load. Thus, for each task, we got 16 ABX stimuli (two non-word pairs × two Cantonese tones × two AB orders × two matches with A or B). The arrangement of stimuli is illustrated in **Table 2**, which shows only one AB order.

Procedure

The participants took part separately in the experiment in a quiet classroom in a local secondary school, with the Praat experiment script run in a computer (Lenovo ThinkCentre desktop, i5 core, USB interface: 3.0) for each participant. Before the start of the experiment, instructions were given by Cantonese native speakers. Participants were asked to listen to three nonce words (A, B, and X) and indicate if X sounded more similar to A or B by a mouse click on "1" or "2" shown on their computer screen, without any script shown. In each task there was a 600 ms interval between standard A and standard B, and X appeared after a 900 ms pause (Braun and Johnson, 2011). The inter-stimuli interval between the two tasks was 2,500 ms, and if the subject failed to respond within the interval, the stimulus would be shown again later on, to ensure no missing data in the experiment. The subjects had been given a 4-min familiarization task in the segment-and-tone condition before the formal experiment began. In the formal experiment, for each individual, there were five repetitions for each stimulus, resulting in 160 ABX tasks (16 ABX stimuli × 2 tasks × 5 repetitions)

FIGURE 2 | The pitch contours of disyllabic non-words produced by one male native speaker and two female native speakers in Cantonese. The pitch frequencies were averaged across /kasu/-/tafu/ and /biso/-/diso/.
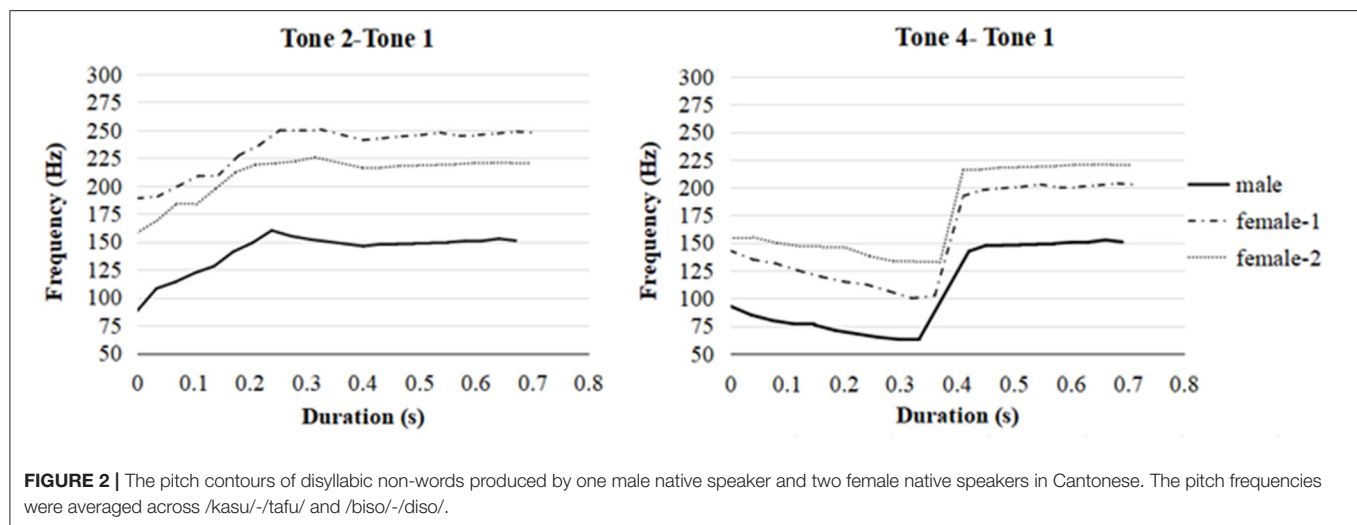
TABLE 2 | Arrangement of stimuli in ABX tasks.

Condition	A	B	X
Segment-and-tone	ka2su1	ta4fu1	ka2su1/ta4fu1
	ka4su1	ta2fu1	ka4su1/ta2fu1
	bi4so1	di2fo1	bi4so1/di2fo1
	bi2so1	di4fo1	bi2so1/di4fo1
Segment-or-tone	ka2su1	ta4fu1	ka4su1/ta2su1
	ka4su1	ta2fu1	ka2su1/ta4fu1
	bi4so1	di2fo1	di4fo1/bi2fo1
	bi2so1	di4fo1	di2fo1/bi4fo1

The number represents a Cantonese tone mark; 1, 2, and 4 stand for Tone 1, Tone 2, and Tone 4 in Cantonese, respectively.

in total. The whole experiment was conducted within 30 min for each participant. The whole experiment was conducted for around 20 min for each participant.

DATA ANALYSES AND RESULTS

Reaction time and response rates were collected throughout the experiment. Response rate was calculated according to the percentage of "correct" (for segment-and-tone) or "segment" (for segment-or-tone) responses out of the five responses for each participant, and each ABX stimulus. For the native speakers group, we got 640 response rates (16 ABX stimuli × 2 tasks × 20 subjects) as well as 3,200 reaction times (16 ABX stimuli × 2 tasks × 20 subjects × 5 repetitions); 576 response rates (16 ABX stimuli × 2 tasks × 18 subjects), and 2,880 reaction times (16 ABX stimuli × 2 tasks × 18 subjects × 5 repetitions) for the Urdu dominant group/Cantonese-dominant group.

In the statistical analysis, raw data of response rate and reaction time were natural-logarithmically transformed to achieve better normality. On the base of sample size and the distribution of data, the linear mixed-effect model (LMM) was performed in R using the lme4 package (Bates et al., 2015),

in the test field of individual response rate and reaction time. According to Baayen et al. (2008), LMM shows advantages in processing nested hierarchical data. The efficiency of the LMM model was examined by marginal R^2 and conditional R^2 using the MuMIn package (Bartoń, 2015) in R, which measures the variances explained by fixed or random effects (Nakagawa and Schielzeth, 2013; Zou et al., 2017). All *p*-values were corrected with Bonferroni adjustment for multi-comparisons.

For response rates and reaction time, initially a full model was run with fixed effects of subject groups (native Cantonese, Cantonese-dominant, and Urdu-dominant groups), experimental trails (segment-and-tone, and segment-or-tone), tone type (low-falling and low-rising), consonant type (/b, d, k, t/), and vowel type (/a, i/). However, the last three factors were removed from the models for both response rate and reaction time due to their insignificance. Once these factors were removed, response rate or reaction time served as the dependent variables in the LMM model, incorporating fixed effects of subject group and experimental task, as well as their interaction. For random effects, by-subject (56 levels) and by-item (16 levels) intercepts were included. In order to gain more insight into the individual variation of the data, the relationship between LDS and the task results (response rates and reaction time) was examined in a linear regression model, with LDS as an independent variable, and response rate or reaction time as a dependent field.

Overall Results of Response Rates and Reaction Time

The statistical results of LMM are presented in **Table 3**. The LMM models showed efficiency with marginal R^2 of 0.58 and conditional R^2 of 0.78 for response rates and marginal R^2 of 0.54 and conditional R^2 of 0.73 for reaction time. It also reported the random effect of the by-subject intercept with a variance of 116.3 (SD = 10.79) and the by-item intercept with a variance of 65.32 (SD = 7.66) for response rates. For reaction time, the by-subject intercept showed a random effect with a variance of 0.02

TABLE 3 | The results of LMM for response rates and reaction time.

Fixed effects	Response rates					Reaction time				
	β	SE	df	t	p	β	SE	df	t	p
Interception	157.67	4.81	129.55	32.82	<0.001	0.09	0.05	71.71	1.66	<0.001
Subject group	28.22	2.26	129.55	12.51	<0.001	0.43	0.03	71.42	16.89	<0.001
Task type	65.98	1.91	1,734	34.46	<0.001	0.89	0.01	8887	68.48	<0.001
Subject group × Task type	22.54	0.89	1,734	25.07	<0.001	0.2	0.06	8887	33.4	<0.001
Random effects	**Variance**	**SD**				**Variance**	**SD**			
1/subject	116.31	10.79				0.02	0.14			
1/item	65.32	7.66				0.09	0.01			
Marginal R^2	0.58					0.54				
Conditional R^2	0.78					0.73				

($SD = 0.14$) and the by-item intercept showed a variance of 0.09 ($SD = 0.01$).

In terms of response rates (see in **Table 3**), according to LMM, there was a significant main effect in the subject group and in the task type. Moreover, LMM revealed an interaction between the subject group and task type, suggesting that native and non-native listeners performed differently across two ABX tasks. In terms of reaction time, LMM reported a significant main effect in the subject group and in the task type. Furthermore, the subject group significantly interacted with the task type in LMM. To answer the first research question, we analyze the data of the segment-and-tone and report the results in section The Task of Segment-and-Tone. Section The Task of Segment-or-Tone gives the results of the segment-or-tone and a comparison with that of segment-and-tone to answer the second research question.

The Task of Segment-and-Tone

The mean percentage of response rates and reaction times for the native and bilingual groups are exhibited in **Figure 3**. According to the *post-hoc* test, the Cantonese native speakers had slightly higher accuracy rates ($M = 85.2\%$, $SD = 10.11$) and slightly shorter reaction time ($M = 1.25$ s, $SD = 0.35$) than the Cantonese-dominant bilinguals, who obtained a mean accuracy of 83.8% ($SD = 12.51$) with a mean reaction time of 1.33 s ($SD = 0.64$). However, the differences between the Cantonese native group and the Cantonese-dominant group were not statistically significant. This suggests that generally, the Cantonese-dominant bilinguals were able to accurately identify Cantonese stimuli as quickly as the Cantonese native speakers did in the segment-and-tone condition. In other words, when both segmental and tonal information were provided in the task, the Cantonese-dominant bilingual speakers could process tones as phonologically as native speakers did.

In comparison with the Cantonese-dominant bilinguals, the Urdu-dominant participants evidently needed ($z = 0.14$, $p < 0.001$) more time ($M = 1.72$ s, $SD = 0.96$) to respond to the Cantonese stimuli, with significantly ($z = 4.29$, $p < 0.001$) lower accuracy rates/response rates ($M = 74.6\%$, $SD = 15.2$). This indicated that Cantonese proficiency and experience facilitated the Cantonese-dominant bilinguals to perceive L2 stimuli more phonologically.

Generally, in the task of segment-and-tone, the speakers, whose maternal or dominant language is Cantonese, responded much more quickly and accurately than those who were dominant in Urdu. It was noted that as the mean accuracy of Urdu-dominants was far above chance level (50%), it was clear that the Urdu-dominant subjects were also able to process Cantonese stimuli phonologically, but in a much weaker way than the other two subject groups.

The Task of Segment-or-Tone

The mean percentage of response rates and reaction times for the native and bilingual groups are exhibited in **Figure 4**. According to the *post-hoc* Tukey test, only 41.1% ($SD = 11.62$) Cantonese native speakers classified the stimuli along "segments," far fewer ($z = 3.33$, $p < 0.001$) than the Cantonese-dominant bilinguals with a percentage of 62.5% ($SD = 12.1$) for "segments." This illustrated that although the Cantonese-dominant bilinguals obtained a comparable performance with the native speakers in the task of segment-and-tone, they still performed significantly differently from the native speakers group. The Cantonese-dominant bilinguals paid more attention to the segmental dimension, while the native speakers were more sensitive to the tonal information.

Around 73.1% ($SD = 19.35$) of Urdu-dominant participants redistributed their attention more frequently ($z = 3.19$, $p = 0.0093$) to the segmental dimension when classifying Cantonese non-words than the Cantonese-dominant bilinguals did. Compared to the Cantonese-dominant bilinguals, the Urdu-dominant participants were evidently more attentive to the segmental information. Thus, the language dominance influenced how the bilinguals distributed their attentional resources.

Moreover, it is noteworthy that the Cantonese-dominant bilinguals ($M = 2.17$ s, $SD = 0.81$) responded much more slowly than both the native speakers ($M = 1.78$ s, $SD = 0.25$; *post-hoc*: $z = 1.26$, $p = 0.0093$) and the Urdu-dominants ($M = 1.86$ s, $SD = 0.58$, $z = 1.81$, $p = 0.0186$). The slow response for the Cantonese-dominants revealed a larger cognitive effort
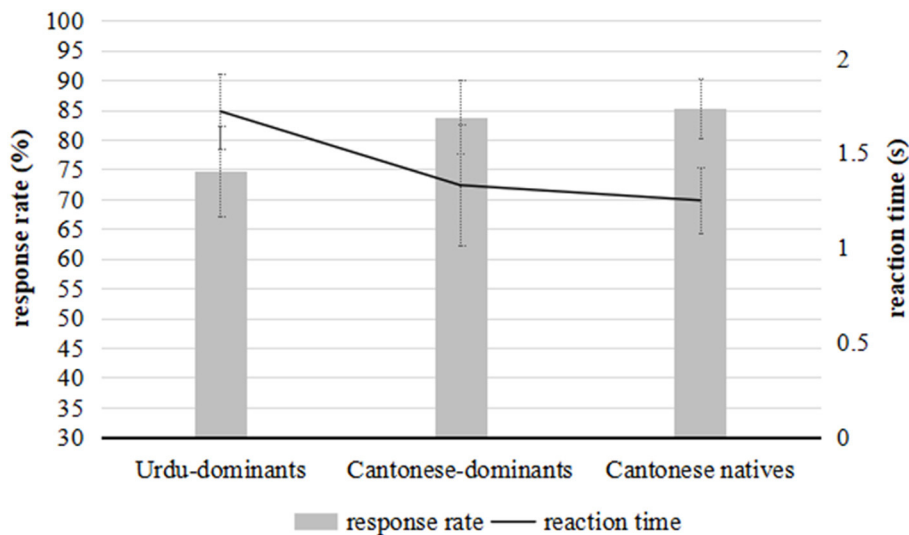
FIGURE 3 | The mean accuracy/response rates (gray bars) and reaction time (dark line) for the bilinguals and Cantonese native speakers in the task of segment-and-tone. The minor y-axis shows the response time and the main y-axis illustrates the response rate. The error bars show 1/2 of *SD*.
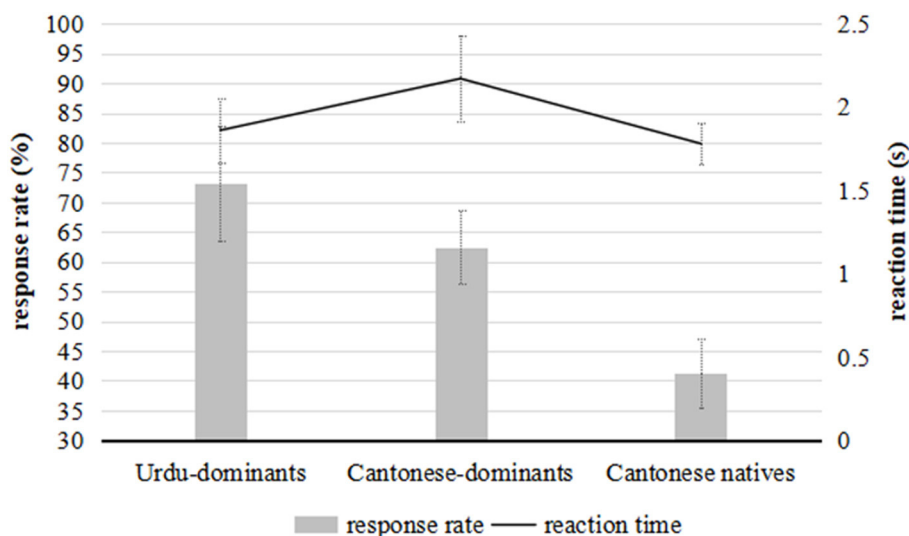
FIGURE 4 | The mean accuracy/response rates (gray bars) and reaction time (dark line) for the bilinguals and Cantonese native speakers in the task of segment-or-tone. The minor y-axis shows the response time and the main y-axis illustrates the response rate. The error bars show 1/2 of *SD*.

in making a decision on the stimuli. Urdu was their maternal language, and Cantonese was gradually becoming a strong language for them. On one hand, they did not feel able to ignore the attentional strategy (attentive to segments) in their L1, and on the other hand, they were not as immediately attentive to the tones as the Cantonese native speakers were. Hence, they needed much more time to resist their L1 strategy and produce a L2 attentional strategy.

No statistical difference was reported in reaction time between the Urdu-dominant bilinguals and the native speakers, suggesting that the Urdu-dominants were not necessarily subject to interference by the weaker language. Both groups

responded immediately according to their native patterns of attention distribution. In the task of segment-or-tone, Cantonese native speakers distributed their attention mainly along tonal dimensions, while the bilinguals classified the stimuli mostly along segmental dimensions.

A comparison of the results of the two experimental tasks shows that the Cantonese natives ($z = 1.27$, $p < 0.001$), the Cantonese-dominant bilinguals ($z = 2.43$, $p < 0.001$), and the Urdu-dominant bilinguals ($z = 2.87$, $p < 0.001$) spent more time giving a response in the segment-or-tone task than in the segment-and-tone task, since the latter task was more cognitively demanding for the listeners.

DISCUSSION

In the segment-and-tone task, both accurate tonal and segmental information were provided, resulting in a comparatively low cognitive demand for the listeners. As predicted, most of the Cantonese native speakers as well as the bilinguals accurately identified the Cantonese stimuli, with accuracy ranging from 74.6 to 85.2%. In terms of the mean accuracy and reaction time, no statistical difference was detected between the Cantonese-dominant bilinguals and the Cantonese native speakers. In contrast, when one of the tonal and segmental dimensions was mismatched in the stimuli, as was the case in the task of segment-or-tone, all the subject groups, including the Cantonese native speakers, showed a much longer reaction time in making a decision than in the task of segment-and-tone. The more cognitively demanding task cost the listeners more time to process the tonal or segmental mismatch in the stimuli.

These results demonstrate that both native and bilingual speakers find it easy to make quick and accurate responses to the stimuli when there is no mismatch in the tonal or segmental dimension. This finding is in line with prior research on bilingualism (Antoniou et al., 2012; Amengual, 2016) showing that bilingual speakers are able to process Cantonese tones phonologically as native speakers do, when undertaking a comparatively less cognitively demanding perception task. Native and non-native speakers might perform comparably in a task with a low cognitive requirement, while the perceptual difference might be revealed by a comparatively high cognitively demanding task. For example, Amengual (2016) showed that Spanish-dominants and Catalan-dominants whose L1 is Spanish, could both categorically perceive the Catalan vowels in an categorical perceptual task where the speech sounds in the continuum varied along acoustic aspects of syllable duration and vowel formants. The reason is that the categorical perceptual task mainly examined the general auditory ability of listeners. However, when Amengual's bilinguals conducted a lexicon decision task, and had to attend to their long-memory of the lexicon system, a perceptual difficulty emerged for the early bilinguals. In addition, our research supports the findings of Strange (2011), indicating that when an easy perception task is conducted, it is possible for bilinguals to obtain a performance comparable with that of native speakers, because they have enough time and attentional resources to extract sufficient information to make an accurate decision.

With regard to the question as to how bilinguals distribute attention to tones and segments, the native and bilingual speakers, as discussed above, were able to rapidly make accurate responses in the task of segment-and-tone, since both tonal and segmental information were matched in the stimuli. As the task of segment-or-tone forced the listeners to respond along only one accurate phonetic dimension, the comparison between the results of the two tasks allows us to examine how the listeners distribute their attention toward tonal and segmental dimensions. The results showed that on average around 41.2% of the Cantonese native speakers classified the stimuli along the tonal dimension, resulting from their native attentional strategy. In Cantonese, tones convey lexical meanings in a syllable, so in order to extract the meanings carried by tones, Cantonese speakers are required to pay much of their attention to the tonal aspect.

This result coincides with the findings in Braun and Johnson (2011) and Zou et al. (2017), which studied the case of Mandarin, and demonstrated that tonal language speakers distribute their attention across both tonal and segmental dimensions in the perception of their native languages. The bilingual speakers in our task of segment-or-tone mainly classified the stimuli along segmental dimensions, with a mean response rate of around 66%. This illustrates that compared with the tonal native speakers, the bilingual speakers paid more attention to the segments than to the tones, which was similar to the performance of the Mandarin learners in Zou et al.'s study whose L1 was Dutch. Although the current study obtains the similar results with that of Zou et al. (2017), the current study recruited Cantonese-dominants and Urdu-dominants as the participants to explore the effect of language dominance on the selective attention of segments and suprasegments in Cantonese. The observations from the current study can make contribution to the field of second language acquisition and Chinese language teaching and learning.

In the task of segment-and-tone, no statistical difference was detected between the performance of the Cantonese-dominants and that of the Cantonese natives, while the Urdu-dominant bilinguals achieved significantly lower accuracy and required far more reaction time to make responses compared with the other two subject groups. Thus, the result supports the finding in Sebastián-Gallés and Soto-Faraco (1999) claiming that language dominance impacts the processing of L2 speeches, and the L2-dominant (Cantonese-dominant in the current study) speakers are able to perform in a more L2-like way, compared with the L1-dominants. This is because L2-dominant bilinguals are usually more proficient and experienced in their L2 language use, age of learning, and LOR (Flege and Fletcher, 1992; Piske et al., 2001).

In the task of segment-or-tone, 73.1% of the Urdu-dominants classified the stimuli according to segmental dimensions, and 62.5% of the Cantonese-dominants were attentive to the segmental information. This indicates that the Urdu-dominants had far more interference from their L1 attentional strategy, depending more on segments than the Cantonese-dominants did in processing Cantonese stimuli. In comparison, Zou et al.'s (2017) results showed that above 80% of Dutch-speaking beginner learners of Mandarin were attentive to segments, and nearly 70% of Dutch-speaking advanced learners of Mandarin classified the Mandarin stimuli along segmental dimensions. Therefore, the result of the Urdu-dominants in our study is closer to that of the advanced learners in Zou et al.'s study. Furthermore, the results of the Cantonese-dominants are different from tonal native speakers who focused mainly on tones, and from the beginner and advanced learners of Mandarin in Zou et al.'s study, who overtly paid attention to the segments. This supports the statement in Antoniou et al. (2012), that bilinguals should be treated as a unique and configured population, clearly different from a native one.

The results also showed that in the task of segment-or-tone the Cantonese-dominant group had a far longer reaction time in processing the mismatched tones and segments, than did the other two subject groups. This may be partly because although

the Cantonese-dominants have mastered a certain awareness and knowledge of attentional strategy in Cantonese, it is not as automatic as it is for the Cantonese natives. Consequently, they are not able to respond as fast as native speakers in the task of segment-or-tone. In accommodating two language-specific attentional strategies at one time the Cantonese-dominants spend more time weighing up the strategies. In comparison, the Urdu-dominants are influenced more by their mother language, which dominates their language systems, so they activate attentional strategy to L1 very quickly, without necessarily spending extra time weighing between Urdu and Cantonese.

In considering how the experience of Urdu influences the bilinguals' processing of Cantonese stimuli, both the phonological impact and higher-order strategical influence were included in the current study. According to PAM-S, bilingual speakers may assimilate the low-rising Cantonese tone as Urdu question intonation, due to the similarity of rising pitch contours. Similarly, the Cantonese low-falling tone may be categorized as Urdu statement intonation, as it is comparable to a low-falling pitch tail and a descending pitch tendency at the end of a statement sentence (So and Best, 2011). PAM-L2 predicts that if listeners assimilate non-native sounds into different L1 categories, they will find it very easy to distinguish non-native sounds. Therefore, the phonological impact, if it indeed exists, would facilitate the processing of Cantonese for the bilinguals, and the perceptual differences shown in the task of segment-or-tone, would result from the impediment of the attentional strategy overtly used in the listeners' L1.

In Urdu, segments are used to classify a syllable, and it is suggested that such segment-dependent attentional strategy for non-tonal speakers would largely impede their processing of a tonal language (Zou et al., 2017). Therefore, bilinguals are not as sensitive as native speakers are when processing tonal information. The current study supports the prior findings on selective attention for native and non-native language listeners (Strange and Shafer, 2008; Steinhauer et al., 2009; Strange, 2011; Steinhauer, 2014; White et al., 2017; Zou et al., 2017), suggesting that non-native learners cannot develop a native-like selective perceptual routine, but their L2 processing can become increasingly automatic as they accumulate L2 experience.

Antoniou et al. (2012) suggested that bilinguals may have well-developed L1 and L2 systems, but that there is still an overlap between L1 and L2. We agree with these observations, since well-developed Urdu and Cantonese phonology systems enabled the bilinguals in our study to perceive phonologically the Cantonese stimuli in the task of segment-and-tone, whilst the overlap between languages allowed the bilinguals to co-activate different attentional strategies, as shown in the task of segment-or-tone. Due to the language overlap, the segment-dependent strategy the bilinguals used in Urdu system hindered the attention distribution of Cantonese segmental and tonal dimensions.

As discussed previously, the Cantonese-dominants performed similarly to the Cantonese natives in the task of segment-and-tone, and showed differences from the native speakers when exposed to the segment-or-tone task. Therefore, the Cantonese-dominants can be regarded as Cantonese speakers in the first task, and they shift to bilingual status in the second task.

This suggests that even L2 dominant speakers cannot perform exactly like native speaker, in line with the previous findings of Sebastián-Gallés and Soto-Faraco (1999). Antoniou et al. (2012) found that English-dominant bilinguals whose L1 is Greek, behaved like monolingual speakers of English when perceiving a phonetic continuum of initial stops (in the categorical perception task). However, the English-dominants shifted their role to bilinguals when they were required to assimilate English and Greek initial stops (in the assimilation task). As outlined by Antoniou et al., the assimilation task required the listeners to refer to both their L1 and L2 phonology systems to make a goodness-of-fit rating between L1 and L2 phonetic contrasts. Antoniou et al. also indicated that PAM-L2 could explain how L1 phonology influenced L2 perceptual performance, but that it could not account for why the role of bilinguals shifted, to monolingual or bilingual, within different perceptual tasks. The flexible role outlined in Antoniou et al. (2012) and in the current study support the claims of Grosjean (2012a,b) language mode framework. Grosjean indicates that when bilinguals are exposed to only one language (language A), the stronger language (language A) will be highly activated, and the weaker language (language B), will be slightly or hardly activated, which generates a monolingual mode. When the listeners are provided with both languages (language A and B), the two languages will be activated to a large degree, but the weaker language (language B) will be slightly less activated since it is not dominant for the bilingual speaker, resulting in a bilingual mode. In fact, the language mode in Grosjean's model concerns the flexible roles that bilinguals play in sound processing. We define the flexibility as the ability of a bilingual speaker to shift roles between bilingual and monolingual mode under different tasks, the "perceptual flexibility" proposed by Antoniou et al. (2012).

Grosjean (2012b) had a definition of "monolingual mode," requiring bilinguals to have a very high proficiency in L2, and the laboratory setting does not allow any activation of another language for bilinguals. However, as Grosjean suggested, "putting bilingual participants in a monolingual mode in a research project is difficult." There have been other research attempts to control a monolingual mode, such as monolingual experimental materials, monolingual testing scripts, etc., for example by Antoniou et al. (2012) and Sebastián-Gallés and Soto-Faraco (1999).

For the purposes of the current study, the experimental stimuli were produced in Cantonese, the facilitators were Cantonese native speakers, and only Cantonese scripts were offered to the listeners, creating a monolingual mode for the bilinguals. In the task of segment-and-tone, the monolingual mode allowed the Cantonese system (the stronger language) to be activated for the Cantonese-dominants, who are highly experienced and proficient in Cantonese, which is why they performed comparably to the Cantonese native speakers. However, for the task of segment-or-tone, the Cantonese-dominants performed quite differently from the Cantonese native speakers, even though they were highly experienced and only the Cantonese mode was provided in the experiment. One possible explanation may be that the task of segment-or-tone not only examines whether the bilinguals have established Cantonese phonetic categories,

but also provides links to their executive functions, which the bilinguals can use to process the tonal and segmental mismatches in the stimuli.

The executive function of selective attention correlates with the selective perceptual routine, suggested by Strange and Shafer (2008), and Strange (2011). According to Grosjean (1998), for a bilingual speaker, the stronger and weaker languages are domain-specific and have dynamic systems instead of static and unchanged ones. A weaker language can become dominant for the bilingual speaker, when they are exposed to an unknown or unfamiliar linguistic context, language domain, or experimental task, and vice versa for a stronger language to change into a weaker one. The earliest systematic Cantonese learning for the bilingual middle school students started in the classroom. Teachers may teach explicit knowledge, such as how to distinguish tones, use vocabulary, and organize sentences grammatically. However, they often neglect tacit knowledge teaching, such as attentional strategy and meta-cognitive knowledge, important for students to develop a native-like attentional strategy. In the executive domain of language processing, native speakers have already developed a mature and automatic strategy to deal with a task although they are usually unaware of it. However, the bilinguals, who never pay attention to it or have not developed a Cantonese-specific attentional strategy, will naturally refer to their native language system, and make responses based on their L1.

With respect to Chinese language learning and teaching, the current study suggests that tonal perceptual training is still an essential part as Urdu-Cantonese bilinguals cannot perceive Cantonese tones like native speakers. Apart from formal classroom teaching, online perception training with L2 syllables, disyllabic words, and conversational materials can be adopted to enhance non-native learners' communicative ability. Also, the "one-to-one" mode provides flexibility in perceptual training, which allows the training procedure to be adjusted based on individual learners' backgrounds and language proficiency.

CONCLUSIONS

To examine how Urdu and Cantonese dominant bilingual speakers distribute their attention when processing Cantonese tones and segments, a cognitively demanding task was conducted. The results showed that the bilinguals, especially the Cantonese-dominants, were able to process Cantonese tones in a phonological way when both segmental and tonal information was accurately matched (the segment-and-tone task). However, they were impeded by Urdu attentional strategy when tonal and segmental dimensions were mismatched. The results supported Strange (2011) research as well as that of Strange and Shafer

(2008), suggesting that non-native listeners can obtain a more automatic selective perceptual routine in L2 as they gain L2 experience. However, even L2 dominant bilinguals still cannot completely overcome the interference of the attentional strategy of their L1.

Moreover, the Cantonese-dominants performed in a monolingual way in the first task (segment-and-tone) and performed like bilinguals in the second task (segment-or-tone). This finding coincides with the research of Antoniou et al. (2012), proposing that highly experienced bilinguals show a perceptual flexibility when conducting different tasks. PAM-L2 cannot account for such flexibility, but it can be explained by the framework of Grosjean's language mode. It also suggests that the bilinguals should be treated as a unique language group instead of being regarded as native speakers of both languages. Furthermore, being more dominant in Cantonese clearly enabled the Cantonese-dominants to gain a more Cantonese-like performance compared with the Urdu-dominants. The relationship between the listeners' perceptual performances and their degree of language dominance indicates that the methodology of PAM-L2 can predict bilinguals' performances.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Hong Kong Polytechnic University. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

Both authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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Motivational Strategies, Language Learning Strategies, and Literal and Inferential Comprehension in Second Language Chinese Reading: A Structural Equation Modeling Study

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Motivational strategies have been recognized as a crucial but insufficiently explored component in second language (L2) learning. This study intends to explore the relationships between motivational strategies, language learning strategies, and literal and inferential comprehension in L2 Chinese reading. Data were collected from 547 international students of universities in mainland China through a strategy use questionnaire and a Chinese reading test. The analysis of the structural equation model indicated that motivational strategies indirectly affected literal comprehension through the mediation of learning strategies. Moreover, motivational strategies were found to directly affect inferential comprehension. The results emphasize the need for a more sophisticated analysis of the motivational strategies and language learning strategies in L2 Chinese reading.

Keywords: motivational strategies, language learning strategies, literal comprehension, inferential comprehension, L2 chinese reading

INTRODUCTION

Over the last two decades, Chinese has been recognized as an important foreign language (FL) or second language (L2) taught and learnt within and outside China (Gong et al., 2018, 2020c,d). At the end of 2018, more than 492 thousand people from 196 countries and regions were reported learning L2 Chinese in mainland China (Ministry of Education of the People's Republic of China, 2019). The growing interest of learning Chinese around the world has called for research into Chinese language teaching and learning (Gong et al., 2020a).

One of the issues concerns L2 learners' strategy use in Chinese language learning. Researchers in L2 education have recognized the vital role of motivational strategies in learning (Oxford, 1990, 2011; Dörnyei, 2005). L2 learners use motivational strategies to initiate their willingness to start learning and sustain their efforts and perseverance

in tedious foreign language learning (Cheng and Dörnyei, 2007). In recent decades, there is a growing interest in developing techniques to increase motivation and explaining the relationships between motivational strategies with language learning strategies (e.g., cognition and metacognition) and learning outcomes (Dörnyei and Csizér, 1998; Cheng and Dörnyei, 2007; Teng and Zhang, 2018). However, there lacks empirical clarity concerning how motivational strategies, while interacting with language learning strategies, influence learners' performance.

Previous research has already found how L2 learners use learning strategies to improve their reading performance (Phakiti, 2003, 2008; Zhang and Zhang, 2013; Zhang et al., 2014). However, most research studies have investigated reading comprehension as a global construct regarding its relationship to language learning strategies (Phakiti, 2003, 2008; Zhang et al., 2014), neglecting the multilevel complexity of comprehension (Kintsch, 1998) when L2 learners interact with texts. Each level of comprehension requires different cognitive demands (Pearson and Johnson, 1978; Kintsch and Rawson, 2005), implying that L2 learners may use various strategies for a specific level of comprehension. Literal and inferential comprehension are two levels of reading comprehension widely used to design comprehension questions in reading tests and recommended in teaching practices and instructional books (Eason et al., 2012; Basaraba et al., 2013). Understanding their relationships with strategy use, including motivational, cognitive, and metacognitive strategies in reading, would help language teachers and learners identify specific strategy use patterns for achieving a certain level of reading comprehension and later adjust their teaching and learning. Given the limited empirical studies on this topic, there is a need to investigate the relationships between L2 learners' strategy use and the reading performance in literal and inferential comprehension.

Most research studies investigating the effects of strategy use on reading comprehension have been conducted in L2 English contexts (Purpura, 1997, 1999; Phakiti, 2003, 2008; Zhang and Zhang, 2013). To date, few studies have examined the interactions between learners' strategy use and reading comprehension performance in L2 Chinese. Compared with English reading, Chinese reading involves different cognitive processes and linguistic characteristics (Koda, 2005; Zhou et al., 2018). L2 Chinese learners may employ distinctive strategies to comprehend texts. Research findings on the strategy use in L2 Chinese reading would contribute to the theoretical development on L2 acquisition by supporting, challenging or proposing modifications to the existing knowledge of L2 theories (Han, 2017).

Given these research gaps mentioned above, this study aimed to explore the influences of motivational and language learning strategies on literal and inferential comprehension in L2 Chinese reading. Its purpose was to determine whether certain types of strategies might affect reading performance at a specific comprehension level. The study also examined how motivational studies interacted with language learning strategies in L2 Chinese reading. For the purpose of this study, L2 Chinese specifically refers to learning L2 Chinese in Chinese-speaking environments. Learning Chinese as an additional language or a FL is not the focus of the present study.

LITERATURE REVIEW

Literature review on strategy use in L2 Chinese reading includes four major parts: motivational strategies in L2 learning, language learning strategies in L2 reading, literal and inferential comprehension in L2 reading, and strategy use and L2 Chinese reading comprehension. The first part addresses the role of motivational strategies in L2 learning and examines the studies that have investigated the relationships between L2 learners' strategy use and academic performance. Then, it moves on to a review of the development of language learning strategies in L2 reading. After that, the roles of different levels of comprehension in L2 reading ability is discussed. The last part reviews strategy use research in L2 Chinese reading context, which is the main focus of the literature review.

Motivational Strategies in L2 Learning

Motivation strategies are activities that individuals intentionally perform to initiate, maintain, or increase their willingness to start or complete a specific task or goal (Wolters, 2003). According to Dörnyei (2005), the purpose of motivational strategies in L2 learning is "to generate and enhance student motivation, as well as maintain ongoing motivated behavior and protect it from distracting and/or competing action tendencies" (p. 117). L2 learners use motivational strategies purposefully to influence their choices, efforts, or persistence for academic works and eventually impact their learning outcomes (Wolters, 2003; Pintrich, 2004). Although motivational strategies have been recognized as an essential part of several L2 strategy taxonomies (Oxford, 1990, 2011; Dörnyei, 2005), empirical research on their relations to other types of strategies and L2 learners' academic performance is still inadequate.

A few studies have tried to explore the effects of motivational strategies on the academic outcomes in self-regulated learning, which is closely related to theories and empirical studies of language learner strategies in L2 learning (Pintrich and De Groot, 1990; Wolters, 1998, 1999; Schwinger and Stiensmeier-Pelster, 2012). Self-regulated learning is an active and constructive process whereby learners set learning goals and monitor, regulate and control themselves cognitively, behaviorally and emotionally to achieve their goals (Pintrich, 2000; Zimmerman, 2002). Self-regulated learners can apply a number of strategies and adapt their behaviors when they encounter problems in language learning (Zimmerman, 2008). Some researchers argued that motivational strategies directly and positively influenced learners' academic outcomes (Wolters, 1999; Cheng and Dörnyei, 2007). However, other researchers claimed that motivational strategies alone were not enough to influence learners' learning outcomes and needed to work in combination with other strategies to achieve a significant effect on the academic

performance (Pintrich and De Groot, 1990; Pekrun et al., 2007; Mega et al., 2014).

Focusing only on investigating the direct effects of motivational strategies is likely to undermine the importance of motivational regulation on academic achievement as motivational strategies aim to optimize learners' learning efforts, persistence, or choices of activities (Wolters, 2003; Schwinger and Stiensmeier-Pelster, 2012). Pintrich and De Groot (1990) found that learners' motivational strategies did not directly affect classroom academic performance but were strongly correlated with cognitive strategies. Schwinger and Stiensmeier-Pelster (2012) reported an indirect effect of motivational strategies on students' academic performance through the mediation of learning effort.

Schwinger and Stiensmeier-Pelster (2012) also pointed out the lack of investigating the effect of motivational strategies in specific academic disciplines or contexts. Students tend to feel more or less motivated in different academic discipline, which may later influence whether a specific motivational strategy effectively sustains or enhances their learning efforts. For example, students' cognition of mathematics is different from that of German and English. They believed that mathematics requires more effort and more intelligence than the other two subjects (Haag and Götz, 2012). Students' perceptions of different subjects or learning domains affect the effects of motivational strategies. A majority of the research on motivational strategies in academic disciplines has been conducted within mathematics, history and English contexts (Rotgans and Schmidt, 2009; Greene et al., 2015; Sinatra and Taasoobshirazi, 2018). Few studies have explored the functions of motivational strategies in L2 Chinese reading. There is a need for more research on how motivational strategies are enacted across a variety of disciplinary contexts.

Language Learning Strategies in L2 Reading

Learning strategies are both behavioral and mental activities adopted by learners to enhance their language ability in L2 learning (Oxford, 1990). Cognitive and metacognitive strategies are two core components of strategies in L2 strategy taxonomies (Oxford, 1990, 2011; O'Malley and Chamot, 1990; Sheorey and Mokhtari, 2001). Cognitive strategies refer to the behaviors a learner uses to solve specific tasks in the learning process. In the process of L2 reading, researchers have generated three categories of cognitive strategies: comprehending, memory, and retrieval (Purpura, 1999; Phakiti, 2008; Zhang and Zhang, 2013). Comprehending includes the use of skills to understand incoming information and identify valuable items for further processing; memory involves storing meaningful information in long-term memory; retrieval concerns recalling specific information from long-term memory.

Metacognitive strategies are mental activities that a learner intentionally employs to control and regulate their learning process (Paris and Winograd, 1990; Cohen and Upton, 2006). Metacognitive strategies in reading include planning, monitoring, and evaluating (Jacobs and Paris, 1987; O'Malley and Chamot, 1990). Planning strategies refer to previewing tasks

and choosing specific activities for pre-set goals; monitoring is concerned with examining ongoing thoughts and actions in the reading process; evaluating involves assessing one's past, current, and future cognitive actions for reading tasks (Phakiti, 2008; Zhang and Zhang, 2013).

A group of empirical studies have explored how L2 learners' strategy use is associated with their L2 English reading performance (Phakiti, 2003, 2008; Zhang and Zhang, 2013; Zhang et al., 2014). Phakiti (2003) investigated the relationships between L2 learners' strategy use and their English reading test performance and found weak and positive relationships of cognitive and metacognitive strategies to reading performance. Later, Phakiti (2008) conducted another strategy use study and discovered that metacognitive strategy use had an indirect influence on reading test performance through the mediation of cognitive strategy use. Cognitive strategy use itself had a direct effect on lexico-grammatical reading ability, which primarily concerns learners' competence in literal comprehension. Metacognitive strategy use strongly affected on cognitive strategy use. Zhang et al. (2014) discovered that cognitive and metacognitive strategies operated jointly to impact L2 learners' lexico-grammatical reading ability assessed in College English Test Band 4 (CET-4) reading subtest. They argued that cognitive and metacognitive strategies might work collectively under a unitary construct to improve L2 learners' reading performance, regardless of their complex characteristics. Although there is an increasing agreement that using these learning strategies improves L2 learners' English reading performance (Phakiti, 2003, 2008; Zhang and Zhang, 2013; Zhang et al., 2014), there is no consensus on the relationship between cognitive and metacognitive strategy use.

Cognitive and metacognitive strategies are closely related to motivational strategies in the learning process, especially in self-regulated learning. Wolters (1999) discovered that motivational regulation strategies explained 22 and 32% of the variance in learners' use of metacognitive and cognitive strategies. His later study (2003) revealed that motivational strategies were positively associated with higher cognitive strategies. Similarly, Pekrun (2006) reported that motivational strategies improved cognitive and metacognitive strategy use in academic contexts. These findings may indicate that motivational strategies may serve as an antecedent of, or operate concurrently with, cognitive and metacognitive strategies to help L2 learners improve their academic performance, as argued by some researchers (Wolters, 2003; Pintrich, 2004). Although previous research has indicated that motivational, cognitive and metacognitive strategies promote L2 learners' reading performance, it is unclear how motivational strategies interact with the other two types of learning strategies to affect reading achievement. Therefore, more empirical research is required.

Literal and Inferential Comprehension in L2 Reading

Reading comprehension is "the ability to receive and interpret information encoded in language form via the medium of print" (Urquhart and Weir, 1998, p. 22). Reading comprehension

involves a complex interaction between bottom-up word-level processing and top-down meaning processing (Rumelhart, 1977; Rayner and Pollatsek, 1989). Levels of comprehension appear in many instructional textbooks recommended for classroom teaching and reading tests in the form of questions to assess learners' comprehension in first language (L1) and L2 reading research (Eason et al., 2012; Basaraba et al., 2013). Literal comprehension and inferential comprehension are two levels of comprehension that language learners encounter most frequently when they engage in reading.

Pearson and Johnson (1978) described literal and inferential comprehension by introducing three types of reading comprehension questions: textually explicit, textually implicit, and scriptally implicit questions. Textually explicit questions, related to literal comprehension, are used to examine a reader's understanding when answers are directly located in the text. Textually implicit questions assess readers' inferential comprehension when making logical inferences about information not explicitly stated in the texts. Scriptally implicit questions assess readers' inferential comprehension in integrating their background knowledge and experiences with the information described in the text.

Kim (2009) based on previous research (Halliday and Hasan, 1989; Kintsch, 1998), proposed a framework of L2 comprehension levels composed of three categories: literal comprehension, inferential comprehension with endophoric reference, and inferential comprehension with exophoric reference. Inferential comprehension with endophoric reference concerns understanding implicit information from the text, whereas inferential comprehension with exophoric reference refers to comprehending implicit information, combined with extra knowledge outside the text. Both are consistent with Pearson and Johnson's (1978) classification of reading comprehension questions. In this study, literal comprehension refers to understanding explicitly stated information in the text; inferential comprehension refers to deriving implicit information from the text and integrating information from various parts of the text or prior knowledge and personal experiences.

Previous research has either measured literal reading comprehension only or used a combined measure of literal and inferential reading comprehension, yet has not compared the relationships between strategy use and literal reading comprehension versus inferential reading comprehension (Phakiti, 2003, 2008; Zhang and Zhang, 2013; Zhang et al., 2014). Different levels of comprehension require distinctive cognitive processes and varying degrees of interaction with the texts (Rupp et al., 2006; Alptekin and Erçetin, 2010). Literal comprehension primarily involves linguistic processes, including word recognition, syntactic parsing, and semantic-proposition formation (Grabe, 2009), whereas inferential comprehension involves higher-order processing assesses readers' competence in interpreting the author's intended meaning and understanding the underlying message in a group of surface sentences (Dole et al., 1991; Vacca et al., 2009). Through the executive control process in their working memory, readers choose to process certain information strategically and use multiple strategies

to achieve reading comprehension in accordance with task difficulties (Grabe, 2014).

Based on the different cognitive-processing demands for answering literal and inferential questions in the reading tasks, previous studies investigating reading comprehension by combining both levels into one construct may have overlooked how strategy use interacts with a specific level of comprehension. Such information may help researchers identify the effectiveness of different strategies used to understand different levels of comprehension. Investigating comprehension performance levels separately will paint a more comprehensive picture of the interactions between L2 learners' strategy use and their reading performance. Since most previous studies have examined the effects of strategy use on overall reading ability, more empirical studies are needed to investigate how these strategies affect L2 learners' performance at literal and inferential reading comprehension, respectively.

Strategy Use and L2 Chinese Reading Comprehension

As a morphosyllabic language, Chinese has a distinct reading process, which is different from English, an alphabetic language. Chinese contrasts clearly to English in the mapping relationships among orthographic representations, morphology and syntax (Peng et al., 2020). Especially in the lower-level reading processing, L2 learners depend heavily on their linguistic knowledge (Shen and Jiang, 2013). L2 learners may use distinctive strategies in reading Chinese texts due to these linguistic and cognitive-processing differences. For example, the written form of Chinese, a character, is independent of its pronunciation, whereas the sound cue usually is identifiable in English (Kong, 2006). Instead of using the strategy of phoneme-grapheme correspondences in English, L2 learners may use semantic and phonetic radical information to retrieve the meanings and sounds of Chinese characters (Zhang et al., 2016). Chinese's morphological structure is predominantly about compounding in words, rather than inflections and derivations commonly used in English (Koda, 2005; Zhou et al., 2018). L2 learners need to get such information through their understanding of the Chinese text they are reading. Moreover, a Chinese word may contain one or more characters. In written texts, there are no space boundaries between words. L2 learners are required to recognize context-appropriate words with their mental lexicons and grammar knowledge to segment words (Shen and Jiang, 2013; Huang, 2018). However, L2 learners may employ some similar strategies relevant to general reading processes across languages when their proficiency in L2 reading has achieved a certain level (Feng and Mokhtari, 1998; Chuang, 2007). Chuang (2007) compared the strategies used by 345 eighth-grade students when they read English and Chinese texts. The quantitative analysis indicated that high- and average-achievers did not show significant differences in the use of metacognitive, problem-solving and support strategies between English reading and Chinese reading. A similar result was found in Feng and Mokhtari's (1998) study, in which the majority of strategies

identified were used by 20 advanced learners in both English and Chinese reading.

In the past decade, Chinese language teaching and learning as a FL or L2 has attracted more and more attention in and outside China (Gong et al., 2020b, 2021; Ke, 2020). However, there still exists a disparity between the development of L2/FL Chinese and L2 English strategy use research (Jiang and Cohen, 2012; Ma et al., 2017). Most research in mainland Chinese journals still describes L2 learners' strategy use in Chinese reading through classroom observation and explains well-recognized strategy taxonomies (Jiang and Cohen, 2012). Moreover, most empirical studies have examined strategy use in lower-level reading processes, such as character recognition and word segmentation (Shen, 2004, 2005; Ke, 2020), rather than higher-level processes involving inferential comprehension.

A few studies have examined the interaction between strategy use and L2 Chinese reading performance (Li, 2002; Qian, 2006; Ke and Chan, 2017). Li (2002) recruited 60 intermediate-level L2 learners to complete a questionnaire developed from Oxford's (1990) theoretical framework of language learning strategies and found no difference in cognitive strategy use between successful and less successful learners in L2 Chinese reading. However, successful L2 learners were identified to use metacognitive strategies more effectively in reading Chinese than their less successful ones. Qian (2006) also used a questionnaire to examine 92 intermediate- and advanced-level Korean learners' strategy use in reading Chinese texts. She found that the most frequently used reading strategies were predicting and using context. Qian (2006) argued that since Chinese is a context-bound language, these two strategies are effective in Chinese reading. Ke and Chan (2017) examined L2 Chinese learners' strategy use of different L1 backgrounds across three proficiency levels. They found that L2 learners' proficiency affected their application of reading strategies. The strategy types improved along with L2 learners' proficiency levels. However, the number of strategies employed in reading did not differentiate across the three proficiency levels.

Most previous studies on L2 Chinese learners' strategy use in reading have adopted descriptive or simple inferential analyses, such as binary correlation (Jiang and Cohen, 2012; Ma et al., 2017). These studies fail to examine the causal relationships between L2 learners' strategy use and their Chinese reading performance. Moreover, the sample size of these studies is relatively small, so their findings are not generalizable to the larger L2 Chinese population. Moreover, most existing empirical evidence of strategy use in reading has been provided by L2 English research. Previous empirical studies have found that using language learning strategies improves L2 learners' English reading performance, especially their lexico-grammatical reading competence (Phakiti, 2003, 2008; Zhang and Zhang, 2013; Zhang et al., 2014). Since Chinese and English are two different languages with different cognitive processes and linguistic characteristics (Koda, 2005; Shen and Jiang, 2013; Zhou et al., 2018), it is unclear whether L2 Chinese learners use similar strategies as their L2 English counterparts. It is hypothesized that L2 Chinese learners may use language-specific strategies, such as decoding characters and segmenting words, in lower-level reading processes due to the linguistic differences between English and Chinese. However, it is possible that L2 Chinese learners may apply similar strategies as their L2 English counterparts once they reach a certain level of L2 reading proficiency due to the decreasing influence of language-specific factors in reading comprehension (Grabe, 2014).

Although there is an extensive body of literature in these strands contributing to our understanding of strategy use and its relationship to L2 reading comprehension, more research is required with several questions yet to be answered. First, the interrelationships among strategies themselves and their relationships to L2 reading performance are inconclusive. Some studies have found that both cognitive and metacognitive strategies had significant effects on L2 reading test performance (Phakiti, 2003; Zhang et al., 2014); others have revealed that only one type, either cognitive or metacognitive, of strategy use directly influenced L2 reading test performance (Phakiti, 2008; Zhang and Zhang, 2013). In terms of the relationships between cognitive and metacognitive strategies, some researchers have indicated that metacognitive strategy use had an executive function on cognitive strategy use (Phakiti, 2008; Zhang and Zhang, 2013), while others have discovered that cognitive and metacognitive strategy use functioned concurrently in test contexts (Phakiti, 2003; Zhang et al., 2014). Second, the interactions between motivational strategies and language learning strategies and the role of motivational strategies in L2 reading are understood poorly. Third, there is a lack of empirical studies investigating the relationships between L2 learners' strategy use and their reading performance at different levels of comprehension. Last, few studies have investigated the role of strategy use in L2 Chinese reading.

Considering these gaps, this study addresses two research questions below:

(1) What are the relationships among motivational strategies, learning strategies, and literal comprehension for L2 Chinese learners?
(2) What are the relationships among motivational strategies, learning strategies, and inferential comprehension for L2 Chinese learners?

MATERIALS AND METHODS

Participants

The participants in this study were 547 international students who learned Chinese in universities in mainland China. All the participants were recruited from upper-intermediate level Chinese classes or above in these universities. On average, they had been learning Chinese in mainland China for 2.90 years (SD = 1.12) with 1,920 instructional hours at the time of the study. According to the test syllabus of Hanyu Shuiping Kaoshi (HSK), intermediate-level participants who have learned Chinese for approximately two academic years are eligible to take HSK Level 5, in which students are evaluated to use higher-order reading comprehension processes (Chinese Language Council International and Confucius Institute Headquarters, 2009). HSK Level 5 corresponds to Level C1 of the Common European

Framework of Reference for Languages (CEFR) (Chinese Language Council International and Confucius Institute Headquarters, 2009). Of all the participants, 353 were female, and 194 were male. The participants' age ranged from 16 to 38, with a mean of 22.58 and a standard deviation of 5.17. In terms of nationalities, the five largest groups of participants were Korean ($n = 103$), Thai ($n = 97$), Indonesian ($n = 62$), Japanese ($n = 45$), and Russian ($n = 37$). A breakdown of the participants by country is shown in **Supplementary Appendix A**.

Instruments

Instruments for this study consisted of a self-reported strategy use questionnaire and a Chinese reading comprehension test. The questionnaire surveyed the motivational strategies and language learning strategies used by the participants. The Chinese reading comprehension test was used to measure their literal and inferential comprehension in L2 reading.

Strategy Use Questionnaire

The motivational strategies were measured based on affective strategies of initiating and maintaining motivation conceptualized by Oxford (1990, 2011). Other sources were also consulted in developing the measures (Pintrich and De Groot, 1990; Dörnyei and Csizér, 1998; Dörnyei, 2001, 2005; Cheng and Dörnyei, 2007). The motivational strategies evaluate how frequently students use strategies to initiate and maintain students' motivation in L2 Chinese reading, such as setting the goals of their learning efforts by getting high grades or improving reading skills and knowledge, avoiding negative assessment of their reading performance, and using thoughts or subvocal statements to enhance their efficacy for an ongoing reading task.

The language learning strategies were categorized into cognitive and metacognitive strategies. Both the cognitive and metacognitive strategies were adapted from Oxford's (1990) Strategy Inventory for Language Learning (SILL) and Sheorey and Mokhtari's (2001) Survey of Reading Strategies. Some questionnaire items were modified to adapt to Chinese linguistic features in reading as the writing systems of Chinese and English differ greatly in their orthographic representations, morphology and syntax. Sample items were "I used Chinese radical knowledge to guess meanings of unknown words in the text." and "I used a known character to guess the meanings of the unknown characters within a word." The cognitive strategies in the questionnaire, measuring the frequency of actions used by students to solve the tasks in reading, include three subsections: comprehending, memory and retrieval. The metacognitive strategies, measuring the frequency of mental activities that students use to manage and regulate the reading process, contain three subsections: planning, monitoring and evaluating.

All questionnaire items were presented in both English and Chinese. The questionnaire items were first translated into Chinese, then back-translated into English. Two Chinese faculty members verified the accuracy of the translation. After piloting the instrument among 175 L2 learners studied in universities in mainland China, who had similar Chinese language proficiency as the main study participants, the final version of the questionnaires (see **Supplementary Appendix B**) contained 47 strategies, 6 items for motivational strategies, 20 for cognitive strategies, and 21 for metacognitive strategies. All items used a 6-point Likert scale, ranging from 0 (never) to 5 (always), which indicated an increased frequency of strategy use in L2 Chinese reading.

Reading Comprehension Test

Chinese reading comprehension was measured using the reading subtest of HSK Level 5, which was designed to assess intermediate-level learners' Chinese reading proficiency (Chinese Language Council International and Confucius Institute Headquarters, 2009). With six difficulty levels, HSK is the only recognized large-scale standardized Chinese proficiency test for L2 learners in mainland China (Chinese Language Council International and Confucius Institute Headquarters, 2009). The reading subtest of HSK Level 5 is used to assess reading comprehension ability for understanding literal and inferential information. The reading subtest contains 45 multiple-choice questions, consisting of 15 items for gap-filling, 10 for long passage comprehension, and 20 for reading comprehension (Chinese Language Council International and Confucius Institute Headquarters, 2009).

Based on Pearson and Johnson's (1978) taxonomy of reading questions, two Chinese reading specialists were invited to classify the 45 test items into literal and inferential questions. Literal questions included identifying the details directly stated in the text. Inferential questions covered inferring the meanings of the words or sentences used in the text, understanding ideas implied in the text, and drawing conclusions based on information stated in several sentences across the text. The ratio of consistent classifications to the total number of classifications reached 94% agreement between the two reading specialists. Disagreements about classifying a question were discussed until consensus was reached. In the end, literal questions contained 7 test items from gap-filling, 10 from long passage comprehension, and 9 from reading comprehension. All other items were categorized as inferential questions.

Data Collection

The participants first completed a 45-minute reading comprehension test and then filled out a 15-minute strategy use questionnaire. Before the test was administered, students were informed that the data collected would be kept confidential and strictly used for research purposes. The participants joined the study on a voluntary basis and their consent informs were obtained. A dichotomous scoring was used to assess the reading comprehension test items, one point for each correct answer and zero for wrong items. Questionnaire items were scored on the 6-point Likert scale of frequency.

Data Analyses

Descriptive statistics were first calculated for items in the questionnaire and the reading test. Exploratory factor analysis (EFA) was then conducted using principal axis factoring with oblimin rotation to explore the factor structures of

strategies. The oblimin rotation was used because potential factors of motivational and learning strategies were correlated based on the theories and results from previous empirical studies (Oxford, 1990, 2011; Wolters, 1999, 2003; Pekrun, 2006). Composite variables were generated at factor levels for both instruments. This approach, known as item parceling, is commonly used in studies of modeling latent variables in the language education field (Purpura, 1999; Zhang and Zhang, 2013). An aggregate score is more representative of the measured construct, and more statistically reliable than individual items (Little et al., 2002). Confirmatory factor analysis (CFA) was conducted to examine if the identified factor structures and the reading test were good. Structural equation modeling (SEM) was later performed to explore the relationships between motivational strategies, language learning strategies, and literal and inferential comprehension. SEM is an analytic approach for testing hypothesized relationships among observed variables and/or latent factors to determine the degree to which the hypothesized model fits the sample data (Kline, 2011). To evaluate the model fit, several goodness-of-fit indices ($x^2/df \leq 3$, RMSEA0 ≤ 0.06, SRMR ≤ 0.08, CFI ≥ 0.90, GFI ≥ 0.95) were adopted (Hu and Bentler, 1999; Bentler, 2005). Descriptive and EFA analyses were performed using SPSS 24 (International Business Machines (IBM), 2016) and SEM was conducted via AMOS (Arbuckle, 2010).

RESULTS

Descriptive Statistics

Table 1 displays the descriptive statistics of each composite variable, including means, standard deviations, and internal consistency reliability. EFA generated seven factors for 47 questionnaire items measuring L2 learners' strategy use in the reading test. These seven factors, namely, comprehending (COM), memory (MEM), retrieval (RET), planning (PLA), monitoring (MON), evaluating (EVA), and motivational (MOT) strategies, were labeled regarding strategy taxonomies in L2 learning (Oxford, 1990, 2011; O'Malley and Chamot, 1990; Sheorey and Mokhtari, 2001). Factors of COM, MEM, and RET were hypothesized to measure cognitive strategies, whereas factors of PLA, MON, and EVA were hypothesized to measure metacognitive strategies. **Table 2** displays the correlations between factors generated from the questionnaire. Composite scores were generated at factor levels for strategy use questionnaire and reading comprehension test. All the questionnaire item scores for one factor were added up and then divided by the number of items under that factor. Literal and inferential comprehension scores were generated by adding up all the test items' scores to those two levels of reading comprehension. **Table 3** presents the correlations between factors of literal and inferential comprehension. The means of all the questionnaire items were all above the mid-point of the six-point Likert scale. The average scores for literal and inferential questions ranged from 4.46 to 7.64. The reliabilities of all the observed variables ranged from

TABLE 1 | Means, standard deviations, internal reliability, and sample items for composite variables ($N = 547$).

Composite variable	No. of items	Mean	SD	Reliability (Cronbach's α)	Sample item
COM	7	3.22	0.60	0.77	I tried to understand the content of the text without looking up every word
MEM	7	3.20	0.64	0.72	I paraphrased or simplified the information in the text to remember.
RET	6	3.22	0.70	0.79	I guessed the meanings of unknown words using root words.
PLA	6	3.05	0.67	0.77	I planned what to do before I began to read texts.
MON	7	3.37	0.65	0.78	I knew when I should read more carefully during the reading.
EVA	8	3.13	0.60	0.83	I checked to see if my understanding of the text was supported by evidence available in the text.
MOT	6	3.61	0.69	0.79	I motivated myself to complete the reading test even if I found it was difficult.
LQGF	7	4.46	1.77	0.62	–
IQGF	8	5.42	1.95	0.62	–
LPC	9	7.64	1.59	0.63	–
LQRC	9	6.85	1.97	0.69	–
IQRC	11	7.58	2.48	0.72	–

COM, comprehending; MEM, memory; RET, retrieval; PLA, planning; MON, monitoring; EVA, evaluating; MOT, motivational strategies; LQGF, literal questions in gap-filling; LPC, long passage comprehension; LQRC, literal questions in reading comprehension; IQGF, inferential questions in gap-filling; IQRC, inferential questions in reading comprehension.

TABLE 2 | Correlation matrix of the strategy use factors.

	COM	MEM	RET	PLA	MON	EVA	MOT
COM	1.00						
MEM	0.57**	1.00					
RET	0.58**	0.57**	1.00				
PLA	0.54**	0.48**	0.49**	1.00			
MON	0.59**	0.50**	0.57**	0.54**	1.00		
EVA	0.63**	0.58**	0.58**	0.66**	0.62**	1.00	
MOT	0.49**	0.44**	0.46**	0.39**	0.63**	0.48**	1.00

*COM, comprehending; MEM, memory; RET, retrieval; PLA, planning; MON, monitoring; EVA, evaluating; MOT, motivational strategies. **p < 0.01.*

0.62 to 0.83, indicating acceptable reliabilities. One item in long passage comprehension in the reading comprehension test was dropped because it reduced the reliability of its relevant factor and negatively correlated with other items within the factor.

TABLE 3 | Correlation matrix of the reading comprehension factors.

	LQGF	IQGF	LPC	LQRC	IQRC
LQGF	1.00				
IQGF	0.62**	1.00			
LPC	0.53**	0.50**	1.00		
LQRC	0.54**	0.50**	0.58**	1.00	
IQRC	0.59**	0.60**	0.58**	0.61**	1.00

*LQGF, literal questions in gap-filling; IQGF, inferential questions in gap-filling; LPC, long passage comprehension; LQRC, literal questions in reading comprehension; IQRC, inferential questions in reading comprehension. **p < 0.01.*

Contribution of Motivational and Language Learning Strategies to Literal and Inferential Comprehension

To answer the research questions, in terms of the influence of motivational, cognitive, and metacognitive strategies on literal and inferential comprehension, SEM was conducted to examine the relationships among these five latent variables. According to the initial SEM model, metacognitive strategies were hypothesized to directly affect cognitive strategies based on theories and empirical results (Purpura, 1999; Phakiti, 2003, 2008; Zhang and Zhang, 2013). Motivational strategies were hypothesized to directly affect both cognitive and metacognitive strategies as prior research found that motivational strategies encouraged L2 learners to flexibly use cognitive and metacognitive strategies to complete specific tasks in the academic setting (Pekrun et al., 2002; Wolters, 2003, 2011). Motivational, cognitive, metacognitive strategies were hypothesized to have an individual effect on literal and inferential comprehension based on previous research (Phakiti, 2003, 2008; Cheng and Dörnyei, 2007; Zhang and Zhang, 2013).

Before SEM analysis, CFA was first conducted to examine whether observed composite variables of strategies and reading comprehension test loaded on their postulated latent factors. The results of CFA model indicated that all the variables were loaded significantly on their designated latent factors. However, a high correlation was found between cognitive and metacognitive strategies ($r = 0.93$, $p < 0.001$), suggesting multicollinearity between these two variables (Kline, 2011). Previous literature showed that cognitive and metacognitive strategies worked concurrently under a unitary construct in reading contexts (Phakiti, 2003; Zhang et al., 2014). Thus, cognitive and metacognitive strategies were merged into one latent variable in this study, namely, language learning strategies. **Supplementary Appendix C** presents the results of CFA model.

Structural equation modeling was first performed to explore the relationships between motivational and language learning strategies and literal comprehension. The model was a good fit for the data in this study ($x^2/df = 2.97$, $p < 0.001$; RMSEA = 0.059, SRMR = 0.039, CFI = 0.98, GFI = 0.97). Motivational strategies had a significantly positive effect on language learning strategies ($\beta = 0.66$, $p < 0.001$). Language learning strategies had a significantly positive effect on literal comprehension ($\beta = 0.17$, $p < 0.05$). Although motivational strategies did not have a significant direct effect on literal

comprehension, they had a significant indirect impact on literal comprehension through the mediation of language learning strategies ($\beta = 0.11$, $p < 0.05$). Therefore, language learning strategies had fully mediated the positive effect of motivational strategies on literal comprehension. **Figure 1** presents the final structural model for motivational strategies, language learning strategies, and literal comprehension.

The second SEM model was conducted to test the relationships between motivational strategies, language learning strategies and inferential comprehension. The model showed an acceptable fit ($x^2/df = 3.11$, $p < 0.001$; RMSEA = 0.060, SRMR = 0.041, CFI = 0.97, GFI = 0.96). As shown in **Figure 2**, motivational strategies had a significantly and directly positive effect on both language learning strategies ($\beta = 0.66$, $p < 0.001$) and inferential comprehension ($\beta = 0.15$, $p < 0.05$). However, the direct relationship between language learning strategies and inferential comprehension was not significant ($\beta = 0.09$, $p = 0.20$). Motivational strategies had no significantly indirect effect on inferential comprehension ($\beta = 0.14$, $p = 0.23$).

DISCUSSION

This study investigated the relationships between L2 Chinese learners' motivational and language learning strategies and their reading comprehension at literal and inferential levels. The findings highlight several differences and similarities concerning those reviewed in previous literature.

Roles of Motivational Strategies, Language Learning Strategies in Literal Comprehension

The result shows that motivational strategies affected L2 learners' performance on literal comprehension through full mediation of learning strategies, supporting the indirect interactions between motivational strategy use and learners' learning performance in some previous studies (Wolters, 2003; Schwinger and Stiensmeier-Pelster, 2012). Effective use of motivational strategies enables learners to intentionally activate their willingness and enhance their efforts to facilitate cognitive and metacognitive strategy use, thus optimizing their performance (Zimmerman, 2000; Pekrun and Stephens, 2010). The significant relationships between motivational strategies and learning strategies also highlight the relevance of motivational strategies to cognitive and metacognitive strategies in earlier research (Pintrich and De Groot, 1990). Cognitive and metacognitive strategies, combined as language learning strategies in this study, function as mediator variables between motivational strategies and literal comprehension, indicating motivational strategies alone are insufficient to affect learners' achievement on literal comprehension. Other strategies are also necessary.

Cognitive and metacognitive strategies were found highly correlated in this study, which is consistent with previous findings that cognitive and metacognitive strategies function concurrently in the reading process (Phakiti, 2003; Zhang et al., 2014). It may be challenging to distinguish cognitive strategies from metacognitive strategies "when they are embedded in
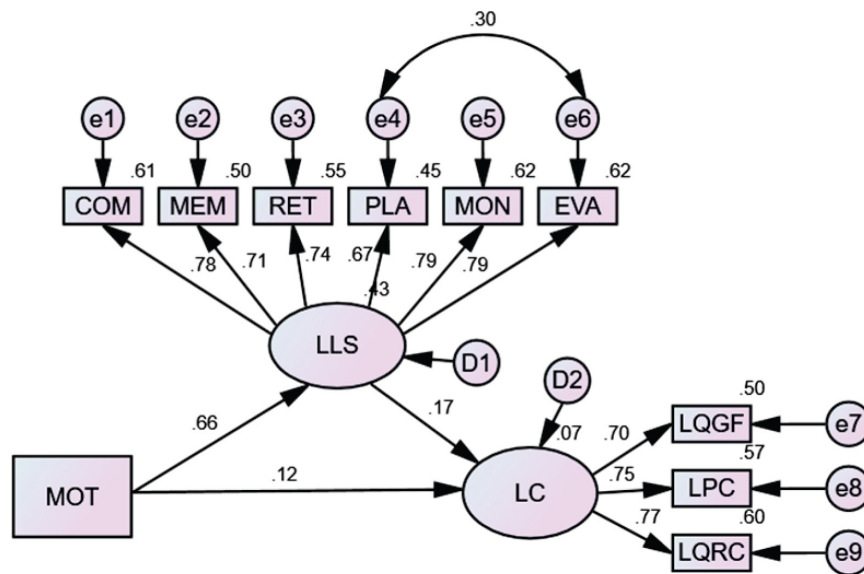
FIGURE 1 | Structural model of the relationships between motivational strategies, language learning strategies and literal comprehension. LLS, Language learning strategies; COM, comprehending; MEM, memory; RET, retrieval; PLA, planning; MON, monitoring; EVA, evaluating; MOT, motivational strategies; LC, literal comprehension; LQGF, literal questions in gap-filling; LPC, long passage comprehension; LQRC, literal questions in reading comprehension.
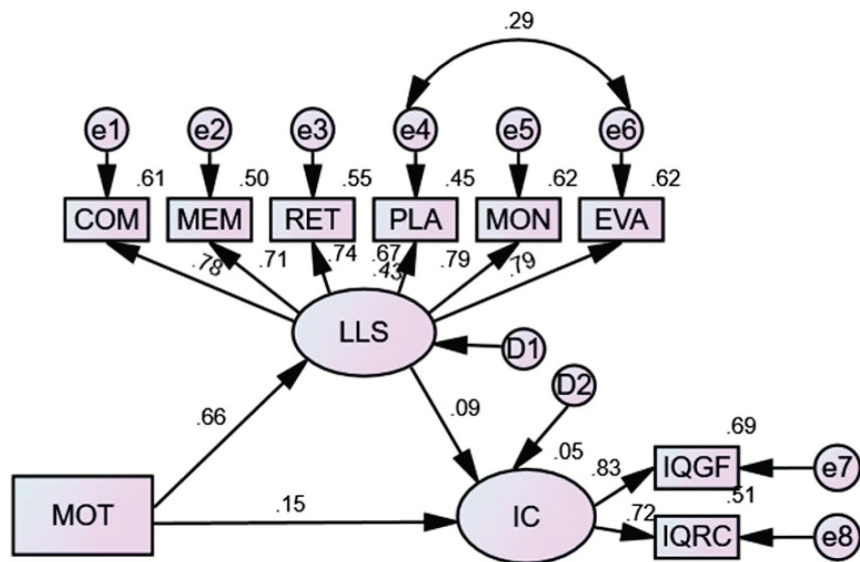
FIGURE 2 | Structural model of the relationships between motivational strategies, language learning strategies and inferential comprehension. LLS, language learning strategies; COM, comprehending; MEM, memory; RET, retrieval; PLA, planning; MON, monitoring; EVA, evaluating; MOT, motivational strategies; IC, inferential comprehension; IQGF, inferential questions in gap-filling; IQRC, inferential questions in reading comprehension.

complex sequences of behavior or hierarchies of decisions" (Paris et al., 1991, p. 610). When L2 learners try to complete a reading task, they are likely to employ multiple strategies simultaneously to deal with task demands to maximize their comprehension and reading test performance (Zhang et al., 2014; Huang, 2018). The strategies L2 learners use to solve this task usually are not clearly distinguishable, especially when they work under time constraints. Huang (2018) found that successful

comprehension in Chinese texts involved a combined use of reading strategies, which contained one or multiple levels of sub-strategies contributing to higher-level strategies. For example, two sub-strategies, using context cues and decoding characters, were applied simultaneously to help readers use a higher-level strategy, inferring words or phrases.

Learning strategies were found to directly affect learners' performance at literal comprehension. Previous studies

found that L2 learners' strategy use directly impacted their lexical-grammatical ability (Purpura, 1999; Phakiti, 2008). Since lexical-grammatical ability primarily concerns an individual's competence in literal comprehension, the current finding is consistent with previous research. The direct effect of language learning strategies on literal comprehension indicates that language learning strategies play a crucial role in compensating L2 learners for their lack of knowledge or skills in linguistical processing, such as unknown words and complex sentence structures in the texts. They also support text-based comprehension developed by L2 learners, especially when they encounter a difficult task for which their habitual behaviors in the reading process are insufficient (Cohen, 1998).

Roles of Motivational Strategies, Language Learning Strategies in Inferential Comprehension

Different from the findings in literal comprehension, motivational strategies directly affected inferential comprehension. No indirect interaction was found between motivational strategies and inferential comprehension, but motivational strategies directly affected language learning strategies. The contextual conditions may lead to different results. The effects of motivational strategies on achievement have been found to be domain-specific (Haag and Götz, 2012; Schwinger and Stiensmeier-Pelster, 2012). The differences are caused by the underlying characteristics of literal and inferential comprehension in this study. L2 learners tend to perceive inferential comprehension tasks as more complicated than literal comprehension. These tasks involve higher-order processing and place more demands on both working memory and cognitive load (Alptekin and Erçetin, 2010). L2 learners may consciously activate and maintain their motivation to engage in a high level of effort in completing a task of inferential comprehension, which later directly affects their reading performance. Otherwise, they would easily give up when encountering difficult questions to measure inferential comprehension in reading, especially with insufficient reading ability.

In terms of literal comprehension, as participants in this study are upper-intermediate learners who are likely to adapt to the demands of Chinese lower-level processes, they may apply motivational strategies with few conscious thoughts. Skilled readers internalize many strategies enhancing reading comprehension as automatic routines when the tasks are not challenging (Alderson, 2000). Therefore, different characteristics of tasks could lead to different effects of motivational strategies. The results emphasize the need to examine the effectiveness of motivational strategies in various contextual conditions.

Language learning strategies failed to affect inferential comprehension. Unlike literal comprehension, inferential comprehension is related to individuals' higher-level processing skills. L2 learners are required to understand implicit information, connect arguments across the text to identify its main idea, and relate the information in the test to their prior knowledge, thus achieving inferential comprehension (Grabe, 2009; Basaraba et al., 2013).When L2 learners try to

complete items to measure inferential comprehension, the role of learning strategies becomes less critical, as it depends on learners' higher-level comprehension ability. The effects of learning strategies may be minimal, especially when they encounter difficult items beyond their reading proficiency. Although L2 learners' motivational strategies initiate and sustain their willingness to use learning strategies in this study, without the use of language learning strategies fails to improve their reading performance in inferential comprehension without competence in higher-order processing. Such a result supports the need to explore L2 learners' strategy use at different levels of reading comprehension, which has been neglected in previous relevant research.

Roles of Strategy Use in L2 Chinese Reading

Although Chinese reading differs from English reading in cognitive processes and linguistic characteristics (Koda, 2005; Zhou et al., 2018), the effects of strategy use on L2 Chinese reading performance in the work are similar to the results in L2 English studies (Purpura, 1999; Phakiti, 2008). The language learning strategies used by L2 Chinese learners significantly affected their literal comprehension. However, no significant relationship was found between learning strategies and inferential comprehension. Such results indicate that L2 Chinese learners use language learning strategies in lower-level processing to compensate for their lexical and grammatical deficiencies in knowledge. The role of strategy use becomes insignificant in inferential comprehension, especially when L2 Chinese learners' reading proficiency level fails to reach item difficulty.

It should be noticed that the participants in this study were upper-intermediate learners, which correspond to proficient users of the languages in CEFR. The degree of linguistic disparities between L1 and L2 affects early L2 reading performance, especially for word-decoding. The influence decreases when L2 learners' reading proficiency improves (Grabe, 2014). These similar findings suggest that L2 learners' strategy use is not influenced by language-specific elements in L2 Chinese when their L2 reading abilities reach a certain level of proficiency. The findings support Cummins's (1979) Linguistic Interdependence Hypothesis which suggests that cognitive aspects of language learning, such as reading strategies, can be transferred across languages, even though the writing systems of languages are strongly different.

The results of this study are also consistent with previous L2 English research findings that strategy use only explains a relatively small amount of L2 learners' reading performance (Phakiti, 2008; Zhang et al., 2014), regardless of the target language. As Bachman (2002) argued, if L2 learners' language knowledge is below the task's difficulty level, the influence of strategy use on reading performance will decline.

CONCLUSION

This study explored the relationships between motivational strategies, language learning strategies used by L2 learners,

and their reading comprehension performance at literal and inferential levels. SEM models indicated that motivational strategies indirectly affected literal comprehension, whereas they directly influenced inferential comprehension. This result highlights the influence of potential contextual differences on the effectiveness of motivational strategies. Language learning strategies were found to significantly affect literal comprehension. However, there was no significant relationship between language learning strategies and inferential comprehension. These results suggest the different roles of learning strategies play in L2 reading depending on the specific levels of comprehension. The relationships between L2 learners' strategy use and their Chinese test performance found in this study are similar to the results reported in L2 English strategy use research (Purpura, 1999; Phakiti, 2008), indicating that strategy use is not language-specific among proficient L2 learners.

Theoretically, the findings of this study enrich researchers' knowledge about L2 learners' strategy use in different levels of reading comprehension, particularly concerning the role of motivational strategies in literal and inferential comprehension. Pedagogically, awareness of the complexity of the motivational and language learning strategies will help Chinese language teachers and L2 learners better understand the effects of strategy use on different levels of comprehension. Teachers are recommended to demonstrate how, when, and why to employ a specific strategy or a group of strategies for a particular reading task to L2 learners, especially motivational strategies that help them to initiate and sustain their willingness to start or complete reading in the challenging tasks (a consideration mostly absent from previous strategy instruction).

This study found that learning strategies were more effective in enhancing L2 Chinese reading performance on items measuring literal comprehension, which was fundamental to inferential comprehension. Given such information, teachers may first give explicit instructions on using strategies for literal questions in Chinese reading, such as strategies facilitating word-decoding and sentence-parsing.

Several limitations of this study need to be noted. First, the questionnaire is the sole instrument used to measure L2 learners' strategy use. Although a self-reported questionnaire is a viable instrument for collecting and analyzing extensive data with high-reliability levels, participants may over- or under-report on questionnaire items based on their comprehension and the accuracy of their retrieval process in reading (O'Malley and Chamot, 1990). It is recommended to adopt a mixed-methods approach in the future to obtain rich and accurate information on L2 learners' strategy use in different reading levels. Using qualitative and quantitative methods would allow for cross-validating the roles of L2 Chinese learners' strategy use in different levels of reading comprehension. Second, the correlation between literal and inferential comprehension is relatively high ($r = 0.89$), indicating that the questions measuring these two levels of comprehension in this study might not be clearly distinguishable. It is suggested to design specific test items based on the characteristics of each level of comprehension in future to further explore the relationships between strategy use and different reading proficiency levels. Third, the participants in this study are all at an upper-intermediate level of Chinese language proficiency. The results can be only applied to that portion of L2 learners with similar reading abilities. Future studies may explore the relationships between strategy use and reading performance at different levels of comprehension among L2 learners with different Chinese reading proficiency levels, e.g., those at the beginning level who are still struggling with word-decoding.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Faculty of Education, University of Hong Kong. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

LL conceived and designed the study, collect and analyzed the data, and wrote the manuscript. W-IL and ST conceived and designed the study. All authors contributed to the article and approved the submitted version.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2021.707538/full#supplementary-material

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A Comparative Study of the Motivations to Teach Chinese Between Native and Non-native Pre-service CSL/CFL Teachers

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The present study compared the motivations to teach Chinese between native and nonnative pre-service teachers of Chinese as a second/foreign language (CSL/CFL). The participants included 325 native and 325 non-native Chinese-speaking pre-service CSL/CFL teachers registered in the Masters in Teaching Chinese to Speakers of Other Languages (MTCSOL) programs; the teachers were asked to complete a 24-item questionnaire. Two major findings emerged. First, a similar six-factor teacher motivation was observed for both the native and non-native teachers. Second, the two groups showed non-significant differences in their ratings of the importance of cross-cultural value, intrinsic value, altruistic value, and fallback career choice as types of motivation but differed significantly in their ratings of extrinsic value and social influence. These results highlight the differences and similarities in the motivation of the second language teacher and offer insights into the variables at different levels that might influence the motivation of the second language teacher. Teacher motivation is advised to be taken into account in the training and administration of CSL/CFL teachers to alleviate the problems of teacher shortage outside China.

INTRODUCTION

Teacher motivation is a key topic in educational psychology and is generally defined as the psychological motives that drive an individual to choose teaching as a career. The importance of teacher motivation for various aspects of teaching and learning has been widely recognized in the field of general education (Dörnyei and Ushioda, 2011; Richardson et al., 2014; Han and Yin, 2016; Hiver et al., 2018; Kissau et al., 2019a), such as the dropout rate of student teachers (Jungert et al., 2014), career decisions (Watt and Richardson, 2007, 2008; Kissau et al., 2019a), teaching performance (Irnidayanti et al., 2020) and learning motivation of students (Wild et al., 1997; Atkinson, 2000; Roth et al., 2007; Radel et al., 2010; Jodaei et al., 2018). Since the1990s, in the field of second language education (Pennington, 1995), a considerable body of literature has explored the motivation to become a second language (L2) teacher. One potential reason for carrying out such research relates to the shortage of L2 teachers, a problem commonly observed in

many countries around the world (Swanson, 2010, 2012; Swanson and Huff, 2010; Swanson and Mason, 2017; Kissau et al., 2019a). Previous research on L2 teacher motivation mainly focused on English language teachers, with insufficient attention paid to teachers of less commonly taught languages, such as Chinese.

The growing importance of learning Chinese as a second/foreign language (CSL/CFL) has been commonly acknowledged around the world. By December 2018, 492,185 foreign students from 196 countries studied in 1,004 universities or colleges in China (Ministry of Education of the People's Republic of China, 2019). By December 2019, 550 Confucius Institutes and 1,172 Confucius Classrooms have been founded in 162 countries; more than 30,000 elementary and middle schools and more than 4,000 universities offered Chinese language courses and more than 25 million people were learning Chinese[1]. Such a growth of Chinese language education leads to a shortage of qualified CSL/CFL teachers in many countries and areas outside China to some extent.

To help solve this problem, first, the Chinese government has established Masters in Teaching Chinese to Speakers of Other Languages (MTCSOL) programs at 149 universities by December 2020[2] and has funded about 105,000 native CSL/CFL teachers to teach abroad from 2004 to 2018[3]. In addition, the Center for Language Education and Cooperation (CLEC, previously known as *Hanban*) and China Scholarship Council have been providing scholarships for non-native Chinese speakers to study MTCSOL programs in China, aiming to train Chinese language teachers for local contexts outside China. However, a considerable proportion of native and non-native preservice teachers have ultimately not worked as CSL/CFL teachers after completing the program (Liu, 2016; Li, 2017), a common problem that has been observed for teaching in other languages (Swanson and Huff, 2010).

Second, along with a noteworthy growth in researching Chinese language education (Ma et al., 2017; Gong et al., 2018b, 2020a,c; Ke, 2020; Lü, 2020), researchers have carried out studies on the professional development of CSL/CFL teachers (such as Moloney, 2013; Moloney and Xu, 2015; Ma and Gao, 2017; Gong et al., 2018a; Wang and Bale, 2019; Yang, 2019; Zhang et al., 2020), focusing on topics, such as teacher cognition, teacher knowledge, and teacher education programs. However, empirical studies on CSL/CFL teachers are relatively few (Ma et al., 2017; Gong et al., 2020a) and existing research mainly concentrated on the in-service native CSL/CFL teachers, paying less attention to the comparison between the preservice native and non-native CSL/CFL teachers.

Compared with the rapid development of Chinese language education and MTCSOL programs, our understanding of the reasons why native and non-native preservice CSL/CFL teachers choose to enter Chinese teaching profession is still relatively

inadequate. Comparing the two groups, teacher motivation is crucial. First, the two groups are critical for solving the problem of CSL/CFL teacher shortage outside China because, after completing the master's program, most non-native preservice CSL/CFL teachers return to their home countries and many native preservice CSL/CFL teachers tend to teach Chinese abroad. Thus, teacher motivation might determine the decision of the two groups to continue CSL/CFL teaching or not. Second, most MTCSOL programs administer a split-class model, where the native and non-native groups study separately, based on the assumed differences between the two groups in terms of Chinese language proficiency, professional knowledge, and teacher cognition. However, it is not clear whether the two groups have different or similar teacher motivations, which might be helpful for designing a tailor-made MTCSOL program. Furthermore, considering common concerns of the researchers over teacher motivation across different contexts (Watt and Richardson, 2012) and limited research on comparing the native and non-native speaker and the motivation of L2 teachers, this study might be of interest and value for researchers and practitioners in other L2s and in general education. Therefore, the present study aims to investigate the similarities and differences in teacher motivation between the native and non-native pre-service CSL/CFL teachers, also as an echo to the call of the researchers for gaining more attention to empirical studies on CSL/CFL teachers (Ma et al., 2017; Gong et al., 2020a).

LITERATURE REVIEW

Motivation to Be a Teacher

Studies on the motivation to be a teacher in general education have been conducted using various frameworks, such as self-determination theory (Deci and Ryan, 1985), achievement-goal theory (Elliot, 2005), and expectancy-value theory (Eccles, 2009). Both quantitative and qualitative methods have been conducted, and one of the most popular methods is questionnaire surveys. Watt and Richardson (2007) developed a reliable and valid tool, the factors influencing teaching choice (FIT-Choice) Scale, to investigate the types of teacher motivation in general education. This questionnaire has been successfully applied in different contexts (Berger and D'Ascoli, 2012; Fokkens-Bruinsma and Canrinus, 2012; Jugović et al., 2012; Kilinç et al., 2012; König and Rothland, 2012; Lin et al., 2012; Watt and Richardson, 2012) and resulted in some consensus on the types of teacher motivation, largely aligning with the results reported in the previous studies (Brookhart and Freeman, 1992; Kyriacou et al., 1999; Kyriacou and Coulthard, 2000; Dörnyei and Ushioda, 2011; Fokkens-Bruinsma and Canrinus, 2014; Richardson et al., 2014).

First, studies have generally found that intrinsic value is a major type of teacher motivation. Interest in teaching or the subject and beliefs about the teaching abilities of an individual are inspiring motives for an individual to work as a teacher. The second type of teacher motivation relates to altruistic or social values, such as making contributions to social justice and shaping the lives of the younger generation. The third type concerns extrinsic value, i.e., perceptions of the teachers on the extrinsic welfare offered by teaching, such as the social status, job security,

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[1]The data were cited from the news report released by International Chinese Language Education Conference (2019). http://conference2019.hanban.org/page/#/pcpage/detailpage/newsdetail?id=42.

[2]The data were cited from the official website for Master's degree programs in China. https://yz.chsi.com.cn/zsml/queryAction.do.

[3]The data were cited from a personal communication with an official in CLEC.

and job transferability of the teachers. Fourth, although the career choices of some teachers are related to encouragement from their family members or friends, they tend to show weak fallback career tendencies. In general, the decision of an individual to work as a teacher is mainly based on her/his own choice, rather than being based on the social influence from others or a view of teaching as a stepping stone to another career.

Motivation to Be a Second Language Teacher

Similar to the results reported for general education, the motivations of L2 teachers have been found to be significant for their career satisfaction (Kassabgy et al., 2001; Kissau et al., 2019a). However, research on the motivation of an L2 teacher is scarce (Dörnyei and Ushioda, 2011; Hastings, 2012), similar to L2 motivation research lying outside the mainstream L2 acquisition research (Ellis, 2008). The L2 teachers are often recruited to be participants in research on teacher motivation in general education (Kyriacou and Coulthard, 2000). However, the uniqueness of L2 teachers has been widely acknowledged (Hammadou and Bernhardt, 1987; Borg, 2006; Dörnyei and Ushioda, 2011), such as the nature of the subject, teacher–learner relationships, and the differences between native and non-native speakers. Borg claimed that "being a foreign language teacher is in many ways unique within the profession of teaching. Becoming a foreign language teacher, too, is a different process from that which other future teachers experience" (p. 5). Thus, researching the motivation of L2 teachers might deepen our understanding of the differences and similarities between L2 teachers and their counterparts in general education, aligning with the call of Watt and Richardson (2012) for examining the influence of subject specialization on teacher motivation.

Studies on L2 teacher motivation have focused on both native and non-native L2 teachers and both in-service and preservice teachers in countries, such as China (Zhao, 2008; Shih, 2016; Zhang et al., 2020), Morocco (Kyriacou and Benmansour, 1999), Greece (Karavas, 2010), Turkey (Erkaya, 2013), the UK (Barnes, 2005), and the USA (Kissau et al., 2019a,b). Most studies have concentrated on teachers teaching English as a second language (ESL) (Pennington, 1995; Kyriacou and Benmansour, 1999; Kassabgy et al., 2001; Zhao, 2008; Karavas, 2010; Erkaya, 2013; Shih, 2016; Kissau et al., 2019a,b), with less attention given to other less commonly taught languages, such as Chinese (Zhu and Qian, 2015; Zhang et al., 2020).

Some common findings have emerged from prior research on L2 teacher motivation (**Table A1**). The top-rated types of motivation include intrinsic values, such as love and enjoyment of the target language and culture, confidence in teaching abilities, love of teaching, and working with children/adolescents, and altruistic values, such as making social contributions and nurturing students to learn and succeed. Extrinsic value, such as job transferability, improved language proficiency, job security, and work–family balance, was reported in some developing countries, such as China (Zhao, 2008; Shih, 2016) and Morocco (Kyriacou and Benmansour, 1999). Social influence, such as family approval and fallback career choice, has been the least

mentioned. According to the findings summarized here and those in section Motivation to Be a Teacher, it seems that L2 teachers and their counterparts in general education have certain similar types of motivations to some extent, such as intrinsic values and altruistic values.

Studies revealed that pre-service CSL/CFL teachers might have a unique type of motivation related to cross-culture communication. Zhu and Qian (2015) reported that learning about foreign cultures ranked sixth among the reasons for student teachers to work as volunteer Chinese language teachers. Zhang et al. (2020) further observed the unique existence of the cross-cultural value of teaching, such as working with foreigners or interest in cross-cultural communications and exchanges, among native pre-service CSL/CFL teachers. The findings on cross-cultural value extracted as an independent factor suggest the uniqueness of L2 teacher motivation. However, whether cross-cultural value drives non-native preservice CSL/CFL teachers to enter teaching is still unclear.

Native and non-native L2 teachers might differ in the types and ratings of teacher motivation. For instance, Shih (2016) found that local Taiwanese teachers did not mention making a social contribution as a type of motivation to be a teacher, yet some native English teachers did. Kissau et al. (2019b) compared the ratings of teacher motivation between ESL teachers in the US (native, $n = 54$), Germany (non-native, $n = 233$), and China (non-native, $n = 116$) using the FIT-Choice scale. The US group rated intrinsic value, social contribution, and cultural connection higher than the German or Chinese group. However, the US and German groups did not differ significantly in their ratings of work with children/adolescents, job security, or social influence. Considering the limited number of participants and the unbalanced native and non-native samples in previous studies, these results should be interpreted with caution. Therefore, a systematic study investigating the similarities and differences in teacher motivation between native and non-native L2 teachers is needed.

Researchers have conducted studies on the differences and similarities between native and non-native L2 teachers from different perspectives (Llurda, 2005; Braine, 2009; Huang, 2017; Martínez Agudo, 2017). Most previous studies have been carried out among ESL teachers and have focused on topics, such as teacher education in ESL settings, as well as the advantages and disadvantages that native and non-native L2 teachers experience (Moussu and Llurda, 2008). In terms of CSL/CFL teachers, several researchers have explored professional identity, perceptions of learners regarding the teaching models of native and non-native CSL/CFL teachers and teaching pedagogy (Burns, 2014; Sung and Poole, 2016; Goh, 2017; Zhang and Wang, 2017; Bo, 2018; Zhang and Zhang, 2018). However, the existing research has paid little attention to the motivations underlying the career choices of native and non- native pre-service CSL/CFL teachers.

The Present Study

As reviewed above, researchers have realized the increasing significance of motivation for L2 teacher education and the development of theoretical frameworks concerning teacher

motivation. As Hiver et al. (2018) noted, "the domain of language teacher motivation is well positioned to become a richer field of inquiry because of its crossover appeal" (p. 17). However, insufficient studies have explored L2 teacher motivation and there are still some research gaps to be filled. One main gap is that no research has systematically compared the motivations of native and non-native pre-service L2 teachers. Previous studies about teacher motivation have concentrated on the English language, which might limit the generalization of the findings with other languages. Meanwhile, the increasing growth of CSL/CFL education and the shortage of CSL/CFL teachers call for more research on teacher motivation among the native and non-native preservice CSL/CFL teachers. More specifically, the types of teacher motivation and the ratings in each type of motivation are still not clear among the native and non-native groups. Therefore, to fill this gap, the present study compared the reasons underlying preservice career choices of L2 teachers among native and non-native speakers of Chinese. To be specific, the present study addressed the following questions:

RQ1: What are the differences and similarities in the types of teacher motivation between native and non-native preservice CSL/CFL teachers?

RQ2: What are the differences and similarities in the ratings of each type of teacher motivation between native and non-native preservice CSL/CFL teachers?

METHODOLOGY

Participants

In the present study, the target participants were preservice CSL/CFL teachers from MTCSOL programs in China. We are aware that stratified sampling is powerful in recruiting representative samples from the population (Neyman, 1992). However, stratified sampling is difficult for administration in the present study due to insufficient data about the characteristics of the preservice CSL/CFL teachers in MTCSOL programs. The participants were recruited using the snowball sampling method. We first sent the questionnaire to familiar CSL/CFL teacher educators at different universities, who then forwarded the questionnaire to the preservice CSL/CFL teachers they could access. The teacher educators and preservice CSL/CFL teachers were requested to further forward the questionnaire to other target participants. All participants were given an online version of the informed consent form before they filled in the questionnaire, informing them of the aim and the tasks, as well as how their personal information would be protected.

A total of 349 non-native CSL/CFL teachers were recruited from 20 universities. Twenty-four participants were excluded due to their insufficient Chinese proficiency (below HSK level 5)[4] or a large amount of time spent completing the questionnaire (more than 30 min). Therefore, 325 participants were retained

for the final analysis (mean age = 25.5 years, SD = 3.33, MIN = 20, MAX = 38), including 245 women and 80 men. Most of the participants came from Asia (n = 265), and the others were from Africa (n = 29), Europe (n = 28), and South America (n = 23). All the non-native participants were at an advanced Chinese level, with 133 participants passing HSK level 5 and 192 participants passing HSK level 6. Different from the non-native samples, the native samples were selected from a large-scale study carried out by Zhang et al. (2020). To minimize the influence of the sample size on the research results between the native and non-native groups, 325 native participants were randomly chosen out of the total pool (n = 411). The native group included MTCSOL students from 17 universities in Mainland China, including 294 women and 22 men (9 unreported). There were 253 participants aged between 20 and 25 and 35 aged between 26 and 30 (37 unreported). All the participants came from seven geographical regions in China, accounting for 41.18% (14/34) of the provincial-level administrative divisions. The female–male ratio in the two groups demonstrated the predominance of women students in MTCSOL programs, largely representative of the population (Ma and Gao, 2017; Gong et al., 2018a).

Instrument

The FIT-Choice scale has been successfully applied to explore teacher motivation among ESL and CSL/CFL teachers (Shih, 2016; Kissau et al., 2019a,b; Zhang et al., 2020). In the present study, the questionnaire used for non-native preservice CSL/CFL teachers was adopted from the study by Zhang et al. (2020), who designed a questionnaire for native preservice CSL/CFL teachers based on FIT-Choice Scale and the interview results of four native Chinese speakers[5]. The original questionnaire designed by Zhang et al. (2020) included 33 items, where 24 items were retained in the final version; the 24 items were further categorized into six factors.

To facilitate the comparison between native and non-native samples, 6 factors and 24 items were retained in the non-native version. Considering the unique language and cultural backgrounds of the non-native participants, the items measuring cross-cultural value and altruistic value were slightly altered according to the results of the interviews with 10 non-native preservice CSL/CFL teachers. For instance, the altruistic value item for native CSL/CFL teachers, "Chinese teaching can help eliminate foreigners' misunderstandings of China," was changed to "Chinese teaching can contribute to the cultural exchange between my country and China;" the cross-cultural value item for native CSL/CFL teachers, "I like socializing with foreigners," was altered to "I like socializing with Chinese people."

The participants were required to rate the importance of each item for their decision to enter the Chinese teaching profession on a scale ranging from 1 (not important at all) to 5 (very important). The following statement preceded all items "I chose to become a CSL/CFL teacher because…" The questionnaire

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[4]Hanyu Shuiping Kaoshi (HSK) is a standardized Chinese language proficiency test. It has six levels, with level 1 as the beginner level and level 6 as the advanced level. According to the Center for Language Education and Cooperation, the minimum Chinese language proficiency for non-native Chinese speakers to register in MTCSOL program is level 5 (https://cis.chinese.cn/Account/Proceduresfor).

[5]The interview was mainly used to design the questionnaire in the present study, instead of a key research instrument in collecting data on teacher motivation. According to the comments of a reviewer, some of the interview results were mentioned in the Discussion section to support the findings generated from the questionnaire survey.

was piloted with 10 non-native preservice CSL/CFL teachers to ensure that the instructions and statements were clear and understandable. The questionnaire was further modified based on the interviews with the participants in the pilot study. The items were presented in Chinese in random order. Cronbach's alpha reliability was found to be 0.88. The design of the questionnaire was as follows.

The first factor, *cross-cultural value*, included six items, such as "I like socializing with Chinese people." The second factor, *altruistic value*, consisted of three items, such as "Chinese teaching can help my compatriots learn Chinese." The third factor, *intrinsic value,* included five items, such as "I have good teaching skills." The fourth factor, *extrinsic value*, comprised four items, such as "As a CSL/CFL teacher, I can have a high salary." The fifth factor, *social influence,* had three items, such as "My friends think I should be a CSL/CFL teacher." There were three fallback career choices in the sixth factor, e.g., "I have not found my ideal major yet."

Data Collection

Previous studies have shown that the results generated from online and traditional paper-and-pencil questionnaires are comparable and consistent (Gosling et al., 2004). Due to the COVID-19 pandemic, the survey was administered online using the mobile version of *Wenjuanxing* (Questionnaire Star, Chinese version of Survey Monkey). A total of 353 out of the 400 initiated online questionnaires were submitted. The questionnaire took ~15–20 min to complete. Upon completion, the participants were entered to win a small amount of cash.

Data Analysis

To answer RQ1 about the differences and similarities in the types of motivation in the native and non-native preservice CSL/CFL teachers, factor analyses were conducted. It has been recommended to split the sample randomly in half, with the first half for exploratory factor analysis (EFA) and the second half for confirmatory factor analysis (CFA) (MacCallum et al., 1994; Fokkema and Greiff, 2017). However, the sample in each of the native and non-native groups in the present study was not large enough to be suitable for splitting randomly into half; therefore the whole sample in each group was used for factor analyses for RQ1.

To explore RQ2 about the differences and similarities in the native and non-native pre-service ratings of CSL/CFL teachers regarding each type of motivation, the one-sample *t*-tests and the MANOVA tests were carried out.

RESULTS

RQ1: Differences and Similarities in the Types of Motivation Between Native and Non-native Preservice CSL/CFL Teachers

First, CFA was carried out in the two groups of CSL/CFL teachers to explore whether the data matched the structure of teacher motivation reported by Zhang et al. (2020). The results in **Table 1**

indicated that the six-factor model was not acceptable in the two groups of preservice teachers.

Second, considering that the CFA results were not satisfactory, EFA was utilized to further analyze the factors of teacher motivation in the two groups. The data collected from each of the two samples were suitable for factor analysis: native group, Kaiser-Meyer-Olkin (KMO) = 0.86, Bartlett's K^2 = 4,341, *df* = 276, $p < 0.001$; non-native group, KMO = 0.88, Bartlett's K^2 = 3,227, *df* = 276, $p < 0.001$. Principal axis factoring and oblimin rotation were chosen because the dimensions describing the structure were closely intercorrelated (Zhang et al., 2020). For factor extraction, two methods were attempted. The first was parallel analysis, and the second was the determination of a fixed number of factors to be retained ($n = 6$) based on the questionnaire design. The cut-off factor loading was 0.40 (Henson and Roberts, 2006; Osborne et al., 2008; Plonsky and Gonulal, 2015)[6].

In the native group, EFA with parallel analysis and a fixed number of factors produced the same results. Six factors were produced with all the items retained, accounting for 55.6% of the total variance. The general results were interpretable. Most of the correlation coefficients between the six factors ranged from small to medium, indicating the validity of the use of the oblimin rotation. The fit statistics of the overall model were acceptable (**Table 2**). Most of the extracted factors were correlated with each other (**Table 3**).

In the non-native group, the first attempt with parallel analysis produced five factors with 20 items retained. Although the general results were interpretable, the five factors explained only 48.7% of the total variance, and the fit measures of the overall model were not acceptable (**Table 2**). Therefore, a second attempt with a fixed number of factors ($n = 6$) was carried out. The second EFA retained six factors with 21 items, which accounted for 51.7% of the total variance. The results were interpretable, and the overall model was acceptable (**Table 2**). Most of the extracted factors were correlated with each other (**Table 3**).

The EFA results in the two groups are presented in **Tables 4**, **5**. The two groups demonstrated the same factors of teacher motivation, including cross-cultural value, intrinsic value, extrinsic value, altruistic value, social influence, and fallback career choice. However, there were certain differences in the factor loadings of some items. For instance, "I am interested in learning about different cultures" and "I like teaching others to learn a foreign language," were retained in the cross-cultural value factor in the native group, yet these two items did not load on any factor in the non-native group. "I like socializing with foreigners" was grouped under the extrinsic value factor in the native group, yet its corresponding statement, "I like socializing with Chinese people" loaded on the cross-cultural value factor in the non-native group. In contrast, "As a CSL/CFL teacher, I can have more opportunities to work abroad" was grouped under extrinsic value in the non-native group and under cross-cultural value in the native group.

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[6]The commonly used cut-off factor loading is 0.30 or 0.40 in the areas of psychological research and language education. We first used 0.30 and found that some items were loaded on two factors; therefore, the cut-off factor loading was changed to 0.40 to make the results more reasonable.

TABLE 1 | Observed fit statistics values and criteria for adequacy based on confirmatory factor analysis (CFA).

Group	Chi-square	df	p	Chi-square/df	CFI	TLI	RMSEA
Non-native	732	237	<0.001	3.09	0.84	0.81	0.08
Native	1,012	237	<0.001	4.27	0.81	0.78	0.09
Criteria			>0.05	<2	>0.90	>0.90	<0.06

RMSEA, root mean square error of approximation; CFI, comparative fit index; TLI, Tucker-Lewis index.

TABLE 2 | Observed fit statistics values and criteria for adequacy based on exploratory factor analysis (EFA).

Group	Factor number	Chi-square	df	p	Chi-square/df	TLI	RMSEA
Native	Parallel analysis	278	147	<0.001	1.89	0.94	0.05
	Fixed number	278	147	<0.001	1.89	0.94	0.05
Non-native	Parallel analysis	416	166	<0.001	2.51	0.86	0.07
	Fixed number	291	147	<0.001	1.98	0.91	0.05
Criteria				>0.05	<2	>0.90	<0.06

TABLE 3 | Correlation matrix between the extracted factors (native below and non-native above).

	1	2	3	4	5	6
Intrinsic		0.53	0.45	0.38	0.45	−0.24
Altruistic	0.45		0.46	0.58	0.34	−0.12
Social influence	0.34	0.32		0.46	0.59	0.30
Cross culture	0.43	0.46	0.34		0.23	0.09
Extrinsic	0.46	0.12	0.46	0.27		0.25
Fallback-career	−0.18	−0.32	0.17	−0.06	0.16	

RQ2: Differences and Similarities in the Ratings of Each Type of Motivation Between Native and Non-native Preservice CSL/CFL Teachers

First, the mean scores of two groups on each factor were compared with the scale midpoint of 3 (**Table 6**). The scores of both the groups for fallback career choice were not significantly different from 3, and the effect sizes were small. Both the samples showed similar patterns of ratings of the importance of altruistic value, cross-cultural value, and intrinsic value, and the scores were significantly higher than 3, with large or close-to-large effect sizes. However, the two groups showed opposite rating patterns for extrinsic value and social influence. In terms of extrinsic value, the score of the non-native group was significantly higher than 3, with a large effect size, while the score of the native group was lower than the midpoint, and the effect size was small. Regarding social influence, the rating was higher than 3 in the non-native group and lower than 3 in the native group, but the effect sizes were medium in both the groups.

Second, Multivariate analysis of variance (MANOVA) tests were carried out to explore the teacher motivation ratings of the two groups. MANOVA tests were used because the six factors were correlated (**Table 3**) and Type I error inflation could occur when conducting multiple independent *t*-tests (O'Brien and Kaiser, 1985; Warne, 2014). In light of previous studies (Lin et al.,

2012; Watt and Richardson, 2012) and considering that altruistic value included different items in the two groups and that some factors such as cross-cultural value and extrinsic value differed in the number of items across the two groups, it was inappropriate to use the original questionnaire to compare the differences of the two groups, which might come from the samples and/or the items.

To make the items in each factor matched in the two groups, only five of the six factors (altruistic value excluded) and the items loading on the same factors in the two groups were kept (see items with # in **Table A2**). The shortened questionnaire with 16 items had a good reliability: native group, Cronbach's alpha = 0.82, McDonald' ω = 0.84; non-native group, Cronbach's alpha = 0.81, McDonald's ω = 0.82. The ratings of the two groups in these five factors in the shortened questionnaire showed similar patterns (**Table 7**) as those observed using the original questionnaires (**Table 6**), indicating that these questionnaires were comparable to a greater extent.

The results of MANOVA analyses revealed that the main effect of L1 group was significant and the effect size was large (Cohen, 1988), $\lambda = 0.83$, $F_{(5,642)} = 27$, $p < 0.001$, partial $\eta^2 = 0.17$. Univariate tests showed significant main effects for L1 group in four factors, and the effect size ranged from small (cross-cultural value and intrinsic value) to large (extrinsic value and social influence); the main effect of L1 group on fallback career choice was not significant and the effect size was small (**Table 7**).

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TABLE 4 | Summary of the factor loadings of EFA (native group).

Item	Factor	% of variance	α/ω	1	2	3	4	5	6	Uniqueness
Chinese teaching could allow more family time.	Cross-cultural value	11.41	0.83/0.83	0.85						0.26
I like working in an environment that involves being in contact with foreigners.				0.77						0.35
I have had pleasant communication experiences with foreigners.				0.58						0.57
As a CSL/CFL teacher, I can have more opportunities to work abroad.				0.54						0.67
I am interested in learning about different cultures.				0.46						0.71
I like teaching others to learn a foreign language.				0.46						0.56
Teaching is a career suited to my abilities.	Intrinsic value	10.69	0.84/0.84		0.64					0.49
I am interested in teaching.					0.70					0.42
I have good teaching skills.					0.69					0.36
I have the qualities of a good teacher.					0.68					0.44
I have always wanted to be a teacher.					0.53					0.50
As a CSL/CFL teacher, I can have a stable income.	Extrinsic value	9.14	0.80/0.81			0.85				0.21
As a CSL/CFL teacher, I can have a high salary.						0.81				0.36
I like socializing with foreigners.						0.54				0.67
Chinese teaching is a secure job.						0.42				0.51
My friends think I should be a CSL/CFL teacher.	Social influence	8.70	0.82/0.82				0.81			0.39
My teachers/classmates think I should to be a CSL/CFL teacher.							0.74			0.38
My family/relatives think I should be a CSL/CFL teacher.							0.67			0.36
Chinese teaching can help improve the international image of China.	Altruistic value	8.26	0.80/0.81					0.82		0.37
Chinese teaching can help communicate Chinese culture to other countries.								0.70		0.34
Chinese teaching can help eliminate foreigners' misunderstandings of China.								0.69		0.51
I have not found my ideal major yet.	Fallback-career value	7.36	0.78/0.79						0.82	0.32
I chose CSL/CFL teaching as a last-resort career.									0.75	0.45
I was unsure of what career I wanted.									0.63	0.48

DISCUSSION

Similarities in Motivation Between Native and Non-native CSL/CFL Teachers

First, the present study found similar types of motivation among both native and non-native preservice CSL/CFL teachers, including cross-cultural, intrinsic, altruistic, and extrinsic values, social influence, and fallback career choice. The findings on intrinsic, altruistic, and extrinsic values, social influence, and fallback career choice resonated with studies using the FIT-Choice scale in L2 teachers (Shih, 2016; Kissau et al., 2019a,b; Zhang et al., 2020) and general education teachers (Berger and D'Ascoli, 2012; Fokkens-Bruinsma and Canrinus, 2012; Jugović et al., 2012; Kilinç et al., 2012; König and Rothland, 2012; Lin et al., 2012; Watt and Richardson, 2012). These results suggest that teachers from different subjects might share similar types of motivation to enter the teaching profession.

Second, the ratings of native and non-native preservice CSL/CFL teachers on the importance of four types of motivation were similar. The ratings of the two groups on altruistic, cross-cultural, and intrinsic values were significantly higher than the midpoint of 3, and the effect sizes were large. Although the two groups differed significantly in the ratings of cross-cultural and intrinsic values, the effect size was small. Moreover, the ratings of

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TABLE 5 | Summary of the factor loadings of EFA (non-native group).

Item	Factor	% of variance	α/ω	1	2	3	4	5	6	Uniqueness
I am interested in teaching.	Intrinsic value	13.33	0.85/0.85	0.77						0.28
Teaching is a career suited to my abilities.				0.70						0.40
I have good teaching skills.				0.70						0.43
I have always wanted to be a teacher.				0.61						0.50
I have the qualities of a good teacher.				0.55						0.61
Chinese teaching can help communicate Chinese culture to my country.	Altruistic value	8.40	0.75/0.76		0.71					0.39
Chinese teaching can help my compatriots have a better understanding of China.					0.71					0.45
Chinese teaching can help my compatriots learn Chinese.					0.50					0.55
My teachers/classmates think I should be a CSL/CFL teacher.	Social influence	8.57	0.78/0.78			0.77				0.30
My friends think I should be a CSL/CFL teacher.						0.67				0.42
My family/relatives think I should be a CSL/CFL teacher.						0.47				0.58
I have had pleasant communication experiences with Chinese people.	Cross-cultural value	7.78	0.77/0.77				0.75			0.32
I like working in an environment that involves being in contact with Chinese people.							0.73			0.48
I like socializing with Chinese people.							0.50			0.48
As a CSL/CFL teacher, I can have a stable income.	Extrinsic value	7.47	0.75/0.75					0.81		0.36
As a CSL/CFL teacher, I can have a high salary.								0.56		0.63
As a CSL/CFL teacher, I can have more opportunities to work abroad.								0.53		0.59
Chinese teaching is a secure job.								0.44		0.52
I have not found my ideal major yet.	Fallback-career value	6.15	0.69/0.70						0.74	0.45
I was unsure of what career I wanted.									0.73	0.41
I chose Chinese teaching as a last-resort career.									0.42	0.73

TABLE 6 | Summary of the ratings of the native and non-native groups in each factor and the results of one-sample *t*-tests.

Group	Factor	Mean	SD	t	df	p	Cohen's d
Non-native	Altruistic value	4.36	0.62	39.29	324	<0.001	2.18
	Cross-culture value	4.17	0.72	29.46	324	<0.001	1.63
	Intrinsic value	3.89	0.75	21.61	324	<0.001	1.20
	Extrinsic value	3.69	0.70	17.79	324	<0.001	0.99
	Social influence	3.35	1.00	6.37	324	<0.001	0.35
	Fallback career	2.97	0.96	−0.64	324	0.52	0.04
Native	Altruistic value	3.93	0.79	21.18	324	<0.001	1.17
	Cross-culture value	3.83	0.74	20.34	324	<0.001	1.13
	Intrinsic value	3.64	0.80	14.50	324	<0.001	0.80
	Fallback career	2.93	0.92	−1.35	324	0.18	0.07
	Extrinsic value	2.86	0.86	−2.92	324	0.004	0.16
	Social influence	2.67	0.95	−6.25	324	<0.001	0.35

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TABLE 7 | Summary of the MANOVA test.

Factor	Native	Non-native	F	df1	df2	p	Partial η^2
Cross-cultural value	3.71 (0.89)	4.08 (0.81)	30.66	1	646	<0.001	0.05
Intrinsic value	3.64 (0.80)	3.89 (0.75)	17.82	1	646	<0.001	0.03
Extrinsic value	2.92 (0.92)	3.58 (0.77)	98.85	1	646	<0.001	0.13
Social influence	2.67 (0.95)	3.35 (1.00)	80.53	1	646	<0.001	0.11
Fallback career	2.93 (0.92)	2.97 (0.96)	0.32	1	646	0.57	0.001

both the groups on fallback career choice were not significantly different from the midpoint of 3 or from each other and had small effect sizes. These results suggest that the contribution of these four types of motivation to the choice of native and non-native preservice CSL/CFL teachers regarding a teaching career might be similar.

Cross-Cultural Value

Cross-cultural value relates to the contribution of interest in cross-cultural exchange and communication to the decisions of the individuals to enter the teaching profession. This finding was in line with the previous findings (Zhu and Qian, 2015; Zhang et al., 2020) and indicates that L2 teachers might have a unique type of motivation to enter the language teaching profession that has not been reported among teachers in other subjects. Cross-cultural value might be closely related to intrinsic value or extrinsic value, yet it emerged as an independent factor in both the two groups, suggesting its uniqueness as a specific type of motivation. Similarly, in the interview, the common reasons for choosing MTCSOL program the participants mentioned included, "interest in foreign cultures," "liking exploring different cultures," "the international context of Chinese teaching," or "interest in China and Chinese cultures."

The next question to answer is why the two groups had such a strong cross-cultural value. For the native group, as suggested by the model of Borg (2003) about the factors influencing teacher cognition, their previous experiences in learning foreign languages or interacting with foreigners and the general desire to understand foreign cultures in the Chinese society, together along with the prospective interaction opportunities with foreigners CSL/CFL teaching could provide, may collectively contribute to their strong cross-cultural value. As for the non-native group, interest in L2 culture or cross-cultural communication was a major type of L2 learning motivation (Gardner, 1985; Williams and Burden, 1997); however, they could encounter different challenges coming from various aspects in China, such as teacher-centered instruction and mismatch in assumed benefits of Chinese-only principle between CSL/CFL teachers and learners inside the classroom, and Chinese lifestyles outside the classroom (Gong et al., 2020b). Their identity as language learners or users in China as well as their desire to overcome the challenges they faced urged them to adopt various strategies to learn about cross-culture knowledge for cultural adaption (Gong et al., 2020b, 2021) to "become sufficiently engaged in local communicative settings" (Kinginger, 2013, p. 342). More importantly, the strong cross-cultural motivation of the two groups was in line with intercultural communicative

competence, which has been set as a key goal in the second language teaching (Byram, 1997; Kusumaningputri and Widodo, 2018) and similarly emphasized in the *Standards for Teachers of Chinese to Speakers of Other Languages* (Hanban, 2007). The cross-cultural motivation of the two groups might help fulfill their role in developing the intercultural communicative competence of CSL/CFL learners. However, these explanations are tentative and more studies are needed in the future.

Intrinsic and Altruistic Values

Intrinsic value was strongly emphasized in the expectancy-value model (Eccles, 2005), and it was also similarly highly rated by the non-native and native teachers in the present study. For instance, all the four native Chinese participants interviewed believed that they had suitable abilities for teaching and liked "teaching Chinese to foreigners" or "teaching languages, such as Chinese and English." Similarly, a Russian participant mentioned that, "the status of teacher in Russia was very low; [they are] treated just like waiters, yet I still like teaching and want to become a teacher."

The high ratings of the participants on the importance of the altruistic value of teaching in the present study were largely in line with the metaphors of the preservice CSL/CFL teachers (Ma and Gao, 2017), who described CSL/CFL teachers as a "dandelion that flies across the ocean" and "miniature of China." These results were consistent with the above-midpoint ratings for shaping the future, making social contributions and enhancing social equity which have been reported in studies using the FIT-Choice scale across different cultural backgrounds, such as Turkey, China, the US, the Netherlands, and Croatia (Watt and Richardson, 2012). For example, some participants mentioned that "I can alleviate foreigners' stereotypes about China and Chinese people by teaching Chinese" and "Helping my students learn about China and Chinese cultures is a success for me." However, this finding was inconsistent with the research by Shih (2016), which reported that social contribution was more frequently mentioned by the native English teachers than the local Taiwanese teachers. This difference might be related to the qualitative method and limited number of participants ($n = 38$) in the study by Shih. These conflicting results indicate that further studies are needed to explore this issue, such as the sources of the altruistic value of CSL/CFL teachers (Ma and Gao, 2017; Gong et al., 2018a).

Fallback Career Choice

The results of the present study indicate that the native and non-native pre-service CSL/CFL teachers were unlikely to choose teaching as a fallback career choice or as a stepping stone

to another career. This finding was consistent with previous studies using the FIT-Choice scale, which reported that the rating of fallback career choice was the lowest among teachers in both developed and developing countries (Watt and Richardson, 2012). However, it cannot be guaranteed that all the recruited participants provided homogeneously low ratings of fallback career choice. In fact, in the present study, 14.77% of the native participants ($n = 48$) and 17.54% of the non-native participants ($n = 57$) had ratings of fallback career choice higher than 4 (*important*). These results suggest that a small proportion of the participants might have failed to enter or pursue their first-choice career and demonstrated a less positive motivational profile. In the interviews, some participants said, "I was not sure about the most suitable job for me after graduation, so I will teach Chinese first to see whether it fits me," "Teaching Chinese is not my ideal job" and "I did not know what to do after graduation and chose to study in the MTCSOL program to explore the real China." However, whether and how the motivation of the participants pursuing changes in fallback career choices is not clear and requires further research.

Differences in the Motivation Between Native and Non-native CSL/CFL Teachers

The native and non-native pre-service CSL/CFL teachers differed significantly in the extrinsic value and social influence, where the non-native groups significantly scored higher than the native group. These results suggest that the non-native group might be motivated more by extrinsic value and social influence than their native counterparts to enter CSL/CFL teaching, which could be accounted for by the difference between the two groups in cultural and teaching contexts.

For most of the non-native preservice CSL/CFL teachers, teaching Chinese is a domestic job in terms of teaching contexts. In most countries, working at schools or universities is generally a stable and respected job, which is widely considered as very attractive for the females, who dominate the non-native preservice CSL/CFL teachers. The salaries offered by Chinese teaching are likely to be competitive because the increasing economic and cultural links between China and foreign countries yield continuing demand for highly proficient CSL/CFL speakers, whose number is yet limited (Ruan et al., 2016; Wang, 2018). In terms of cultural contexts, most of the non-native participants came from Asia, where family ties are strongly valued, and their career choice might be heavily influenced by family members or friends. This account could be corroborated by the interview results, such as "Chinese teaching is a stable job," "Teaching Chinese is highly respected and high-salary [in Korea]" and "Most of my family members are teachers, so teaching is an obvious and stable choice for me."

As for the native group, *going abroad* culture and teaching Chinese as an international job might be the main reasons. Just as a traditional Chinese saying goes, read 10,000 books and travel 10,000 miles (读万卷书, 行万里路), working or studying abroad has been encouraged by the Chinese people in modern societies. The total number of students studying abroad reached 6.56 million from 1978 to 2019 (Ministry of Education

of the People's Republic of China, 2020) and Chinese students are ranking the top among the international students in the developed countries (Henze and Zhu, 2012; Thøgersen, 2016; Chao et al., 2017; Universities UK, 2018). However, going abroad, in particular to developed countries, is expensive and poses a great challenge for the middle and lower classes. Meanwhile, Competitive Local Exchange Carriers (CLEC) has been funding thousands of CSL/CFL teachers to work abroad every year in the recent decade. Thus, being a CSL/CFL teacher could be a good choice for students from the middle and lower classes who desire to go abroad, and this unique experience is of great value for job hunting and career development in China (Zhu and Qian, 2015). Therefore, the native preservice CSL/CFL teachers might value the potential experience of working abroad more than salary or stability. In addition, teaching Chinese abroad is international in nature and mainly managed by CLEC and Confucius Institutes/Classrooms, where the influence from the family members or friends of the applicants is minimal. This assumption is consistent with the comments of the participants, such as that, "the experience of teaching Chinese in Ireland might make my resume eye-catching," "teaching Chinese could help you learn more about everything and be helpful for future jobs," and "Although my parents have traditionally considered teaching to be an 'iron rice bowl' job (a job with guaranteed job security), their perceptions of CSL/CFL teaching is limited or distorted."

In summary, the overall results of the present study contribute some new knowledge to the area of CSL/CFL teaching, in particular, to the education of preservice CSL/CFL teachers. One major contribution is that, in contrast to the commonly held assumption that native and non-native preservice CSL/CFL teachers might differ a great deal in teaching-related factors, the two groups were found to have similar motivations for entering the CSL/CFL teaching profession and had similar ratings of the importance of four of the six factors, with significant differences observed only in the external factors, such as extrinsic motivation and social influence. These results suggest that native and non-native preservice CSL/CFL teachers might share commonalities in other internal aspects, such as teacher cognition or meta-cognition of teaching abilities. This new finding could be significant for the design of MTCSOL programs, which is discussed in section Implications.

Implications
Theoretical Implications
In terms of theoretical significance, the results of the present study confirm that teachers of different subjects have some similar types of motivations (Dörnyei and Ushioda, 2011; Watt and Richardson, 2012; Han and Yin, 2016), for example, placing strong importance on the intrinsic and altruistic values. However, the finding about cross-cultural value in native and non-native preservice CSL/CFL teachers sheds light on the uniqueness of L2 teacher motivation, which might relate to the influence of subject specialization (Watt and Richardson, 2012). In addition, the differences between native and non-native groups in extrinsic value and social influence point to the potential influence of socio-cultural settings and teaching contexts on teacher motivation. Based on the overall findings of the present study

and implied by the ecological system theory (Bronfenbrenner, 1977, 1986; Bronfenbrenner and Evans, 2000; Hornberger, 2003; Lier, 2004; Kramsch, 2008; Steffensen and Kramsch, 2017; Mohammadabadi et al., 2019), teacher motivation might be jointly influenced by variables at different levels, such as native language background at the microsystem, subject specialization at the mesosystem, teaching context at the exosystem, and social cultures at the macrosystem. That is to say, teacher motivation might not be "a product of a limited number of factors, but it is a constellation of various distal and proximal factors to the teachers' classes" (Mohammadabadi et al., 2019, p. 765). However, this account is tentative, and more supporting evidence will be needed from future studies.

In addition, the present study further corroborates the validity and reliability of the FIT-Choice scale in exploring the motivation of the language teacher (Shih, 2016; Kissau et al., 2019a,b; Zhang et al., 2020) by providing evidence from both native and non-native pre-service CSL/CFL teachers. The general results provide further support for the application of expectancy-value theory in exploring second language teacher motivation.

Practical Implications

In terms of practical implications, the findings of the present study might be useful to help solve the problem of CSL/CFL teacher shortage outside China. The solution lies in attracting preservice CSL/CFL teachers and retaining in-service CSL/CFL teachers, whose motivation should be taken into account in designing MTCSOL program and administration of in-service teachers.

In terms of designing MTCSOL program, the findings of the present study suggest the potential application of a mixed-class model for native and non-native preservice CSL/CFL teachers. A noteworthy trend in teacher education is to view teachers as agents in knowledge-building practice and to provide chances for teachers to take part in this practice by forming a community, where they can share, discuss, improve, and transfer ideas (Darling-Hammond and McLaughlin, 1995; Sachs, 2005; Hong and Sullivan, 2009; Yang, 2021). A mixed-class model, where the two groups study together and form a teaching community to some extent, could align with the teacher motivation of the two groups.

The mixed-class model could boost the cross-cultural value of the two groups. The study found that native CSL/CFL teachers were limited in intercultural communicative competence (Gong et al., 2018a), which is yet emphasized in *Standards for Teachers of Chinese to Speakers of Other Languages* (Hanban, 2007). Meanwhile, the identity of non-native preservice CSL/CFL teachers as language learner/user/teacher could drive them to undertake Chinese language and culture learning (Gong et al., 2021), as an investment to gain access to various symbolic and material resources (Li and Li, 2020). Thus, the mixed-class model as a teaching community could serve as a platform to meet the needs of both the groups, where the two groups demonstrate and learn different cultures, enrich cross-cultural knowledge, and develop intercultural communication competence.

The mixed-class model could also benefit the intrinsic motivation of the two groups. In the teaching community of

the mixed-class model, the interactions with native Chinese speakers could facilitate the development of the Chinese language proficiency of the non-native groups and their confidence in Chinese teaching, considering that anxieties caused by self-perceived insufficient L2 proficiency might influence language teaching (Horwitz, 1996; Lee et al., 2017; Calafato, 2019). For the native group, the mixed-class model could mimic different CSL/CFL teaching contexts and deepen their understanding of Chinese language acquisition, which further contributes to the growth of teaching skills, similar to the effect of practicum on the growth of teaching competence (Yuan and Lee, 2014; Aghabarari and Rahimi, 2020; Qiu et al., 2021). More importantly, most native CSL/CFL teachers tend to undergo a transformation in pedagogical beliefs and practices when working abroad due to the different educational contexts in China and other countries (Moloney, 2013; Wang and Du, 2014; Moloney and Xu, 2015). This model could provide opportunities for the native group to experience the different education settings in advance and alleviate the troubles caused by the transformation.

In sum, the mixed-class model could be viewed as a response to the call of the researchers for integrating cross-cultural elements into teacher education programs to fulfill the professional roles of CSL/CFL teachers (Moloney, 2013; Lai et al., 2015; Moloney and Xu, 2015; Jin and Dervin, 2017; Gong et al., 2018a). These assumed benefits of the mixed-class model could strengthen the motivations of the two groups and thus might attract them to enter the Chinese teaching profession. However, this suggestion is tentative, and the details of a mixed-class model need to be carefully designed in future research.

As for retaining in-service CSL/CFL teachers, measures are recommended to be taken against demotivation. In the context of L2 teaching, demotivation concerns external or internal factors that negatively affect the willingness of an individual to teach. Researchers have identified different categories of variables that might lead to demotivation, such as students, stress, inhibition of teacher autonomy, and limited potential for intellectual development (Kiziltepe, 2008; Sugino, 2010; Dörnyei and Ushioda, 2011; Yaghoubinejad et al., 2017). Policymakers in CSL/CFL education organizations or institutions are advised to tackle the influencing factors that might demotivate the in-service teachers in different contexts and take necessary measures to create an environment that could retain them for CSL/CFL teaching, such as improving the welfare and stability of Chinese teaching. Due to the limited scope of the present study, the measures to retain in-service teachers are not discussed in detail here.

CONCLUSION

The present study explored the types of teacher motivation and the ratings of the importance of each type of motivation between native and non-native preservice CSL/CFL teachers. The results highlight that the two groups had more similarities than differences in the types and ratings of teacher motivation, providing a new perspective in comparing the native and non-native L2 teachers. The findings further suggest the uniqueness

of cross-cultural value in L2 teacher motivation in comparison to that in general education and the valid application of FIT-Choice scale in exploring teacher motivation in the contexts of teaching Chinese.

The present study was subjected to several limitations, which could be overcome in future research. The first limitation concerns the language in which the questionnaire was presented to the non-native group. Although the recruited non-native participants were at an advanced level of Chinese and a pilot study was conducted before the formal data collection, the participants might have had different results if the instructions and statements had been presented in their native languages. Therefore, developing valid and reliable multilingual versions of CSL/CFL teacher motivation questionnaires that are comparable with the Chinese version is one future research direction.

The second limitation lies in the representativeness of the non-native sample. Snowball sampling method was used in the present study, and most of the recruited non-native CSL/CFL participants came from Asia, such as Thailand and Vietnam, and were registered at universities in Mainland China. Therefore, the results generated from the present study might not be generalizable to teachers from other areas, such as Europe and America, or those who study in their home countries. Considering the potential influence of cultural and socioeconomic factors on teacher motivation (Watt and Richardson, 2012), comparing teacher motivation among pre-service CSL/CFL teachers from different countries might reveal more insightful findings about this topic.

Third, the present study mainly depended on a questionnaire to explore the motivations of pre-service CSL/CFL teachers, and the interview results were supplementary. Considering the pros and cons of quantitative and qualitative research, qualitative studies using in-depth interviews or narrative research could be carried out in the future to comprehensively understand the underlying reasons accounting for the similarities and differences in teacher motivation among native and non-native CSL/CFL teachers.

Fourth, it has been commonly acknowledged that motivation is likely to change over time (Richardson et al., 2014; Han and Yin, 2016); however, the present study only explored the motivation of native and non-native CSL/CFL teachers in the preservice stage. Therefore, future research could investigate the change path of teacher motivation from preservice to in-service stage among second language teachers.

Despite the above-mentioned limitations, the findings of the present study showcased the significance of understanding teacher motivation in the context of CSL/CFL teaching. Meanwhile, we call for more attention to the design of MTCSOL program based on the empirical studies on CSL/CFL teacher education to further mitigate the problem of the shortage of CSL/CFL teachers outside China.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethics Committee in College of International Education, Minzu University of China. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

LG was responsible for research design and article drafting. BW was responsible for research design, data collection, and data analysis. HZ was responsible for research design, data collection, data analysis, and article drafting. All authors contributed to the article and approved the submitted version.

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Strategy Use Among Chinese as Second Language Learners in Mainland China From the Mediation Theory Perspective

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This paper reports a mixed-methods study that explored the strategy use of a cohort of Chinese as second language learners in mainland China from the perspective of mediation theory. Data sources include a questionnaire survey ($N = 189$) and a semi-structured interview ($N = 12$). The findings revealed that the participants orchestrated a repertoire of language learning strategies and frequently used social and meta-cognitive strategies. Analysis of the qualitative data suggested that the participants' strategy use was shaped by the learners' self agentic power (their beliefs and Ideal L2 self), and the socio-cultural environment. Specifically, their strategy use was mediated by a host of socio-cultural factors, including learner beliefs, social agents, cultural artifacts, and learning environment. Considered together, the findings illuminate the socially situated nature of the use of language learning strategy. That is, strategy use of the participants stems from the interplay of learner agency and socio-cultural factors. The findings also imply the necessity of strategy-based instruction and highlight the importance of a Chinese-speaking environment for Chinese learning.

Keywords: learners of Chinese as second language, use of learning strategies, mediation theory, learner self, socio-cultural factors

INTRODUCTION

The past two decades have witnessed a surging number of people learning Chinese as a second/foreign language (CSL/CFL) in and outside China (Gong et al., 2018, 2020a). It has been reported that more than 20 million people from more than 180 countries/regions were learning Chinese as an additional language by the end of 2020 (Sun, 2021). Around one quarter million international students were learning Chinese in mainland China in 2019 according to a report released by the Ministry of Education (MOE) of China (MOE, 2019). For all the dramatically increasing volume of CSL learners around the world, the learning process of those learners is found to be under-researched (Luo and Sun, 2018). A number of relevant issues warrant further exploration that includes profiling repertoire of strategy use (Bao and Jiang, 2020), and assessing and improving strategic competence in learning Chinese (Bruen, 2020; Yang et al., 2021).

Existing research has explored the orchestration of using learning strategies among learners in various Chinese-as-foreign-language (CFL) settings (i.e., Bruen, 2020; Chen et al., 2021; Yang et al., 2021). These studies mainly documented the use of learning strategies among CFL learners in their home countries. However, relatively few studies have paid attention to the endorsement of learning strategies when an increasing number of Chinese-as-second-language (CSL) learners are being recently relocated into Chinese-speaking contexts like mainland China (Chu et al., 2015; Luo and Sun, 2018).

Previous studies on learning strategies have been mainly cognitively-oriented (Macaro, 2006; Gao, 2010). The cognitive perspective takes learning strategies as a static construct and fails to unveil the influence of the socio-cultural factors upon learners' strategic efforts (Macaro, 2006). Besides, there is an increasing voice that learning strategies should be regarded as a socially situated construct (Gao, 2006) and a shifting educational context would reshape the situatedness of strategy use (Gong et al., 2021a). Echoing this call, the socio-cultural perspective has been proposed as an alternative in learning strategy research (Donato and Mccormick, 1994). This socio-cultural lens to strategy use could present a holistic picture of how the learners develop their linguistic knowledge as well as how they adapt to the target language context (Cohen and Griffiths, 2015; Gong et al., 2020b). However, although the socio-cultural orientation has been drawing attention in the research of learning strategies of English as second/foreign language learners (ESL/EFL) (Donato and Mccormick, 1994), little effort has been made to unveil the underpinning factors that might have formulated the mechanism of using learning strategies among the CSL/CFL learners.

To address the issues aforementioned, the present study aims to investigate the use of learning strategies among a group of international students in mainland China. More specifically, it proposes to explore the mediational process of the use of Chinese language learning strategies. This study promises to illuminate the nature of strategy use of CSL learners, which in return contributes to the existing literature of learning strategies, in particular, Chinese language learning strategies.

LITERATURE REVIEW

Strategy Use in Second/Foreign Language Learning

Learning strategy has been regarded as an essential factor in second language learning and acquisition (Griffiths, 2020). Early effort to learning strategy has been dominated by the cognitive perspective. This approach conceptualizes learning strategies into multiple categories, namely, learning, communication, and social strategies (Rubin, 1975), meta-cognitive, cognitive, and social-affective strategies (O'Malley and Chamot, 1990), and the six-category taxonomy of learning strategies (Oxford, 1990). Among these cognition-oriented theoretical proposals, Oxford's (1990) taxonomy is the far-reaching classic for later learning strategy research.

Following the cognitive approach and Oxford's (1990) taxonomy, researchers have extensively examined the use of

learning strategies among English as second/foreign language (ESL/EFL) learners of diversified socio-cultural backgrounds (Rao, 2016; Griffiths, 2020). For example, Chinese learners of English are reported to have moderately used learning strategies (Li, 2014). In addition, students of non-English disciplines in EFL context tend to frequently use memory and cognitive strategies, but least deploy affective and social strategies (Rao, 2016). By contrast, this finding is incompatible with the observation that learners in ESL context use meta-cognitive and social strategies the most (Zhong, 2015). Last but not the least, the use of learning strategies is associated with other learner variables such as beliefs (Zhong, 2015) and motivation (Hajar, 2018). For instance, a belief about the primacy of using language for communication seems to shape the learners' more frequent use of social strategies rather than rote learning strategies (Zhong, 2015). Learners' deployment of social strategies is also reported to be influenced by their ideal L2 self (Hajar, 2018).

In summary, the studies reviewed above have deepened our understanding of the features of learning strategies in various socio-cultural contexts, and the relationship between strategy use and other learner variables. However, these previous studies have been primarily confined to ESL/EFL learners. It remains unknown whether these features identified in early studies can be generalized to learners of languages other than English such as Chinese.

Strategy Use in Chinese Language Learning

Chinese as foreign language (CFL) learners' strategy use has been drawing attention in recent years (Chu et al., 2015). Existing research mainly follows Oxford's (1990) Strategy Inventory for Language Learning (SILL) and her criteria to measure and evaluate the profiles of strategy use among CFL learners. Social strategies were found to be frequently used by CFL learners in various contexts such as Australia (Jiang and Wu, 2016), Spain (Wang and Cáceres-Lorenzo, 2019) and Brazil (Yang et al., 2021). Brazilian beginning CFL learners displayed a high level of employing meta-cognitive strategies, only secondary to social strategies (Yang et al., 2021). Irish CFL learners frequently exercised cognitive strategies (Bruen, 2020), while Spanish CFL learners did not deploy these strategies that much (Wang and Cáceres-Lorenzo, 2019). In addition, it has been reported that affective strategies were favored by the British CFL learners (Qian et al., 2018), but least frequently deployed by their Australian counterparts (Jiang and Wu, 2016).

Previous research, though scant in number, has started to explore the use of learning strategies among CSL learners. The CSL learners tend to use cognitive and meta-cognitive strategies most frequently in learning Chinese characters (Luo and Sun, 2018; Sheu, 2018). These two categories of learning strategies are also favored by Chinese heritage speakers in their learning of Chinese characters (Bao and Jiang, 2020). To recap, the previous research subjects have mainly included the CFL learners, while inadequate attention has been paid to CSL learners. In light of the increasing number of CSL learners in mainland China, it is essential to explore how these learners adapt themselves to this

new context which is linguistically, pedagogically and socially different from the one in their home environments (Ma et al., 2017).

Previous studies have shown that the use of learning strategies seems to be divergent in the CFL and CSL contexts, which sheds light on the contextually situated nature of learning strategy (Li, 2014). However, these studies have mainly followed the cognitive orientation which is increasingly criticized for its overreliance on normative techniques to measure learners' strategy use and for its failure in unveiling the socio-cultural complexity of learning strategies (Lei, 2012). Against this background, it has been advocated to capture the socio-cultural disposition of learning strategies (Gao, 2006).

In a nutshell, the review of the existing research reveals that whilst the early studies have mainly focused on strategy use of CFL learners, they paid inadequate attention to CSL learners. Besides, these previous studies primarily relied on quantitative techniques to examine the features of strategy use among the learners of Chinese, but failed to take into account the interaction of strategy use and social cultural contexts. There is also paucity in profiling strategy use of CSL learners and in understanding the socio-cultural dispositions of their strategy use.

Strategy Use From a Socio-Cultural Perspective

The socio-cultural perspective conceptualizes human beings' cognitive development as a mediational process in which a host of personal, social, cultural and physical tools are applied by the individual to actualize the meaningfulness of an activity (Vygotsky, 1978; Lantolf, 2000). The mediational perspective is introduced to understand strategy use of second/foreign language learning (Donato and Mccormick, 1994; Gao, 2006).

Following the mediational approach, previous research has mainly focused on strategy use among EFL/ESL learners. For instance, when shifting from mainland China to the UK, Chinese ESL learners come to apply more social strategies due to the new medium language for instruction and communication, academic learning tasks, social agents, learning environment, and learner self (Gao, 2006; Liu, 2013). Learners tend to apply private speech–memorize words (de Guerrero, 2018), control affect state (Jiménez-Jiménez, 2015), and interact with others (Smith, 2007). Assessment practice such as formative methods and portfolio has mediating effect on learners' strategy use (Donato and Mccormick, 1994). Social agents like teachers are also found to be a critical mediator in learners' strategy use (Oxford, 2014).

Taken together, these findings suggest that factors such as agents, assessment methods and learning environment tend to mediate strategy use in learning the target language (Li, 2014; Perea, 2019). These mediational tools encompass learner self associated with beliefs and attitudes toward language learning (Gao, 2006; Lantolf, 2006), social agents such as parents, teachers, and peers (Lantolf, 2000), cultural artifacts pertaining to resources like assessment, textbooks and other learning materials (Lantolf and Poehner, 2008; Gao, 2010), and learning environment at macro and situational levels (Gao, 2010; Lei, 2012). These tools will be used as the guiding analytical

framework for the present study. Since previous studies following the mediational lens have mainly centered on ESL/EFL learners, more effort to examine CSL learners' strategy use from this perspective is necessary.

To sum up, the above literature review has shown that the use of learning strategies of CSL learners has not received due attention and that existing research on strategy use fails to take socio-cultural context into account. The inadequacy in focusing on the CSL learners' strategy use and in crystallizing the interaction between strategy use and socio-cultural conditions thus necessitates further exploration. Therefore, to address these gaps this study proposes to explore the strategy use among CSL learners from the perspective of mediation theory.

RESEARCH DESIGN

Research Questions

(1) What are the features of learning strategies among the CSL learners?
(2) What mediational factors might have contributed to the use of learning strategies among those CSL learners?

Research Context and Participants

This study was conducted at a provincial key university in Central China. The university started to recruit international students as early as 1998. Since then, it has a steady annual population of 1,000 international students. It was among the list of the first cohort of institutions of higher education who passed the quality evaluation of international education programmes accredited by the Ministry of Education of China in 2019. It was therefore chosen as the research setting of this study. The university offers the CSL learners a series of Chinese language modules regarding Chinese characters, pronunciation, listening, speaking, reading, culture, and preparatory courses for the Chinese language proficiency test (Hanyu Shuiping Kaoshi: HSK). The preparatory courses are mainly directed at HSK Level 3 for most of the CSL learners at the university. Only a small proportion of them would aspire to sit the HSK Level 4. The CSL learners are required to take these courses for a certain length of time before they are qualified to upgrade onto the degree programs. These courses are delivered by native Chinese-speaking teachers who have obtained postgraduate degrees in the fields of teaching Chinese to speakers of other languages. Formative assessment methods are practiced with such elements as presentations, projects, mid-term, and final exams. Asides from these courses, it provides the learners with some extra-curricular activities including Chinese Calligraphy and costumes, Chinese corner, Taiji, Chinese talent shows and Chinese language proficiency competitions at university, provincial, and national levels.

One hundred eighty-nine CSL learners were involved in the questionnaire survey of this study. These participants included 55 males and 134 females, who were from 26 countries including Morocco, Kazakhstan, Congo, Zimbabwe, Thailand, Russia and others. They ranged in age from 16 to 26, with an average age of 21.37. Among these participants, 90 of them had an experience of learning Chinese <6 months, 80 of them from 6 to 12 months, and 19 of them over 12 months. It is noteworthy that a great

No.	Name	Gender	Age	Nationality	Length of time spent learning Chinese
1	Hadi	Male	26	Bangladesh	12 months
2	Qiaozhen	Female	24	Thailand	24 months
3	Wangyu	Male	21	Laos	18 months
4	Benliyi	Male	23	Algeria	6 months
5	Doha	Female	23	Morocco	6 months
6	Chenan	Male	22	Ghana	5 months
7	Molly	Female	19	Kazakhstan	4 months
8	Yiwan	Male	23	Kazakhstan	10 months
9	Anan	Female	20	Kazakhstan	17 months
10	Xiaoye	Female	18	Kazakhstan	15 months
11	Xiaoyi	Male	21	Russia	12 months
12	Ahao	Male	23	Russia	11 months

majority of these participants had limited experience of learning Chinese before the survey. They may be roughly regarded as beginning learners of CSL.

Twelve students were invited for the semi-structured interviews of this study (**Table 1**). There were 5 females and 7 males, with four of them from Kazakhstan, two from Russia, and the other six from Algeria, Ghana, Morocco, Laos, Thailand, and Bangladesh, respectively. These interviewees were aged from 18 to 26 years old. Each four of them fell into the three groups of length of time spent learning Chinese, including the <6-month group, the 6- to 12-month group, and the over-12-month group. All the interviewees were pseudonymously named as Ahao, Anan, Benliyi, Chenan, Doha, Hadi, Molly, Qiaozhen, Wangyu, Xiaoye, Xiaoyi, and Yiwan respectively.

Instruments
Questionnaire
A self-designed questionnaire was adapted from Oxford (1990) seminal SILL. Modifications were made in order to situate the questionnaire into the Chinese language learning contexts for this study. For example, the word "*English*" was replaced with "*Chinese.*" For another example, the statement "*I use rhymes to remember new English words*" was changed into "*I use Pinyin to remember newly learned Chinese characters.*" Before the questionnaire was finalized, six CSL learners were invited to participate in a pilot study for the purpose of checking the validity of the instrument. Based on the feedback from the pilot study, further revisions were made accordingly.

The finalized questionnaire consisted of two sections. Section 1 was designed to inquire the demographic information of the participants such as gender, age, nationality, and length of time spent learning Chinese. Section 2 included 53 items, which fell into six categories including Memory Strategies (Item 1–10), Cognitive Strategies (Item 11–26), Compensation Strategies (Item 27–32), Meta-cognitive Strategies (Item 33–41), Affective Strategies (Item 42–47), and Social Strategies (Item 48–53). These items followed a 5-point Likert scale, ranging from *Completely Inapplicable to my Situation* (1) to *Completely Applicable to my Situation* (5). The questionnaire was originally designed with an English-Chinese version, and the Chinese parts were translated

into English by a doctoral researcher in applied linguistics. The reliability of the questionnaire was measured with Cronbach Alpha. The Cronbach Alpha for the whole questionnaire is 0.93, with the ones for the six dimensions ranging from 0.715 to 0.853. The results reveal that the questionnaire has good internal consistency and high reliability.

Interview Protocol
An interview protocol (**Appendix 1**) was designed for the semi-structured interview by drawing on sources from previous studies (e.g., Gao, 2010). In so doing, it aimed to obtain in-depth information about the mediational factors that might have shaped the application of learning strategies among the CSL learners. Similar to the designing process of the questionnaire, a pilot study was conducted with 2 of the participants of the present study. Alterations were made according to the feedback from the 2 participants. The finalized protocol embraced two parts. The first part elicited the interviewees' background information such as their name, gender, age, nationality, and length of time of learning Chinese. The second part included aspects such as the strategies they adopted to learn Chinese, the challenges they encountered in their Chinese learning and the ways they used to help themselves out, the impressive Chinese class they ever had, their strategic response to role of examinations, the most influential person in their Chinese learning, and their ways to learn Chinese after class. Each of the aspects was well-attended by asking the interviewees to provide specific examples and reasons.

Data Collection
Before administering the questionnaire survey, the authors contacted the Chinese language teachers of the CSL learners for their consent of participation. Upon consent obtained, the participants were informed of the objectives of this questionnaire survey. The participants were also told that their responses to the survey would not influence the scores of their final examination and that the collected information would be kept confidentially. Two hundred ten copies of the questionnaire were distributed to the participants, with 206 copies returned. Among the returned ones, 17 copies were taken as invalid because of incompletion

or wrongly answered problems. In total, 189 valid copies were included into the final data analysis.

Twelve out of the 189 quantitative respondents were invited for the follow-up semi-structured interviews by following a purposive sampling method (Dörnyei, 2007). The interviews were guided by the interview protocol. All the interviews were conducted in English. Even though Chinese was the target language to the interviewees, in light of their limited Chinese language proficiency as indicated in the length of time they spent on learning Chinese prior to the survey of this study. English was therefore used in the interviews to elicit information on the reasons for their strategy use as much as possible, because it was the common language for communication between the interviewees and the authors of this study. Immediately after each interview, the interviewee's responses were checked by the interviewer to see whether the interviewee had some points to be clarified due to his/her poor English language proficiency. Each interview lasted 30–50 min and was recorded for subsequent coding and data analysis.

Data Analysis

The data collected from the questionnaire were analyzed by the Statistical Package for the Social Sciences (SPSS 22.0). Descriptive techniques such as means and standard deviation were applied to gain a basic picture of using learning strategies among the CSL learners (Research Question 1).

The interview data were processed with the qualitative data analysis programme ATLAS.ti. In particular, the data were analyzed by means of the qualitative content analysis approach (Dörnyei, 2007) so as to find out the mediational factors that might have influenced the participants' use of learning strategies (Research Question 2). More specifically, the analytical approach followed an iterative process including initial coding, secondary coding, and theorizing the emergent themes. During the initial coding, if there was any account associated with the learners' use of learning strategies, it would be coded. For example, the following account "*My Chinese language teacher often encourages me to communicate with him and other Chinese students so that I come to understand the importance of talking to native Chinese-speakers*" was coded as teacher mediation on learners' use of social strategies. Based on the analysis, a coding scheme was developed by following the above steps (Please refer to **Table 3** in section Factors influencing strategy use among the participants for the details of the coding scheme). In the secondary coding, the data were recoded and re-classified to seek emergent thematic patterns from the initial coding. The newly obtained categories emerging from the secondary coding were repeatedly compared and checked by referring to the mediational framework (Gao, 2010; Lei, 2012). This iterative process finally yielded the reasons for the learners' adoption of learning strategies.

To ensure the coding reliability, one third of the transcribed data were re-classified 3 months after the initial coding. The newly coded results were then compared with those completed earlier. The intra-coder coefficient was 148/167 = 0.886, which suggested that the coding of the data was consistently reliable over time (Miles and Huberman, 1994).

Those inconsistent results were further compared and revised until the categorization was finalized.

RESULTS

Features of Using Learning Strategies Among the Participants

When analyzing the collected quantitative data to answer Research Question 1 regarding the features of using learning strategies among the participants, this study adopted the judging criteria proposed by Oxford (1990). According to her, the mean of the five-point Likert scale represents a level of using learning strategies, with the value above 3.5 as a high level, the value between 3.0 and 3.5 as an intermediate-upper level, and the value between 2.5 and 3.0 as an intermediate-lower level. However, the value below 2.5 symbolizes a low level. **Table 2** reports the level of strategy use in learning Chinese among the participants.

As depicted in **Table 2**, the overall mean of the strategy use scale was 3.606, which was above 3.5. This suggested that the participants displayed a high level of deploying learning strategies in general. In addition, the means for social, meta-cognitive and memory strategies were 3.888, 3.836, and 3.562, respectively, all above 3.5. These results revealed that the participants exhibited a high level of using these three dimensional strategies. By contrast, the means for cognitive, affective and compensation strategies were 3.467, 3.444, and 3.437, respectively, all these values falling between 3.0 and 3.5. These results implied that the participants were at an intermediate-upper level in endorsing these three subcategories of learning strategies.

Factors Influencing Strategy Use Among the Participants

The interview data were analyzed within the mediational framework (Gao, 2010; Lei, 2012), using a qualitative content analysis approach (Dörnyei, 2007). This analysis was made to explore the reasons for the participants' use of learning strategies (Research Question 2). The analysis of the qualitative data yielded four major mediational themes, which encompassed social agents, self mediation, cultural artifacts, and learning environment (**Table 3**).

Social Agents

Social agents refer to important others including teachers, peers and friends, parents and other family members, who might mediate learners' strategy use in their second/foreign language learning (Gao, 2006; Li, 2014). The interview data revealed that the CSL learners' application of learning strategies was mediated by a number of important others including teachers and peers. A good rapport between teachers and students seems to have mediated the interviewees' deployment of affective strategies. For instance, Interviewee Hadi acknowledged the mediating effect of his teacher on his endorsement of social-affective strategies: "*Well I found most of the Chinese teachers here are quite helpful and very friendly, and they always motivate us to learn in an easier way and give us the tips to learn it*" (Hadi, Extract 1). It was revealed from Hadi's responses that a harmonious teacher-student relationship would promote the learners' recognition of

TABLE 2 | Level of strategy use in learning Chinese among the participants.

Dimension	N.	Min.	Max.	Mean	Standard deviation
Memory	189	1.0	5.0	3.562	1.0513
Cognitive	189	1.0	5.0	3.467	1.0929
Compensation	189	1.0	5.0	3.437	1.0627
Meta-Cognitive	189	1.0	5.0	3.836	0.9961
Affective	189	1.0	5.0	3.444	1.1217
Social	189	1.0	5.0	3.888	1.0233
Overall	189	1.0	5.0	3.606	1.0580

TABLE 3 | Mediational factors identified from the qualitative data.

Mediational factors	Secondary mediational factors	Frequency
Social agents	Teachers	30
	Peers	45
Learner self	Private speech	61
Cultural artifacts	Medium language	17
	WhatsApp and online resources	39
	Textbooks and other materials	45
	Assessment methods	24
Learning Environment	Macro environment	62
	Classroom environment	31
	Learning community	24

the teacher and his teaching, which in return could stimulate the learners to take initiative in learning the target language. Similar opinion is also concurred by other interviewees like Doha who said that "… *I become more confident to learn Chinese when I feel his (Teacher Alex) approval of my performance*" (Doha, Extract 2). The appreciation of teachers upon the students' performance seems to signal a positive psychological indication to the learner, which in return considerably enhanced their confidence in learning the language.

The interview data also revealed that peers played a critical role in mediating the utilization of social strategies among the interviewees. Remarks like "… *my Chinese friends often help correct my Chinese pronunciations and grammatical mistakes*" (Benliyi, Extract 3) showed that the interviewees would exercise social strategies to seek help from their Chinese peers and friends when encountering difficulties in their Chinese learning. Another peer influence relates to the endorsement of meta-cognitive strategies among the participants. For example, Chenan mentioned: "*Mostly I learned Chinese by myself by writing 5–6 Chinese characters, which were subsequently used in my talk with my Chinese friends*" (Chenan, Extract 4). This shows that the participant bewared how to learn Chinese by exercising his meta-cognition. He initially learned the target language on his/her own and then strengthened the learnt knowledge through interacting with peers.

Learner Self

Private speech is often approbated by learners to regulate their language learning (Xu and Fu, 2019). It refers to the behavior of whistling or murmuring to oneself during language learning (Xi, 2020), which contributes to the cognitive development of the learners (de Guerrero and Commander, 2013).

The analysis of the interview data revealed that private speech was applied by the interviewees to mediate their exercise of meta-cognitive strategies. For example, Ahao, a competent learner, said as follows: "*I keep telling myself that I need to fill out all by myself. …I do make plans for what am I going to study Chinese every day*" (Ahao, Extract 5). Such kind of private speech indicated that self reminding is the ground for a learner to take initiative in planning his/her Chinese learning, which reflects the deployment of meta-cognitive strategies. Private speech was also found to have influenced the deployment of affective strategies among the interviewees. As mentioned by Hadi, "… *That is why I always tell myself that for the sake of my mom's devotion to me, I will have to work harder on Chinese*" (Hadi, Extract 6). It was evident that reminding himself of his mother's commitment to him was taken as an encouragement by Hadi in his Chinese learning.

Cultural Artifacts

Cultural artifacts are a kind of mediational resources associated with semiotic signs and physical tools (Vygotsky, 1978). Cultural artifacts include linguistic and non-linguistic resources which could promote cognitive development. Mediational resources like mother tongue, the target language, textbooks and online materials have been found to influence learners' strategy use (Lei, 2012; Li, 2014).

The interviews suggested that the medium language of communication was claimed to have a mediating effect upon the learners' employment of compensation strategies. Learners would turn to the commonly accepted medium language in case of a breakdown in their communication. For example, Doha said that "*When people don't understand my Chinese, I would use English (to explain again)*" (Doha, Extract 7). The example indicates that participants like Doha were able to endorse compensation strategies in circumstances in which they encountered breakdowns in an attempt to communicate by utilizing the target language such as Chinese.

Moreover, WhatsApp and other online resources were found to mediate the learners' use of cognitive strategies. For example, Xiaoye mentioned that "*I would go to Youtube to watch Chinese language learning programs when I am learning the tones of Chinese characters*" (Xiaoye, Extract 8). It seems that these learners were familiar with using WhatsApp to facilitate their Chinese language learning. There were various online resources

like language learning videos and movies at the university where the interviewees were studying, which can accommodate Chinese learning. This process reflects the role of mediation of WhatsApp in the learners' application of cognitive strategies.

Textbooks and other teaching materials were also reported with a mediational effect upon the deployment of cognitive strategies among the interviewees. As Molly said, "*I love reading textbooks with pictures and pinyin because the pinyin and pictures helps my understanding very easily*" (Molly, Extract 9). Other interviewees like Qiaozhen also similarly expressed that they would resort to textbook exercises to consolidate her Chinese learning, which shows the mediation of textbooks on learners' use of cognitive strategies.

Assessment methods pertain to the ways applied to evaluate learners' performance, which usually encompass summative assessment like final exams and formative assessment such as presentations, essays, projects, and mid-term and final examinations (Li, 2014). Assessment practices like formative assessment and high-stake examinations were found to mediate the learners' exercise of memory strategies. As Molly said, "*I realized I was more attentive to my study before an examination than on ordinary occasions. I would recite and write more characters in order to keep them in my mind*" (Molly, Extract 10). The remark suggested that the participant mainly resorted to memory strategies to prepare for her examinations. In addition, examinations seemed to drive the learners to approbate meta-cognitive strategies. For example, Anan said: "*For exams, I would plan and regularly review once in a while, in case I will repeat my mistakes again*" (Anan, Extract 11). This shows that she has learnt to reflect on all the exercises for better performance in the examinations.

Learning Environment

Learning environment includes the contexts for learning at micro level like institutional learning conditions and macro levels such as social environment (Lamb, 2013). Social environment was found to influence the harnessing of social strategies among the participants. For example, Ahao said: "*I learn Chinese because I want to stay here in future. To survive in China requires me to learn Chinese as well as Chinese people. Therefore, I learn it by conversing with the locals around us, which is beneficial for my Chinese learning*" (Ahao, Extract 12). His ideal L2 self seemed to shape his strategic belief that socializing with the locals is effective for learning Chinese.

Besides, social environment might have mediated the participants' employment of meta-cognitive strategies. For example, Yiwan mentioned that he came to know the effectiveness of learning Chinese through talking to local Chinese people. When he tried to greet the local Chinese by saying "*Hello! How are you?*" he found that these people would respond to him with "*Have you had your dinner?*"(Yiwan, Extract 13). Therefore, he came to learn that to utilize Chinese to talk with the locals is more effective than to learn only from the textbooks. His interaction with the local Chinese made him reflect on what he learned from textbook and what he observed in real-life language use, which influenced his choice of strategies to learn Chinese.

Another illustration of the influence of learning environment upon the use of learning strategies of the participants regards class environment. Classroom environment was found to have possibly influenced the learners' approbation of social strategies. As commented by Doha, "*In my class, we have some real good students who can speak very fluent Chinese. So sometimes if I have any problems, I will ask turn to them for help*" (Doha, Extract 14). This is echoed by Anan who voiced that "*I would turn to our Chinese student assistants when I have difficulties in learning Chinese*" (Anan, Extract 15). Availability of more capable learners in class illustrates the mediating effect of classroom environment upon learners' use of social strategy in their Chinese learning.

Lastly, learning associations were found to have probably exerted influence upon the learners' social-affective strategies. Xiaoye expressed that "*I encouraged myself to participate in the Chinese Calligraphy Association, where I could learn from my peers*" (Xiaoye, Extract 16). In short, learning associations provided opportunities for the learners to interact with their Chinese peers so that they could make better achievements in Chinese learning.

DISCUSSION

The present study yielded two major findings. Firstly, it has identified the commonalities and divergences in strategy use of the participants from learners in other CFL/CSL contexts. The surveyed CSL learners showed a frequent deployment of social, meta-cognitive and memory strategies. Their frequent use of social and meta-cognitive strategies corroborates with the previous findings in both the CFL and CSL contexts (e.g., Luo and Sun, 2018; Chen et al., 2021; Yang et al., 2021). Besides, the present study revealed a moderate level of using affective strategies among the participants, which contradicts the previous findings that the CFL learners frequently use affective strategies in the British context (e.g., Qian et al., 2018). Moreover, the present study distinguishes itself from previous studies in that memory strategies are found to be frequently applied by the CSL learners. This finding has not been previously reported with regard to the strategic profiles of CSL learners, thereby enriching the existing literature. The participants' frequent use of memory strategies might be expounded as follows: for one thing, since most of them were beginning learners, they might rely on direct strategies, memory strategies in particular. Learners of low level of language proficiency are often found to frequently use memory strategies (Yu and Wang, 2009; Griffiths, 2013). For another, the participants surveyed in this study were supposed to pass the HSK test. This might be another reason that drove them to adopt memory strategies in their preparation for the test.

The second major finding is that the participants' strategy use manifested a contextually situated construct, which resulted from the interplay of learner agency and the social and cultural conditions. The present study explored the mediating factors upon the learners' strategy use at personal, situational, institutional, and contextual levels. It has found that learner self is a central mediator in shaping the interviewees' strategy use. Learners like Ahao, Hadi, and Qiaozhen exercised their

private speech in learning Chinese. This result accords with what Perea (2019) has found. An adept command of private speech suggests a sound awareness of planning in language learning, and explicating the learners' frequent use of meta-cognitive learning strategies (Hu and Gao, 2018).

Social agents including teachers and peers were found to have a mediational effect on the CSL learners' deployment of learning strategies, particularly social-affective strategies. This result lends support to a number of previous studies (e.g., Li, 2014; Gong et al., 2021b). There are two possible reasons explicating the mediating role of teachers in shaping the learners' use of affective strategies. For one reason, teacher immediacy seems to shorten the distance between teachers and the CSL learners, as the Interviewees like Doha and Hadi expressed that they enjoyed the opportunities to interact with their Chinese language teachers in case they encountered problems in study and suffered from hardships in life. Thus, a rapport is created between the teacher and the CSL learners, which contributes to their use of affective strategies (Santana-Quintana, 2018). For another, the mediating role might be associated with the teaching beliefs of these native Chinese-speaking teachers. All the CSL teachers hold a qualification in teaching Chinese to speakers of other languages, which means that they are well-prepared in pedagogical theories and beliefs (Ma et al., 2017). One of such beliefs beholds the value of teaching students how to fish (Wei, 2012). This belief praises the training and cultivation of the students' indirect strategic awareness such as meta-cognitive and social-affective strategies.

Another critical social agent relates to peers who were found to exert a mediating effect on the use of meta-cognitive and social strategies among the CSL learners. This result is assonated with previous studies (e.g., Hajar, 2017). The interviewees' frequent use of mate-cognitive and social strategies illustrates their awareness of using indirect strategy for learning Chinese. This strategic awareness, apart from being nurtured from the pedagogical practice of the university, might also result from the availability of native Chinese-speaking peers in the learners' CSL class. The surveyed university provided two teaching assistants and two interim TCSOL postgraduates for each class. These teaching assistants form social resources for the CSL learners. These rich social resources thus offered opportunities for the CSL learners to socialize with the native Chinese-speaking peers, nurturing their strategic awareness and competence for Chinese learning.

A third mediating factor pertains to cultural artifacts associated with the medium language of communication, textbooks and online learning resources, and assessment of high stake examinations. Medium language of communication is found to be used as a compensatory technique to accommodate the limited Chinese competence among the CSL learners like Doha and Ahao. This phenomenon reflects the emerging topic of translanguaging and English as lingua franca against the multilingual background (Li, 2018). The CSL learners originated from diversified linguistic backgrounds. Once faced with difficulty in speaking Chinese, they would translanguage back to their mother tongue or English, an international language.

WhatsApp and other online resources were found of mediational effect upon the use of cognitive and compensation

strategies in the cases of the CSL learners like Xiaoye and Benliyi. The online resources provided the CSL learners with a rich variety of Apps and databases for Chinese learning. For example, the CSL learners with access to online resources could learn how to enrich their ways of learning Chinese and compensate for the communication breakdowns caused by their poor language proficiency. Additionally, teaching materials like textbooks were found with a mediating effect on the learners' use of cognitive strategies. This verified the mediating effect of textbooks and notes in second and foreign language learning (Perea, 2019). The textbooks and other teaching materials were compiled with multi-modal features like colorful graphs and videos to accommodate the needs of CSL learners. These multi-modal features could arouse the learners' interest and enrich their repertoire of cognitive strategies in Chinese learning.

Assessment methods were another artifact mediator identified in the participant's deployment of learning strategies. This result verifies some previous findings (e.g., Saks and Leijen, 2018). The surveyed university adopts formative assessment in the evaluation of the CSL learners, including classroom presentations, mid-term examinations, projects, and final examinations. The CSL learners have to sit for the HSK tests, should they expect to obtain degree or scholarship in Chinese universities. These formative elements consequently lead the participants to pay much attention to the learning process and seek effective ways to improve their performance through memorizing more characters, adopting more diversified methods, reflecting, and scheduling their study (Li, 2014). Therefore, their strategic competence is strengthened, which is mainly displayed in their use of memory, cognitive and meta-cognitive strategies among the CSL learners such as Molly, Xiaoyi, and Anan.

Learning environment was found to be the fourth mediator in the learners' use of learning strategies, which accorded with a number of previous findings (e.g., Cruz and Pariña, 2018). The CSL learners' deployment of social (Ahao and Xiaoyi) and meta-cognitive (Yiwan) strategies was mediated by the social environment, as they expressed that they learned Chinese by interacting with local people. It seemed that the participants have realized the value of native target language contexts for learning Chinese. This strategic belief echoes the perception of the primacy of learning a foreign language in the native target language context, which prevails among second/foreign language learners (Li, 2021). This is because in the target language environment like China, there are abundant social resources such as native Chinese speakers for Chinese learning. These rich social resources thus provide adequate opportunities for the CSL learners to interact with the locals using Chinese (Gong et al., 2021a).

Situational learning environment like classroom environment and extracurricular associations is another mediator of learning environment, which has been found to mediate the use of social-affective strategies among learners like Doha, and Xiaoye. This finding corroborates with some previous studies (e.g., Li, 2014; Huang, 2018). This might attribute to the opportunities created by the surveyed university for the CSL learners to interact with local Chinese students. For each class, the university

offered Chinese students as teaching assistants to help the CSL learners. Besides, there were campus clubs and societies such as Chinese Calligraphy Association, and Chinese Bridge Series of Chinese Proficiency Competition. All these extra-curricular activities create numerous channels for the learners to immerse themselves into the Chinese learning environment. Therefore, the CSL learners could easily reach out to the local Chinese students for interaction. This involvement would thus affect the learners' emotional state and increase their use of social-affective strategies (Li, 2014).

The present findings also indicate that the adoption of Chinese language learning strategies is the result of the interplay between learner self and the situational, institutional, and contextual factors. This finding aligns with the studies by Li (2014) and Gao (2010), which demonstrated that L2 learners displayed a wide repertoire of learning strategies when relocated into the target language settings. The strategic use of the learners was simultaneously influenced by personal and contextual factors. To be concrete, the learners internalized the value of learning a second/foreign language in the target language environment through immersion into the Chinese-speaking context, interaction with the local Chinese people, and their learning experiences in class and extra-curricular activities. The internalization of these situational and contextual realities seems to shape their strategic beliefs, which indicates their exercise of agency in CSL learning. Their agentic power is also reflected in their use of private speech and their ideal L2 self (such as the reflection in Ahao's motivation), which tends to influence their approbation of learning strategies.

CONCLUSION

The present study explored the strategy use and its mediating factors among a group of CSL learners in mainland China from the mediation theory perspective. It is found that the surveyed participants displayed a wide orchestration of strategies in their Chinese learning. The present study verifies previous findings that social and meta-cognitive strategies are most frequently deployed by the learners in both the CFL and CSL contexts. It also gains new insights into strategy use in that memory strategies are the most frequently used, and that affective strategies are moderately used among the CSL learners, which contradicts previous finding. Their approbation of learning strategies is mediated by an array of personal, situational, institutional, and contextual factors. Specifically, the learners' deployment of learning strategies was influenced by a series of factors, including learner self such as private speech and ideal L2 self, social agents like teachers and peers, artifacts including medium language of communication, assessment methods, and online resources, societal environment and extra-curricular activities. The present study contributes to existing literature in the following aspects. It firstly enriches the literature on strategy use of CSL learners. Besides, this study validates the feasibility of integrating the mediation theory into the exploration of L2 learning strategy, which consequently provides a new theoretical approach for L2 strategy research. Furthermore, it illuminates the contextually situated nature of strategy use, which sheds light on the interplay between learner agency and socio-cultural conditions that mutually shapes the learners' strategy use in their Chinese learning.

The present findings are implicative for teaching Chinese to speakers of other languages in China and other similar contexts. This study found that teachers are the most critical agents in mediating the learners' strategic use. This finding informs the development of teachers of non-Chinese learners against the background of the rapidly increasing number of Chinese language learners and educators (Ma et al., 2017). Teachers need to sensitize themselves of the strategy profiles of their students (Zhang and Wan, 2019). In light of the mediating effect of artifacts, CSL/CFL teachers are suggested to integrate the updated Apps and other online resources for Chinese learning into their class. This study also indicates the necessity and importance of a collective effort from teachers, policy makers and administrators to create a Chinese-speaking context for the learners. In view of the contributing effect of agentic power, it is suggestive that strategy-based instruction be provided to train the learners so as to enlarge their strategic repertoire. In addition, considering the diversity in cultural backgrounds of the Chinese learners and the profound mediating effect of teachers upon the learners' practice of Chinese learning (Gong et al., 2021b), it is essential for teachers to strengthen their intercultural competence.

This study has some shortcomings. First of all, this study only followed a cross-sectional paradigm to investigate the features and influencing factors of strategy use among the participants. Besides, this study did not take into account other learner variables such as language proficiency and length of time spent learning Chinese. Therefore, it is cautioned when generalizing the findings of this study into other contexts. Future studies are called for to adopt a longitudinal paradigm with larger sample population from various institutions. It is also recommended to further explore the interrelationship between strategy use and other factors of CSL learners with diverse language proficiency levels and learning experiences.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by School of Foreign Languages, Hubei University of Technology, China. The participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

CL designed the study and finalized the draft. LC collected, analyzed, and made the first draft of the manuscript. CM helped process the data. SZ analyzed and helped revise the manuscript.

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APPENDIX 1

Interview protocol.

1. Do you like Chinese?

2. How do you usually learn Chinese? Could you give any example?

3. What do you usually do when you have a problem in learning Chinese? Could you give any example?

4. Could you describe a Chinese class that impresses you at this university?

5. What do you think of the role of examinations in your Chinese learning, like HSK? Why or why not?

6. How do you think of the role of other people like your teachers, peers, and family members in your Chinese learning? Why or why not?

7. How do you learn Chinese after class? Do you participate in any Chinese activities after class? Why or why not?

Pragmatic Competence and Willingness to Communicate Among L2 Learners of Chinese

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Research in second language (L2) pragmatics has paid increasing attention to learners' individual differences, but few studies have examined the relationship between learners' willingness to communicate (WTC) in L2 and their pragmatic competence. To this end, this study investigates the association between WTC and pragmatic awareness and comprehension of Chinese as a second language (CSL) learners. A total of 80 CSL learners studying abroad in three universities in China participated in this study. Data were collected through a WTC questionnaire, a self-perceived communication competence (SPCC) questionnaire, a pragmatic awareness judgment task, and a multiple-choice test for pragmatic comprehension. Statistical analyses were conducted to explore the relationship between the learners' pragmatic awareness and pragmatic comprehension on the one hand and their WTC and SPCC in L2 on the other. The findings indicated that SPCC correlated positively with the learners' L2 pragmatic comprehension, but not with their L2 pragmatic awareness. No correlation was found between WTC and pragmatic awareness and comprehension. The results suggest that SPCC may contribute to learners' L2 pragmatic comprehension; some implications for teaching and future research directions are also discussed.

Keywords: pragmatic awareness, pragmatic comprehension, willingness to communicate, self-perceived communication competence, Chinese as second language

INTRODUCTION

Pragmatic competence is key to effective communication and success in second language (L2) learning. However, developing pragmatic competence can bring challenges for L2 learners, regardless of their language proficiency. Even those with advanced abilities in a L2 sometimes use the language inappropriately in daily communication due to their lack of pragmatic knowledge (Bardovi-Harlig and Dörnyei, 1998; Bardovi-Harlig, 2001; Ren, 2013). Studies on L2 pragmatics have started to focus on L2 learners' differences (Roever et al., 2014; Takahashi, 2019; Yang and Ren, 2019). Willingness to communicate (WTC), which is a learner's intention to speak in the target language given free choice (MacIntyre, 2020; MacIntyre et al., 2020), is a factor that influences

individual differences in language learning (Henry et al., 2021). WTC is found as a vital factor for communication (Cao, 2011; MacIntyre, 2020). Some studies have identified several factors that influenced WTC in L2. For example, Liu (2017) investigated adult Chinese as a second language (CSL) learners' WTC in Chinese and found their WTC was determined by speaking anxiety and length of stay in China. Nkrumah (2021) also found that the environment and teaching practices influenced CSL learners' WTC. However, aside from Hosseinpur and Nevisi (2017), which found a positive relation between pragmatic production and WTC, few studies have investigated the relationship between pragmatic competence and WTC. Indeed, little attention has been paid to L2 learners' WTC from the perspective of pragmatics. In addition, previous studies have found that self-perceived communication competence (SPCC) is one of the most highly correlated factors with WTC (e.g., Yu, 2009). Thus, this study will examine the relationship between pragmatic competence and WTC, including SPCC.

Pragmatic awareness and pragmatic comprehension are important components of receptive pragmatic competence (Ren, 2015). Many previous studies on pragmatic awareness have paid attention to influencing factors such as proficiency and study abroad (e.g., Bardovi-Harlig and Dörnyei, 1998; Schauer, 2009; Ren, 2015), but only a few have focused on L2 learners' individual differences, such as motivation (e.g., Tagashira et al., 2011; Takahashi, 2015; Yang and Ren, 2019) and social networks (Li et al., 2021). This is partially because learners were considered as a homogeneous group in pragmatic awareness research for a long time (Barron, 2019; Yang and Ren, 2019). There is increasing awareness that L2 learners' inner characteristics, i.e., individual differences such as learners' attitudes and identities, vary and influence the development of pragmatic awareness (LoCastro, 2001; Hassall, 2015; Ren, 2018). Previous findings have also shown that even when learners are able to comprehend implied meaning in L2, their performance varies in different types of implicatures (Taguchi et al., 2013). L2 learners' comprehension of these implicatures is influenced by pragmatic awareness (Alcón Soler and Jordà, 2008). A systematic investigation of the relationship between pragmatic comprehension and other dimensions of individual differences, for example, WTC/SPCC, will therefore contribute to studies on learners' L2 pragmatic competence development.

Although CSL learners' pragmatic production has been investigated (e.g., Qi and Lai, 2017; Ren, 2019; Gong et al., 2020b), few studies have examined their pragmatic awareness and comprehension. On the other hand, some studies have explored how CSL learners' individual differences (motivation, attitude, etc.) influence their language acquisition and use (Ma et al., 2017; Gong et al., 2018b, 2020a), but little attention was paid to their pragmatic competence. Therefore, it is necessary to investigate the impact of individual differences, for example, WTC and SPCC, on L2 learners' pragmatic awareness and pragmatic comprehension, particularly in a language other than English such as Chinese. Therefore, this study aims to investigate the pragmatic awareness and comprehension of CSL learners and to explore the relationship between their pragmatic awareness/comprehension and WTC/SPCC.

LITERATURE REVIEW

Willingness to Communicate and Self-Perceived Communication Competence

The construct of WTC in L2 has been defined as "a readiness to enter into discourse at a particular time with a specific person or persons, using a L2" (MacIntyre et al., 1998, p.547). It is believed that WTC is a complex construct because of its situated nature and context-dependent characteristics (MacIntyre, 2020). Since L2 WTC is situated in nature and it changes when L2 learners interact with their environment (MacIntyre et al., 2011), WTC research pays much attention to contextual influences. Given the importance of contexts in pragmatics, a link between WTC research and pragmatics research could be established (MacIntyre et al., 2020).

Numerous studies on the associations between L2 WTC and other variables at the social or personal level have been explored by quantitative methods and questionnaires (Lahuerta, 2014; Peng, 2014; Zhou et al., 2020). Some individual difference factors such as L2 attitude, SPCC, L2 communicative confidence, and communication anxiety have been investigated and found to have an impact on WTC (Lockley, 2013; Lahuerta, 2014; Zhou et al., 2020). Among these variables, SPCC has been the most frequently examined and has a relatively strong impact on WTC (Burroughs et al., 2003; Lockley, 2013; Shirvan et al., 2019). Thus, SPCC will also be examined in this study.

Self-perceived communication competence reflects learners' self-assessment of their L2 competence (MacIntyre, 1994; Peng, 2014). Previous studies on L2 WTC have shown that there is a close relationship between WTC and SPCC (Yashima, 2002), in that SPCC appears to be a strong predictor of WTC with others in L2 (Clément et al., 2003; Lockley, 2013; Shirvan et al., 2019). Yu and Hsu (2008) argued that L2 learners with a high level of SPCC would like to communicate more. As a predictor of WTC, SPCC also promotes or hinders communication. Thus, to ensure SPCC positively promotes L2 learning, studies have found that crucial elements such as learning environment, teachers' attitudes, and approaches should be given serious consideration (Horwitz, 2001; Ushioda, 2010).

The interaction between SPCC and actual L2 competence has also been investigated (Lockley, 2013). L2 learners' SPCC is found more decisive for WTC than their actual L2 competence (MacIntyre et al., 1998). The learning context and language experiences are found to be associated with the effect of SPCC on L2 WTC (Shirvan et al., 2019). Individual differences such as gender and age have also been examined, which are shown as significant moderators in the relationship between SPCC and actual L2 competence (Lahuerta, 2014). However, most studies on WTC have been conducted with learners of English as a L2, while few studies have focused on learners of Chinese as the target language.

Pragmatic Awareness and Pragmatic Comprehension

Pragmatic awareness, a crucial dimension of receptive pragmatic competence (Ren, 2015), is defined as "conscious, reflective and explicit knowledge about pragmatics" (Alcón Soler and Jordà, 2008, p.1948). A number of studies have investigated the impact of different variables on the development of pragmatic awareness (Bardovi-Harlig and Dörnyei, 1998; Schauer, 2006), which was found to correlate positively with attitudes towards the L2 community (Yang and Ren, 2019). Length of residence in the target community was also shown to be positively related to the development of pragmatic awareness (Schauer, 2006). Meanwhile, an examination of L2 learners' pragmatic awareness revealed some linguistic factors that contributed to the conditions needed to understand pragmatic meaning (Alcón Soler and Jordà, 2008). L2 learners' awareness of pragmatic features may be assessed by meta-pragmatic judgment tasks (Bardovi-Harlig, 2018), which have been demonstrated to be a reliable assessment tool for pragmatic awareness. In this study, we will adopt this technique to assess CSL learners' pragmatic awareness.

Pragmatic comprehension is key to interpreting mechanisms of interpersonal communication (Taguchi and Yamaguchi, 2019), which refers to the ability to comprehend implied meaning in the target language (Taguchi, 2008). L2 learners show differences in their pragmatic comprehension of different implicature types, since the implicatures incorporate different levels of conventionality. The ability to comprehend implicatures is mediated by L2 proficiency and learning environment in terms of both accuracy and speed of comprehension (Taguchi et al., 2013). Taguchi (2011) examined learners' pragmatic comprehension and found that study-abroad experience had a greater impact on the comprehension of conventional expressions than non-conventional ones.

Based on previous research (e.g., Taguchi et al., 2013; Li, 2018), in this study we will develop a framework of implicatures with three types, consisting of conventionally indirect refusals, conventional routines, and non-conventionally indirect opinions. For pragmatic comprehension assessment, most studies have adopted a reading test where prompts take the form of a sentence or dialogue and multiple-choice questions, although some studies have used audio input or video clips in a listening test (Taguchi and Yamaguchi, 2019). This study will investigate L2 learners' comprehension of implicatures based on a reading test.

The above review reveals that few studies have investigated WTC and SPCC in L2 pragmatics and the field of learning and teaching Chinese as a L2. It is an open question whether pragmatic awareness and pragmatic comprehension are related to CSL learners' WTC and SPCC, and to what extent. The following research questions will therefore be addressed:

(1) To what extent can the CSL learners complete the pragmatic awareness and pragmatic comprehension tasks?

(2) Are there any correlations between pragmatic awareness/pragmatic comprehension and the WTC/SPCC of the CSL learners?

METHODOLOGY

This study employs a quantitative design using a set of questionnaires to explore the relationships between pragmatic awareness/pragmatic comprehension and WTC/SPCC.

Participants

Since a quantitative examination needs a fair number of participants, the study was conducted in different universities in China to recruit participants with convenience sampling. A total of 90 CSL learners from various countries volunteered to participate in the study. After validating demographic information, it was found that two learners had not yet come to China due to the influence of COVID-19, and eight learners' first language was Chinese. Thus, their data were excluded from the analysis. Therefore, data from 80 learners were analyzed in this study (45 males and 35 females, *Mean age* = 23.56, *SD* = 4.706). They came from different countries, including Russian, the United Kingdom, the United States, Korea, Thailand, Poland, Mali, Japan, etc., and were majoring in various disciplines such as economics, chemistry, physics, and so on. The learners had learned Chinese for nearly four years on average (*M* = 6.23, *SD* = 5.40). 90% of them had lived in a Chinese-speaking country above one year; 68.7% of them had taken and passed HSK (28 learners at level 6, 19 at level 5, 6 at level 4, 1 at level 3, and 1 at level 2).

Instruments

Data were collected by a web-based survey consisting of demographic information (gender, name, how many years they had studied Chinese, etc.), a WTC questionnaire, a SPCC questionnaire, a pragmatic awareness judgment task, and a multiple-choice test for pragmatic comprehension.

Willingness to Communicate Questionnaire

The WTC questionnaire consists of 12 items adapted from MacIntyre et al. (1998). While the WTC items were originally developed by McCroskey (1992) in the context of L1, MacIntyre et al. (1998) adapted them into a L2 setting. We adapted the items from asking students their WTC in English to their WTC in Chinese. The learners were asked to indicate the percentage of time (from 0 to 100%) they would choose to communicate in Chinese in different situations; some item examples are "Talk with an acquaintance" and "Talk in a small group of strangers" (see **Supplementary Appendix I**). The internal consistency reliability of the WTC questionnaire was high (α = 0.93).

Self-Perceived Communication Competence Questionnaire

The SPCC questionnaire was designed to measure learners' self-perceived level of communication competence in different contexts, with 12 items adapted from MacIntyre et al. (1998). The learners were asked to indicate the percentage of time (from 0 to 100%) they considered they were able to communicate in Chinese in different situations. Some item examples are "Talk with an acquaintance" and "Talk in a small group of strangers"

(see **Supplementary Appendix II**). The internal consistency reliability of the SPCC questionnaire was high (α = 0.95).

Pragmatic Awareness Judgment Task

The pragmatic awareness judgment task, containing ten items, was adapted from Bardovi-Harlig and Dörnyei (1998). Since the task was originally developed for English as the target language, we translated all the items into Chinese to suit our research purpose in CSL. Six native Chinese speakers piloted this instrument, and two items were replaced. Later, another two native Chinese speakers piloted the adjusted instrument and no item was needed to be revised. Each item contained a brief Chinese description of a scenario, a two-turn dialogue, and a question prompt; learners were asked to judge whether the final sentence of the short exchange was appropriate or not. If not, they should further judge the degree of inappropriateness, using scores of 0 for "not at all" to 6 for "extremely seriously." The test items included two categories: (a) sentences that were pragmatically appropriate, and (b) sentences that were pragmatically inappropriate (see **Supplementary Appendix III**). The internal consistency reliability of the pragmatic awareness judgment task was acceptable (α = 0.75).

Multiple-Choice Test for Pragmatic Comprehension

The multiple-choice test for pragmatic comprehension was adapted from the pragmatic comprehension test used in Alsuhaibani (2020), which was a written version of the pragmatic listening test originally developed by Taguchi (2012). In addition, we also consulted Li (2018) in developing the items. The test, containing 12 items, was composed of conventional implicatures (4 items for routines and 4 items for indirect refusal) and non-conventionally indirect opinions (4 items) (see **Supplementary Appendix IV**). All the items were piloted by native Chinese speakers and minor changes in expressions were made. The internal consistency reliability of the multiple-choice test for pragmatic comprehension was acceptable (α = 0.80).

Procedure

Web-based questionnaire data were collected to assess learners' levels of WTC, SPCC, pragmatic awareness, and pragmatic comprehension. Learners received a link to the web-based questionnaires from their instructors. All learners were recruited voluntarily and assured that their participation would not affect their term grades.

Data Analysis

The scores from the 80 learners were imported into SPSS version 22.0 for analysis. The WTC and SPCC questionnaires were coded according to the percentage selected by learners, and total points were computed.

Each answer in pragmatic awareness judgment task was scored out of 2 points. If the sentence was appropriate, the participant was given 2 points for selecting 'appropriate' and 0 point for 'inappropriate.' If the sentence was inappropriate, the item was scored into two parts, 1 point for selecting 'inappropriate' and 1 point for accurately judging the degree of appropriateness.

Each answer in the multiple-choice test for pragmatic comprehension was coded "1" for a selection of the desired answer and "0" for other options. This means that a score of 12 was the highest score the learners could achieve. Descriptive analysis was conducted. Correlations between pragmatic awareness/pragmatic comprehension and WTC/SPCC were investigated separately. In order to examine the interactions between variables, a moderate effect analysis was also conducted.

RESULTS

Pragmatic Awareness and Pragmatic Comprehension

Pragmatic Awareness

As previously stated, there were 10 items in the pragmatic awareness judgment task, with a possible score of 2 marks for each item. Thus, the highest possible score on the task was 20 points. Most learners performed well in this task, with an average score of over 13 points (*M* = 13.04, *SD* = 3.513). The results showed that all the CSL learners were good at identifying pragmatic errors and judging the degree of inappropriateness.

Table 1 presents the means and standard deviations of each item in the pragmatic awareness judgment task. The results showed that Item 8 was the easiest for the learners while Item 6 the most difficult. Most learners could judge the appropriateness of Item 8, and they all consider the utterance "我觉得已经很好了，非常感谢您提供的所有信息" ("That's great. Thank you so much for all the information") addressed to a teacher to be an appropriate expression. However, they encountered difficulties in judging Item 6, most of them failing to correctly judge whether Anna's utterance to a teacher "你好！我是安娜。你要是不介意的话，我想让你帮我填一下这个问卷" ("Hello. My name is Anna. If you don't mind, I would like you to fill this in for me") was appropriate or not.

Pragmatic Comprehension

As mentioned above, there were 12 items in the pragmatic comprehension task. If learners chose the desired answer, 1 point was scored. Thus, the highest possible score for this task was 12 points. Again, most of the CSL learners performed well in this task, with an overall average score above 9 points (*M* = 9.55,

TABLE 1 | Learners' performance in pragmatic awareness judgment task (*n* = 80).

Item	Mean	Standard deviation
8	1.80	0.604
7	1.70	0.719
10	1.70	0.719
9	1.64	0.661
2	1.41	0.760
5	1.40	0.739
4	1.18	0.725
5	0.91	0.845
1	0.71	0.874
6	0.65	0.781

SD = 2.951). The results demonstrated that the CSL learners were generally successful at identifying implied meaning in terms of different implicature types.

The means and standard deviations of the learners' performance for each item are presented in **Table 2**. Most of the learners could comprehend the implied meaning of the underlined sentence in the dialogue "他可以出去开饭店了!" ("He can run a restaurant!") (Item 4). However, learners had great difficulty interpreting the implicature of the comment "就你那手艺啊!" ("Just your cooking!") (Item 7).

As shown in **Table 3**, the learners' comprehension of implicatures differed in terms of the different types, with their comprehension of routines the lowest. In general, the learners' comprehension of non-conventional indirect opinion/comments was the best, a bit higher than that of conventional indirect refusals.

Relationship Between Pragmatic Awareness/Comprehension and WTC/SPCC

As presented in **Table 4**, the correlation coefficient between the CSL learners' pragmatic awareness and their SPCC indicated a small or no correlation. Also, it was found that there was no correlation between the learners' pragmatic awareness and their WTC either.

As presented in **Table 5**, the learners' overall pragmatic comprehension demonstrated no relation with their WTC; however, there was a weak correlation between CSL learners' comprehension and their SPCC.

As aforementioned, there are three types of implicatures in this test, namely conventionally indirect refusals, conventional routines, and non-conventionally indirect

TABLE 2 | Learners' performance in the pragmatic comprehension task ($n = 80$).

Item	Mean	Standard deviation
4	0.91	0.284
1	0.90	0.302
11	0.89	0.318
9	0.88	0.333
12	0.85	0.359
8	0.84	0.371
2	0.81	0.393
3	0.75	0.436
6	0.74	0.443
5	0.70	0.461
10	0.66	0.476
7	0.63	0.487

TABLE 3 | The comprehension of different implicatures.

Item	Mean	Standard deviation
Non-conventional indirect opinions/comments	3.375	0.107
Conventional indirect refusals	3.275	0.128
Routines	2.900	0.141

TABLE 4 | Correlations between pragmatic awareness and WTC/SPCC.

		WTC	SPCC
Pragmatic awareness	Pearson correlation	0.138	0.199
	Sig. (2-tailed)	0.224	0.077
	N	80	80

TABLE 5 | Correlations between pragmatic comprehension and WTC/SPCC.

		WTC	SPCC
Pragmatic Comprehension	Pearson Correlation	0.058	0.259*
	Sig. (2-tailed)	0.607	0.021
	N	80	80

*Correlation is significant at the 0.05 level (2-tailed).

TABLE 6 | Correlations between subgroups of pragmatic comprehension and WTC/SPCC.

		WTC	SPCC
Conventional indirect refusals	Pearson Correlation	0.089	0.234*
	Sig. (2-tailed)	0.434	0.037
	N	80	80
Routines	Pearson Correlation	0.051	0.316*
	Sig. (2-tailed)	0.650	0.000
	N	80	80
Non-conventional indirect opinions or comments	Pearson Correlation	0.006	0.100
	Sig. (2-tailed)	0.958	0.376
	N	80	80

*Correlation is significant at the 0.05 level (2-tailed).

opinions. Thus, three subgroups of pragmatic comprehension were investigated.

The results in **Table 6** showed that there was a weak correlation between the performance of conventionally indirect refusals and SPCC ($r = 0.234$), but this was statistically significant. In addition, the learners' performance in routines also was found to be weakly correlated with SPCC ($r = 0.316$). However, there was a small or no correlation between all the three subgroups of implicature and WTC.

To further explore how pragmatic comprehension interacts with SPCC, based on previous studies the moderating effects of several variables were examined, such as gender, age, etc. Only age was found to be a moderating variable between SPCC and pragmatic comprehension (see **Table 7**).

Because there was a positive correlation between pragmatic comprehension and SPCC by Model 1 ($p = 0.021$), a moderate effects analysis could be conducted. As **Table 7** shows, in Model 3 the interaction between learners' age and pragmatic comprehension was statistically significant ($t = -2.294, p = 0.025 < 0.05$).

Table 8 shows that when learners' pragmatic comprehension interacts with their SPCC, age plays a moderate role across three levels, of which age at the low and mean level may moderate learners' SPCC more remarkably ($p = 0.002; p = 0.019$).

TABLE 7 | Moderate effect analysis ($n = 80$).

	Model 1					Model 2					Model 3				
	B	*SDE*	*T*	*p*	β	*B*	*SDE*	*t*	*p*	β	*B*	*SDE*	*t*	*p*	β
Constant	7.669	0.290	26.471	0.000**	—	7.669	0.290	26.403	0.000**	—	7.554	0.287	26.311	0.000**	—
Pragmatic comprehension	0.234	0.099	2.364	0.021*	0.259	0.221	0.100	2.208	0.030*	0.245	0.235	0.098	2.399	0.019*	0.260
Age						−0.049	0.063	−0.774	0.441	−0.086	−0.035	0.062	−0.565	0.574	−0.061
Pragmatic comprehension*Age											−0.053	0.023	−2.294	0.025*	−0.246
R^2		0.067					0.074					0.134			
Adjusted R^2		0.055					0.050					0.100			
F value		$F_{(1,78)} = 5.588, p = 0.021$					$F_{(2,77)} = 3.080, p = 0.052$					$F_{(3,76)} = 3.921, p = 0.012$			
$\triangle R^2$		0.067					0.007					0.060			
$\triangle F$ value		$F_{(1,78)} = 5.588, p = 0.021$					$F_{(1,77)} = 0.600, p = 0.441$					$F_{(1,76)} = 5.262, p = 0.025$			

*Dependable Variable: SPCC *p<0.05 **p<0.01.*

TABLE 8 | Simple slope test.

Moderator level	Coefficient of skewness	Std deviation	*t*	*p*	95% CI	
Mean	0.235	0.098	2.399	0.019	0.043	0.426
High(+1SD)	−0.017	0.142	−0.117	0.907	−0.296	0.263
Low(−1SD)	0.486	0.151	3.216	0.002	0.190	0.782

DISCUSSION

This study examined CSL learners' pragmatic awareness and pragmatic comprehension, and the possible relation between them and the level of the learners' WTC and SPCC. The first research question concerned the CSL learners' degree of pragmatic awareness and pragmatic comprehension. On the one hand, in terms of the pragmatic awareness of CSL learners, our quantitative results showed that more than 60% of the CSL learners performed well in the pragmatic awareness judgment task. The finding indicated that the CSL learners' pragmatic awareness was rather advanced, which was reasonable considering that most of them had already lived in China for longer than a year. The result is consistent with the findings of previous studies that L2 learners' pragmatic awareness develops significantly after an academic year spent in the L2 community environment (Bardovi-Harlig and Dörnyei, 1998; Schauer, 2009; Ren, 2015).

The results from the multiple-choice task also revealed high performance by most of the CSL learners in different types of implicature comprehension. In a comparison of subgroups, it was found that the learners interpreted non-conventional implicatures better, indicating that conventional implicatures may be difficult to comprehend. Similarly, Taguchi et al. (2013) also found that conventionally indirect opinions were the most difficult for their learners of Chinese. Thus, it is necessary for CSL instructors to put more emphasis on teaching conventional implicatures in the classroom so that CSL learners' pragmatic comprehension can be improved. Also, since the target language setting may contribute to the acquisition of conventional implicatures (Inagaki, 2019), CSL learners should take the advantage of their study-abroad opportunity and access more instances of conventional implicatures in daily communication.

Due to limited time in the classroom, CSL instructors should also consider the integration of the instructional resources in and outside the classroom into curriculum design (Ren and Han, 2016) and encourage CSL learners to participate in out-of-class activities, as they would benefit CSL learners' linguistic and pragmatic competence (Gong et al., 2021b; Li et al., 2021). In addition, the study-abroad program would be well-designed to provide more resources and opportunities for CSL learners to communicate with locals so that their pragmatic comprehension and awareness would be well developed (Gong et al., 2018a; Ren, 2019; Li et al., 2021).

The second question asked whether there were correlations between the CSL learners' pragmatic awareness/pragmatic comprehension and WTC/SPCC. Our statistical analysis did not find a direct correlation between the CSL learners' pragmatic awareness and WTC. Also, the learners' pragmatic comprehension did not show a direct correlation with their WTC. This is contrary to the conclusions of Hosseinpur and Nevisi (2017), which indicated a positive relationship between EFL learners' pragmatic competence and their WTC. A possible interpretation for this finding might be differences in the pragmatic aspects examined and the tasks employed. On the one hand, this study examined CSL learners' pragmatic awareness and comprehension, while Hosseinpur and Nevisi (2017) examined EFL learners' pragmatic production. On the other hand, in the present study, the pragmatic awareness judgment task and the pragmatic comprehension test were in the paper-and-pencil version, which may be less affected by learners' WTC compared to discourse completion task used in Hosseinpur and Nevisi (2017). Therefore, L2 pragmatics research and instruction on learners' pragmatic production should take full consideration of their WTC. Also, instructors and researchers could develop innovative

teaching methods and research methods to encourage CSL learners' intention to speak, which would benefit their pragmatic competence by developing their WTC. Communicative and intercultural pedagogy can be involved in pragmatics instructions by Chinese language instructors since the teaching intervention would help CSL learners improve their intercultural communicative competence (Moloney, 2013; Gong et al., 2021a). In addition, more pragmatic practices could be provided for CSL learners in and outside the classroom to assist them to improve their pragmatic awareness (Li et al., 2021). Thus, instructional methods should be carefully designed, and instructors' attitudes are also critical in influencing CSL learners' WTC.

The findings indicated that the CSL learners' pragmatic comprehension had a positive correlation with their SPCC. That is, if the CSL learners perceived their communicative competence to be high, they showed better performance in terms of comprehension of implicatures. The construct of communicative competence includes how to utilize pragmatic knowledge to communicate with others (Mao, 2021). Thus, if L2 learners can accurately self-assess their actual communicative competence, they perform well in the comprehension of some implicatures (Jamrus and Razali, 2019). As the findings showed, in this study, SPCC as a predictor of WTC (Burroughs et al., 2003) had a positive correlation with the CSL learners' comprehension of two subgroups of implicatures, namely conventionally indirect refusals and conventional routines. That is, the learners' SPCC interacted with their pragmatic comprehension of the conventional implicatures.

Based on previous literature (MacIntyre, 1994; Lahuerta, 2014; Liu, 2016), the present study also conducted an analysis of the moderating effect of variables including gender, age, length of time spent in Chinese-speaking countries, and duration of Chinese learning. However, only the variable of age presented as a moderator of the interaction between pragmatic comprehension and SPCC. This finding echoes previous findings that age has an impact on the development of pragmatic comprehension (Lee, 2010) and on pragmatic production (Liu et al., 2021). In addition, age may also influence language learners' SPCC. For instance, early starters have been found to self-assess their oral communicative competence more highly than those learning language later (Dewaele, 2009). As L2 pragmatics research predominantly investigate learners at the university level, how age as a moderator promotes the interaction of pragmatic comprehension with SPCC may be an interesting topic for future studies.

CONCLUSION AND LIMITATIONS

This study examined CSL learners' performance of pragmatic awareness and pragmatic comprehension tasks. Most of the CSL learners attained high scores and performed well in the tasks. The relationships between the learners' pragmatic awareness/pragmatic comprehension and WTC/SPCC were also examined by correlation analysis. It was found that the CSL

learners' pragmatic comprehension had a positive correlation with their SPCC, but pragmatic awareness and pragmatic comprehension did not correlate with WTC. The study also found age as a moderating factor between the learners' SPCC and pragmatic comprehension. These findings shed light on our understanding of CSL learners' individual differences (in terms of their WTC and SPCC) and their pragmatic competence (pragmatic awareness and pragmatic comprehension).

The findings have implications for CSL pragmatics instruction and provide a new perspective on the research of CSL learners' pragmatic competence. More specifically, this study contributes to research examining the relationship between CSL learners' pragmatic competence and their WTC. The study suggests that CSL instructors, or L2 instructors in general, should apply the communicative and/or cultural pedagogies in pragmatics teaching and integrate instructional resources and opportunities for CSL learners to develop their SPCC and pragmatic competence. The study also has some limitations. First, we only focused on pragmatic comprehension and awareness. Future studies could also include pragmatic production and compare similarities and differences between productive pragmatic competence and receptive pragmatic competence. Second, a mixed-methods design including interviews or verbal reports (Ren, 2014; Gass and Mackey, 2016) would be helpful to further examine learners' own understanding of the relationship between pragmatic competence and WTC. Third, instruments could be designed covering several different contexts, taking full consideration of the situated nature of L2 WTC.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/**Supplementary Material**, further inquiries can be directed to the corresponding author/s.

AUTHOR CONTRIBUTIONS

XL: conceptualization, data analysis, writing, and revision. WR: conceptualization, data collection, data analysis, writing—review, and editing. LL: data collection, data analysis, and revision. All authors contributed to the article and approved the submitted version.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2021. 797419/full#supplementary-material

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Online Self-Regulated Learning Profiles: A Study of Chinese as a Foreign Language Learners

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The role of self-regulated learning (SRL) in achieving academic success has been widely investigated for campus-based college students. However, research on online learners' SRL is limited, while the number of online learners has been increasing tremendously in recent years, especially after the COVID-19 pandemic worldwide. As SRL is context-bound, differences caused by classroom and home environments may be expected. This study investigated the factor structures of online learners' SRL in Chinese as a foreign language education and the existence of SRL profiles in online learners. Data were collected from 378 international students enrolled in online Chinese language courses in 2020. Ten latent factors were revealed by exploratory factor analysis with motivation and learning strategies scales of the Motivated Strategies for Learning Questionnaire (MSLQ). A follow-up latent profile analysis showed three profiles of low, moderate, and high self-regulated learners. The study supports the context-bound nature of SRL and calls for developing adaptive training programs according to SRL profiles of Chinese language learners.

Keywords: online self-regulated learning, motivated strategies for learning questionnaire, Chinese as a foreign language, latent profile analysis, motivation, learning strategies

INTRODUCTION

Over the past 20 years, the number of Chinese as a foreign language (CFL) or second language (CSL) learners has grown significantly within and outside China (Gong et al., 2020a,c, 2021c). In 2018, more than 500,000 international students participated in various courses and short-term immersion programs in over 820 educational institutions in mainland China (Ministry of Education, 2019). Influenced by the COVID-19 pandemic worldwide, international students enrolled in Chinese universities were required to learn Chinese language courses in their home countries via the internet (Ministry of Education, 2020). The nature of online classes is considerably different from face-to-face traditional classroom settings, which requires learners to be more autonomous and self-regulated (Stevens and Switzer, 2006).

Self-regulated learning (SRL) has received increasing attention in educational research due to its essential role in society today (Zimmerman, 2002; Heirweg et al., 2019). Effective SRL has been found to optimize learning processes and positively affect learning results in the traditional classroom (Dörrenbächer and Perels, 2016). Few studies have explored the SRL of non-traditional learners studying in an online learning environment. As SRL is context-bound, differences caused by classroom and home environment can be expected (Duncan and McKeachie, 2005; Meijs et al., 2019). Since studying online requires more SRL than in traditional education, it is necessary to determine whether the SRL structure developed

for traditional college students is also suitable for online learners, especially for CFL/CSL learners (Gong et al., 2021a).

There is increasing evidence that individual differences exist in SRL (Barnard-Brak et al., 2010; Dörrenbächer and Perels, 2016). Learners may combine their motivation and learning strategies in a relatively unique way in SRL (Vansteenkiste et al., 2009). Most studies have explored SRL using a variable-centered approach instead of a person-centered approach. A person-centered approach should be adopted to identify different groups of online learners characterized by different SRL profiles.

Given the increasing demands of learning Chinese online since the outbreak of COVID-19, this study aimed to explore the SRL of international students in the context of learning CFL online in mainland China. The study also examined the SRL characteristics of different groups of online learners from a person-centered perspective. This contextualized examination offers new insights into the construct of SRL and produces practical implications for online Chinese language education.

LITERATURE REVIEW

Self-Regulated Learning

Self-regulated learning is "an active, constructive process whereby learners set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation, and behavior, guided and constrained by their goals and the contextual features in the environment" (Pintrich, 2000, p. 453). This conceptualization indicates that SRL is complex and multicomponent. Referring to Pintrich's (2000) framework, SRL is composed of four stages: (1) forethought, planning, and activation; (2) monitoring; (3) control; and (4) reaction and reflection. Each stage has four different aspects for regulation: cognition, motivation/affect, behavior, and context. The combination of stages and aspects displays a comprehensive picture of a significant number of SRL processes (e.g., goal orientation adoption, monitoring of cognition, and self-observations of behaviors). The different SRL components for regulation are employed in the different stages.

A wildly used instrument to measure learners' SRL is the Motivational Strategies for Learning Questionnaire (MSLQ) developed by Pintrich et al. (1991), established on the general cognitive model of motivation (Pintrich, 1988, 2003) and information processing (Weinstein and Mayer, 1986). This questionnaire has two subscales of motivation and learning strategies. Specifically, the motivation focuses on three constructs: (1) value, concerning the reason of learners' engagement in a learning task, such as intrinsic and extrinsic goal orientation; (2) expectancy, referring to learners' belief in accomplishing a task through their efforts or ability, such as self-efficacy; (3) affect, tapped into learners' cognitive and emotional reactions to test anxiety. The subscale of learning strategies, built on the cognitive theory of learning (Bandura, 1986; Schunk, 2012), concerns three constructs: cognitive, metacognitive, and resource management strategies. Cognitive strategies include simple and complex strategies that learners use in a learning task, such as rehearsal and organization. Metacognitive strategies are

applied by learners to regulate their cognitive behaviors, such as setting learning goals, monitoring learning processes, and modifying learning behaviors. Resource management strategies are non-cognitive strategies that learners utilize to regulate their learning, such as time, study environment, and peer learning. MSLQ is recognized as the most used instrument in SRL measurement (Roth et al., 2016). One of its major strengths is its combination of motivation and learning strategies, which provides learners with detailed information about their SRL.

Researchers have explored learners' SRL behaviors across cultural contexts and population (Panadero, 2017; Tong et al., 2020). Many researchers have applied MSLQ to examine different groups of learners in many countries, such as Australia (e.g., Martin and Marsh, 2006), China (e.g., Tong et al., 2020), and Pakistan (e.g., Nausheen, 2016). Although there might be some universal constructs of SRL, researchers have found differences in factor structures and item assignments across culture and educational contexts (Nausheen, 2016; Ramírez Echeverry et al., 2016; Tong et al., 2020). Nausheen (2016) examined the factor structure of the motivation subscale of MSLQ through 368 graduate students in Pakistan. The factors of control of learning belief and intrinsic goal orientation were not found among this group of learners. Moreover, items of intrinsic goal orientation were loaded on the task value, indicating that the intrinsic motivation for the course was related to its overall utility and value. Ramírez Echeverry et al. (2016) collected the data from 1,218 engineering students in a Colombian university and found that the time and study environment in the learning-strategy scale was separated into two independent factors, i.e., time and study environment. In addition, the factors of peer learning and help-seeking were combined into one factor with all the original seven items, suggesting that learners considered these two resources similar.

In the context of mainland China, Tong et al. (2020) investigated 611 undergraduate students' SRL behaviors in two coastal universities. The factor of intrinsic goal orientation was not identified, implying the interdependence between culture and SRL models. Peer learning and help-seeking were aggregated into one factor, indicating that Chinese adult learners did not differentiate between learning with peers and seeking help from peers. Time and study environment was split into two independent constructs, i.e., time management and study environment management, similar to those found in Ramírez Echeverry et al.'s (2016) study. Although time and study environment are two different resources learners should master ideally, the researchers argued that it was sufficient for learners to use either one properly to optimize their learning. Grounded in social cognitive theory, learners' motivation and learning strategies in SRL are context-specific and influenced by culture (Zhou and Wang, 2021). Therefore, more research is needed to explore the constructs of MSLQ among different groups of learners in different educational contexts to better understand the transferability of SRL theory.

Online Self-Regulated Learning

The COVID-19 outbreak worldwide has rapidly increased online learning, whereby digital technology facilitates teaching. Online

learners choose the time, pace, and location to study and decide whether to contact teachers or peers of their wills (Eurydice, 2011). Distinct from the traditional face-to-face in-class education, online learning requires students to learn with more SRL strategies and self-motivation as they receive less support and guidance on how to learn efficiently (Zhou and Wang, 2021). As SRL is context-bound, different learning environments may lead to differences in motivation and learning strategy use between online and traditional learners (Duncan and McKeachie, 2005; Meijs et al., 2019).

Few empirical studies have explored the SRL behaviors of online learners. Since it is not practical to create a new instrument to measure existing SRL concepts, some researchers used the subscales of MSLQ to investigate online learning (e.g., Cho and Summers, 2012; Kizilcec et al., 2017). Cho and Summers (2012) used the original MSLQ to study learning strategies on online learning among 193 online learners at a large mid-western research university in the United States. The results indicated that the factor structure did not fit the sample well. As the MSLQ is initially designed to measure SRL among learners in traditional face-to-face education, some items in the questionnaire may not reflect the learning characteristics of online learners, especially their learning strategy use (Zhou and Wang, 2021). Recognizing this problem, Meijs et al. (2019) revised the learning strategy subscale of the MSLQ to apply to online education. They discovered that a 5-factor structure has a better fit than the original 9-factor model, namely, management of time and effort, simple cognitive strategy use, complex cognitive strategy use, contact with others, and academic thinking. Zhou and Wang (2021) validated Meijs et al.'s (2019) questionnaire using 385 students in an open university in China and found it had good validity and reliability. Five factors were generated from their data. They were named time management, effort regulation, cognitive strategy, critical thinking, and help-seeking, slightly different from the factors emerging from Meijs et al.'s (2019) study. Firstly, time management and effort management were split into two factors. Second, simple and complex cognitive strategies were aggregated into one factor. The researchers called for more empirical studies in different subjects to explore the SRL characteristics of online learners.

Most empirical studies have used a variable-centered approach to explore the different motivation and learning strategies that learners engage in separately (Cho and Summers, 2012; Meijs et al., 2019; Zhou and Wang, 2021). However, SRL learners may vary at the individual level. Even with the same learning context, students may have a different combination of motivation and learning strategies. A person-centered approach should be adopted to categorize individuals into groups with similar SRL profiles. Liu et al. (2014) investigated the SRL profiles of 238 college students using their MSLQ scores. They identified four subgroups: positive motivated strategies for learning, average motivated strategies for learning, low motivated strategies for learning with high anxiety, and negative motivated strategies for learning. Dörrenbächer and Perels (2016) collected the data from 337 college students and discovered four distinct SRL profiles: high SRL, conflicting SRL with high motivation, moderate SRL, and low SRL with moderate motivation. Few studies have adopted a person-centered approach to explore the SRL characteristics

of online learners. Given that such diagnostic information may contribute to effective online instruction, additional research evidence is needed.

The COVID-19 pandemic outbreak forced many universities to remain closed temporarily in 2020 (UNESCO, 2020). In mainland China, almost half-million international students retreated to their countries and had to study online from their homes to continue their education (Bao, 2020). Since it is uncertain to get back to ordinary face-to-face teaching soon, online learning is promoted as a solution to teach international students in universities in China (Bao, 2020). As most international students deciding to study in Chinese universities involve Chinese language learning, it is necessary to investigate their online learning in Chinese language courses, especially for their SRL behaviors (Gong et al., 2021b). Moreover, as reviewed above, there lacks empirical research examining the SRL characteristics of online learners and their individual differences in SRL. Given these research gaps, this study is guided by the following two research questions:

RQ1: What are the characteristics of international students' self-regulated learning in the context of online Chinese as a foreign language education?
RQ2: What are the distinctive profiles of international students concerning their self-regulated learning in the context of online Chinese as a foreign language education?

METHODOLOGY

Participants

A sample of 378 international students enrolled in higher-level education in mainland China participated in administering an online self-report SRL questionnaire. More particularly, 344 undergraduate and 34 graduate students took part, with a mean age of 22.49 years ($SD = 4.24$). There were 134 males (35.4%) and 234 females (64.6%). Most of the participants were from Teaching Chinese as a Foreign Language (TCFL) ($n = 272$). The rest were from different majors, such as Economics, International Business, and Law. On average, these participants had been learning Chinese in mainland China for 2.65 years ($SD = 1.13$) with 1,920 instructional hours at the time of the study. They all had passed Hanyu Shuiping Kaoshi (HSK) Level 4, a large-scale standardized Chinese proficiency test for non-Chinese learners in mainland China (Chinese Language Council International and Confucius Institute Headquarters, 2009). HSK Level 4 corresponds to Level B2 of the Common European Framework of Reference for Languages (CEFR) (Chinese Language Council International and Confucius Institute Headquarters, 2009). All the participants took at least one online Chinese language course in the autumn of 2020. Before that, they all have received at least 1 year of face-to-face classroom instruction in China. **Appendix A** displays the breakdown of the participants by country.

Instrument
Motivated Strategies for Learning Questionnaire
The MSLQ (Pintrich et al., 1991) was used to measure the participants' motivation and learning strategies in online Chinese

language courses. The questionnaire contains two sections: motivation and learning strategies (Pintrich et al., 1991). The original 31 items in the motivation section were adopted in this study. These items assess students' goal orientation and value beliefs for a course, the self-confidence of their ability to succeed in a course, and the anxiety of their academic performance. There are six factors in the motivation section: intrinsic goal orientation, extrinsic goal orientation, task value, control of learning beliefs, self-efficacy for learning and performance, and test anxiety. The learning strategies were measured with the adapted version of the MSLQ-B developed by Meijs et al. (2019), applied to online learners. This 25-item questionnaire consists of five factors: management of time and effort, complex cognitive strategy use, simple cognitive strategy use, contact with others, and academic thinking. Meijs et al. (2019) reported Cronbach's alphas of factors ranging from 0.70 to 0.80. Strong validity and reliability support for this questionnaire were found in further empirical studies (Neroni et al., 2019; Zhou and Wang, 2021).

All questionnaire items were presented in both English and Chinese, with the English item corresponding to each Chinese item being provided to help participants accurately understand the items. The "translate and back translate" procedure was adopted to ensure a readable Chinese expression of the same meaning. Two bilingual scholars were invited to examine the accuracy of the translation. As the students could take several courses simultaneously in one semester, statements were stated generally instead of for a specific course. The participants rated themselves on a 7-point Likert scale, ranging from *not at all true of me* (1) to *very true of me* (7).

Data Collection

A convenience sampling method was used to select the participants. The research team contacted Chinese language teachers in universities in mainland China through personal relationships and asked them to invite their students to complete the online questionnaire. Students were informed that their participation was completely voluntary and that their data would be kept confidential and used only for research purposes. Students filled out e-questionnaires through the link provided by the researchers and received e-learning materials as compensation for their participation. According to the information provided by the online questionnaire tool, most participants took approximately 20 min to complete the questionnaire.

Data Analysis

Descriptive statistics of the questionnaire of items were first calculated, including means and standard deviations. The univariate and multivariate normality of the collected data were examined. Skewness and kurtosis were used to check for item-level univariate normality. Values of skewness between [−3, 3] and kurtosis between [−10, 10] were considered acceptable, indicating univariate normality (Kline, 2011). Mardia's coefficient was used to examine multivariate normality. A value of 5.00 or below represented multivariate normality (Bentler, 2005). Confirmatory factor analysis (CFA) was then used to test whether the data in this study fit the original subscales of the motivation and

learning strategies in the questionnaire (Pintrich et al., 1991; Meijs et al., 2019). However, the data failed to fit the pre-existing model. Thus, exploratory factor analysis (EFA) was performed to identify the factor constructs of motivation and learning strategies used in online language courses. CFA was later used to examine the latent factor structures hypothesized based on EFA results. EFA is an approach to explore the number of latent variables and possible underlying factor structures of a group of observed variables (Fabrigar et al., 1999). Principal axis factoring (PAF) was chosen as an extraction method as it is consistent with the common factor model (Fabrigar and Wegener, 2011). Oblimin rotation was selected because it allows factors to be correlated, as found in previous research (Neroni et al., 2019; Zhou and Wang, 2021). Items with factor loadings greater than 0.3 were considered meaningful. Correlations of factors were also calculated. CFA is a technique to examine the number of factors and the specification of factor loadings postulated by the researchers based on theoretical frameworks or/and empirical studies (Thompson, 2004). Maximum likelihood (ML) was chosen as the estimation method. Several goodness-of-fit indices ($x^2/df \leq 3$, Comparative Fit Index [CFI] ≥ 0.90, Goodness of Fit Index [GFI] ≥ 0.90, Root Mean Square Error of Approximation [RMSEA] ≥ 0.06, Standardized Root Mean Square Residual [SRMR] ≥ 0.08) were used to evaluate the fit of the hypothesized model (Hu and Bentler, 1999; Kline, 2011).

Latent profile analysis (LPA) was used to group students into homogenous classes with regard to SRL level. LPA is a probability-based approach to identify underlying group members showing similar patterns of continuous variables (Muthén, 2001; Magidson and Vermunt, 2004). The students' responses to the factors generated from MSLQ were used to categorize them into groups that shared a similar degree of agreement on a particular combination of motivation and learning strategies. Maximum likelihood (ML) estimation, the most commonly used approach to estimate model parameters in LPA, was adopted to find the parameter estimates associated with the highest likelihood value coming from the sample (McLachlan and Peel, 2000; Pastor et al., 2007). Following the criteria set by Nylund et al. (2007), models from two to four profiles were tested to identify the number of profiles. The best-fitting model was decided by evaluating a combination of absolute (Vuong–Lo–Mendell–Rubin likelihood ratio test [VLMR-LRT] and Lo–Mendell–Rubin adjusted likelihood ratio test [LMRA-LRT]) and relative -(Akaike Information Criterion [AIC], Bayesian Information Criterion [BIC], Sample Size-adjusted Bayesian Information Criterion [SSA-BIC]) fit indices (Nylund et al., 2007). The non-significant p-value for VLMR-LRT and LMRA-LRT indicates that the estimated model with k-profiles fits the data better than the model with $k-1$ profiles (Lo et al., 2001). Generally, lower AIC, BIC, ABIC values indicate better model fit, whereas higher entropy, usually closer to one, indicates high discrimination among the latent profiles (Muthén and Muthén, 2007).

To examine whether there were significant differences across profiles with distinct patterns in online SRL, a series of one-way analyses of variance (ANOVA) were performed. Profile membership serves as the independent variable and the identified

underlying factors of motivation and learning strategies as the dependent variables. A Bonferroni correction (α = 0.05) was employed to find the statistical difference in the post-hoc test as well as to control for Type I error. Partial eta squared was used to measure effect sizes. A value lower than 0.06 was interpreted as a small effect, a value of 0.06–0.14 a medium effect, and a value higher than 0.14 a large effect when comparing the group differences (Cohen, 1988). LPA was conducted using Mplus 7 (Muthén and Muthén, 1998–2012), while all other data analyses were performed in SPSS 24 (International Business Machines (IBM), 2016).

RESULTS

Factor Analyses

Before EFA, univariate normality was examined for the collected data. All items in the questionnaire were normally distributed, as the values for skewness and kurtosis were close to zero (Kline, 2011). Aligned with the two main scales of the MSLQ, the results are presented in two parts. First, EFA generated five factors in the analysis of the Motivation scale, accounting for 48.23% of the total variance. Six items were removed from the questionnaire due to their low factor loadings or cross-loadings on two factors. Referring to the original item assignments and interpretation (Pintrich et al., 1991), these five factors were labeled as extrinsic goal orientation, task value, control for learning beliefs, self-efficacy for learning and performance, and test anxiety. The original factor of intrinsic goal orientation did not emerge from the analysis. Two items of this factor (i.e., 'The most satisfying thing for me in the course is trying to understand the content as thoroughly as possible,' 'When I have the opportunity in the class, I choose course assignments that I can learn from even if they don't guarantee a good grade') were found to load on the factor of task value. The other two items were deleted due to low factor loadings on any of the factors. The final motivation scale consists of five factors with 25 items. Mardia's coefficient was 3.42, indicating the variables had multivariate normal distributions (Bentler, 2005). Later, the five-factor model was tested in CFA and found to have acceptable model fit (x^2/df = 1.94, $p < 0.001$; CFI = 0.93; GFI = 0.91; RMSEA = 0.050; SRMR = 0.055). **Table 1** presents the factor loading matrix of the five-factor solution.

In the analysis of the subscale of the learning strategies revised for online learners, EFA generated five factors, accounting for 43.01% of the total variance. Four items were deleted because their factor loadings were lower than 0.30. Based on the factor explanation of Meijs et al.'s (2019) questionnaire, these five factors were named as time management, effort regulation, Simple Cognitive Strategy Use, Contact with Others, and Academic Thinking. The original factor of management of time and effort was split into two factors in this study: time management and effort regulation. The original factor of complex cognitive strategy use was not identified. Three items were scattered among effort regulation (i.e., 'When studying for this course, I try to determine which concepts I don't understand well'), simple cognitive strategy use (i.e. 'When reading for this class, I try to relate the material to what I

already know'), and Academic Thinking (i.e., 'I try to think through a topic and decide what I am supposed to learn from it rather than just reading it over when studying for this course'). The other two items were removed due to their low factor loadings. The final Learning Strategies scale includes five factors with 21 items. The value of Mardia's coefficient was 4.28, indicating no violation of multivariate normality (Bentler, 2005). The goodness-of-fit indices of the CFA model were acceptable (x^2/df = 2.76, $p < 0.001$; CFI = 0.92; GFI = 0.91; RMSEA = 0.058; SRMR = 0.066). **Table 2** displays the factor loading estimates in the Learning Strategies scale. The correlations between factors generated from the MSLQ are shown in **Table 3**.

Latent Profile Analysis

Based on the results of CFA, LPA was conducted with SRL factors as indicator variables. A three-profile model showed a robust statistical fit to the data. The entropy value for a three-profile model was high (0.847), indicating the precision of assigning individuals to their respective groups. The values of AIC, BIC, and SSA-BIC decreased considerably at the three-profile model. The results of VLMR-LRT and LMRA-LRT showed that the three-profile model had a better fit than the two- and four-profile models. The fit indices for the three latent profile models are shown in **Table 4**.

Table 5 presents means and standard deviations of SRL factors for the three profile groups. The first group showed the lowest values on all ten factors, which was named as the low SRL group (n = 120, 31.7%). The second group had moderate values on most subscales with the lowest value on the factor of contact with others. Thus, this group was named as moderate SRL group (n = 165, 43.7%). The third group was described as high SRL (n = 93, 24.6%) as this group had high values on all subscales except the factor of Test Anxiety. A series of ANOVAs were conducted to examine if there were significant associations between profile membership and ten SRL factors. Significant differences were revealed between the groups on the factors of extrinsic goal orientation [$F(2,375)$ = 65.20, $p < 0.001$, η^2 = 0.25], task value [$F(2,375)$ = 294.74, $p < 0.001$, η^2 = 0.61], control for learning beliefs [$F(2,375)$ = 43.56, $p < 0.001$, η^2 = 0.19], self-efficacy for learning and performance [$F(2,375)$ = 110.91, $p < 0.001$, η^2 = 0.37], time management [$F(2,375)$ = 31.08, $p < 0.001$, η^2 = 0.14], effort regulation [$F(2,375)$ = 213.84, $p < 0.001$, η^2 = 0.53], simple cognitive strategy use [$F(2,375)$ = 291.93, $p < 0.001$, η^2 = 0.61], Contact with Others [$F(2,375)$ = 34.80, $p < 0.001$, η^2 = 0.16], and Academic Thinking [$F(2,376)$ = 147.29, $p < 0.001$, η^2 = 0.44]. There was no statistically significant difference on the factor of test anxiety, as students in all three groups showed relatively low degree of anxiety.

DISCUSSION

This study investigated the SRL characteristics of international learners in online CFL courses. A person-centered approach was adopted to examine how homogenous subgroups of individuals combine several SRL strategies differently. The findings highlight

TABLE 1 | Exploratory factor analysis results for motivation items.

Factor	Item	Mean	SD	Factor loading					Reliability (α)
				1	2	3	4	5	
(1) Extrinsic Goal Orientation	(1) Getting a good grade in the class is the most satisfying thing for me right now.	5.46	1.37	0.56					0.72
	(2) The most important thing for me right now is improving my overall grade point average, so my main concern in the class is getting a good grade.	5.25	1.48	0.66					
	(3) If I can, I want to get better grades in the class than most of the other students.	5.33	1.43	0.61					
	(4) I want to do well in the class because it is important to show my ability to my family, friends, employer, or others.	4.97	1.63	0.55					
(2) Task Value	(5) If I study in appropriate ways, then I will be able to learn the materials in the course.	5.67	1.07		0.32				0.89
	(6) It is important for me to learn the course material in the class.	5.92	1.10		0.74				
	(7) I am very interested in the content area of the course.	5.55	1.24		0.71				
	(8) If I try hard enough, then I will understand the course material.	5.76	1.16		0.56				
	(9) I expect to do well in the class.	5.87	1.14		0.55				
	(10) The most satisfying thing for me in the course is trying to understand the content as thoroughly as possible.	5.65	1.17		0.59				
	(11) I think the course material in the class is useful for me to learn.	5.83	1.18		0.75				
	(12) When I have the opportunity in the class, I choose course assignments that I can learn from even if they don't guarantee a good grade.	5.28	1.31		0.36				
	(13) I like the subject matter for the course.	5.61	1.16		0.79				
	(14) Understanding the subject matter of the course is very important to me.	5.81	1.13		0.82				
(3) Control for Learning Beliefs	(15) It is my own fault if I don't learn the material in the course.	5.17	1.58			0.62			0.60
	(16) If I don't understand the course material, it is because I didn't try hard enough.	4.79	1.56			0.58			
(4) Self-Efficacy for Learning and Performance	(17) I believe I will receive an excellent grade in the class.	5.36	1.28				0.72		0.85
	(18) I'm certain I can understand the most difficult material presented in the readings for the course.	4.80	1.43				0.83		
	(19) I'm confident I can understand the most complex material presented by the instructor in the course.	4.84	1.33				0.79		
	(20) I'm confident I can do an excellent job on the assignments and tests in the course.	5.28	1.19				0.62		
	(21) I'm certain I can master the skills being taught in the class.	5.25	1.21				0.61		
(5) Test Anxiety	(22) When I take a test, I think about how poorly I am doing compared with other students.	3.79	1.78					0.35	0.72
	(23) When I take tests, I think of the consequences of failing.	4.34	1.80					0.57	
	(24) I have an uneasy, upset feeling when I take an exam.	4.29	1.69					0.84	
	(25) I feel my heart beating fast when I take an exam.	4.81	1.69					0.72	

several differences and similarities concerning those documented in previous studies.

Self-Regulated Learning Constructs of Online Learners

In terms of the first research question, the EFA analysis generated five factors for the motivation subscale: extrinsic goal orientation, task value, control for learning beliefs, self-efficacy for learning and performance, and test anxiety. The original factor of intrinsic goal orientation was not identified in this study. Two original

items of this factor (i.e., 'The most satisfying thing for me in the course is trying to understand the content as thoroughly as possible,' 'When I have the opportunity in the class, I choose course assignments that I can learn from even if they do not guarantee a good grade') were found to load on the factor of the task value. The result is consistent with the findings of previous studies conducted with on-campus students in different contexts, such as Pakistan (Nausheen, 2016) and China (Tong et al., 2020). These two items focused on the learners' evaluation of how interesting and valuable the online course was. Such statements did not strongly indicate that the learners participated in the

TABLE 2 | Exploratory factor analysis results for items of learning strategies.

Factor	Item	Mean	SD	Factor loading					Reliability (α)
				1	2	3	4	5	
(1) Time Management	(1) I make good use of my study time for the course.	5.25	1.27	0.32					0.61
	(2) I rarely find time to review my notes or readings before an exam.	4.35	1.80	0.43					
(2) Effort Regulation	(3) I make sure that I keep up with the weekly readings and assignments for the course.	5.26	1.40		0.62				0.75
	(4) I attend this class regularly.	5.98	1.36		0.73				
	(5) Even when the course materials are dull and uninteresting, I manage to keep working until I finish.	5.54	1.11		0.61				
	(6) When studying for the course, I try to determine which concepts I don't understand well.	5.20	1.25		0.51				
(3) Simple Cognitive Strategy Use	(7) When studying for the course, I read my class notes and the course readings over and over again.	5.10	1.29			0.54			0.79
	(8) When I study for the course, I go over my class notes and make an outline of important concepts.	5.07	1.29			0.83			
	(9) When reading for the class, I try to relate the material to what I already know.	5.28	1.21			0.45			
	(10) When I study for the course, I write brief summaries of the main ideas from the readings and my class notes.	4.84	1.39			0.55			
	(11) Whenever I read or hear an assertion or conclusion in the class, I think about possible alternatives.	4.85	1.22			0.32			
	(12) I make lists of important item for the course and memorize the lists.	4.84	1.38			0.73			
(4) Contact with Others	(13) I try to work with other students from the class to complete the course assignments.	4.14	1.68				0.88		0.67
	(14) When studying for the course, I often set aside time to discuss course material with a group of students from the class.	3.88	1.64				0.50		
	(15) I try to identify students in the class whom I can ask for help if necessary.	4.64	1.60				0.45		
(5) Academic Thinking	(16) When I study the readings for the course, I outline the material to help me organize my thoughts.	4.85	1.41					0.44	0.74
	(17) When reading for the course, I make up questions to help focus my reading.	4.74	1.35					0.44	
	(18) I often find myself questioning things I hear or read in the course to decide if I find them convincing.	4.37	1.04					0.58	
	(19) When a theory, interpretation, or conclusion is presented in class or in the readings, I try to decide if there is good supporting evidence.	4.79	1.14					0.47	
	(20) I treat the course material as a starting point and try to develop my own ideas about it.	4.88	1.33					0.48	
	(21) I try to think through a topic and decide what I am supposed to learn from it rather than just reading it over when studying for the course.	4.75	1.30					0.71	

online course for the challenge, curiosity, and mastery. They failed to distinguish between intrinsic goal orientation and task value that refer to learners' perception of the course regarding its interest and usefulness (Tong et al., 2020).

Self-regulated learning theories and cultural differences may explain the absence of intrinsic goal orientation found in this study. Theoretically, context or external evaluation also plays an essential role in developing and adapting learners' SRL competence (Efklides, 2011). Moreover, the extrinsic motivation that drives learners to study to achieve a goal or participate in a task has been found to promote their learning (Eisenberger and Cameron, 1996; Greene et al., 2004). From the perspective of culture, two-thirds of the participants are from Asia. They may grow up in societies pursuing goals set or approved by families (Yu and Yang, 1994). They are likely to choose to learn Chinese

language courses to fulfill their parents' expectations (Tang and Neber, 2008). Participation in learning online Chinese courses is also compelled by social reasons, such as receiving good grades, pleasing others, gaining approval, or earning social status, all of which are typical representations of extrinsic motivation (Wang and Lu, 2016). Social and familial influences may make Asian learners more external-goal-oriented (Tong et al., 2020). The lack of intrinsic goal orientation is also aligned with empirical results in cross-cultural validation between Chinese (Tong et al., 2020) and Pakistani (Nausheen, 2016) college students. More research is recommended to explore the constructs of online SRL with various populations.

The EFA analysis generated five factors for the learning strategies scale: time management, effort regulation, simple cognitive strategy use, contact with others, and academic

TABLE 3 | Correlation matrix of the SRL factors.

	EGO	TV	CLB	SLP	TA	TM	ER	SCSU	CO	AT
EGO	1.00									
TV	0.46**	1.00								
CLB	0.20**	0.45**	1.00							
SLP	0.38**	0.60**	0.34**	1.00						
TA	0.30**	0.07	0.11*	−0.07	1.00					
TM	0.10	0.41**	0.16**	0.24**	−0.13*	1.00				
ER	0.31**	0.57**	0.25**	0.43**	0.10*	0.39**	1.00			
SCSU	0.37**	0.56**	0.25**	0.42**	0.15**	0.28**	0.59**	1.00		
CO	0.29**	0.17**	0.08	.17**	0.17**	−0.06	0.16**	0.34**	1.00	
AT	0.37**	0.51**	0.23**	0.35**	0.10	0.20**	0.40**	0.64**	0.43**	1.00

EGO, extrinsic goal orientation; TV, task value; CLB, control for learning beliefs; SLP, self-efficacy for learning and performance; TA, test anxiety; TM, time management; ER, effort regulation; SCSU, simple cognitive strategy use; CO, contact with others; AT, academic thinking.
*p < 0.05, **p < 0.01.

thinking. The first difference is the split of time and effort management into two factors: time management and effort regulation. This result is similar to those studies reported among Spanish and Chinese learners (Ramírez Echeverry et al., 2016; Tong et al., 2020; Zhou and Wang, 2021). The online learners in this study consider the management of time and effort as two different resources. Ideally, learners should manage both resources properly. However, they may only use one of them appropriately. Online learners have the autonomy to manage learning time flexibly devoted to course learning (Kenner and Weinerman, 2011) or regulate their effort adaptably to learn better (Panadero, 2017). Notably, effort regulation is recognized as one of the most crucial SRL strategies for online learners (Kizilcec et al., 2017). In online learning, learners' persistence against distractions or obstacles when watching videos or working on tedious tasks leads to their success (Lee et al., 2019). Therefore, it is reasonable to separate factors. The result also supports the SRL theory of learners' effort to improve their learning (Panadero, 2017).

The second difference from the original scale is the absence of complex cognitive strategy use in this study. Items were scattered among effort regulation, simple cognitive strategy use, and academic thinking. The original factor of complex cognitive strategy use was not identified. Some items were loaded on other factors. The result supports Zhou and Wang's (2021) argument that cognitive strategy use is complex. It is challenging to distinguish complex cognitive strategies from other learning strategies, especially in relatively large samples in the online

context (Zhou and Wang, 2021). For example, one original item (i.e., 'I try to think through a topic and decide what I am supposed to learn from it rather than just reading it over when studying for this course') was loaded on the factor of academic thinking. This item focuses on critically evaluating the course material and using it as a beginning for intertwining the information with previous and common knowledge (Meijs et al., 2019). Such a statement does not seem to be a strong indicator of organizing or elaborating information. Therefore, it is reasonable to assign this item to academic thinking. The unidentified complex cognitive strategy use may also suggest that its components are separate and not based on a similar latent construct among international students in online Chinese language courses. The different factors of SRL that emerged in the study underline the importance of exploring the internal structure of SRL across cultural contexts and population.

Latent Profile Analysis

Latent profile analysis was conducted to address the second research question. The results indicated variability in the SRL of online learners within the same learning context. Three distinct profiles of online learners were found, namely, the *low*, *moderate*, and *high* SRL groups. Online learners who were assigned to the *high SRL* profile, which was the smallest profile group, showed higher scores for both the motivation and the learning strategies. The *post hoc* tests indicated that these online learners had significantly higher scores in all factors than those in the *low* and *moderate* profiles, except for Test Anxiety. Individuals in this profile had the high motivation and regulated their online learning strategically. Nearly half of the online learners were described as *moderate SRL*. Online learners in this group gave relatively average scores to the factors of motivation and learning strategies except for test anxiety and contact with others. They reported the lowest score on contact with others among the three profiles, implying they preferred studying independently to making contact with others. Over 30% of the participants in the sample were categorized into the *low SRL* profile. This finding indicated that quite some online learners were less motivated and applied learning strategies less frequently and effectively.

It should be noted that online learners across the three profiles gave relatively low ratings to items under the factor of test anxiety. It is reasonable that online learners in the *high SRL* profile have low test anxiety as they are highly motivated and capable of regulating their online learning process. The low anxiety toward assessment performance among the *low* and *moderate SRL* learners can be signs of apathy (Liu et al., 2014). Another plausible explanation is the differences in the test-delivery format.

TABLE 4 | Fit statistics for latent profile analysis.

Model	Profile size(n)	Free parameters	Entropy	AIC	BIC	SSA-BIC	VLMR-LRT (p)	LMRA-LRT (p)
2-profile	182/196	31	0.812	10478.12	10600.09	10501.74	<0.01	<0.01
3-profile	93/120/165	42	0.841	10280.45	10445.72	10312.47	<0.01	<0.01
4-profile	49/65/128/136	53	0.817	10198.88	10407.43	10239.27	0.493	0.499

AIC, Akaike's Information Criterion; BIC, Bayesian Information Criterion; SSA–BIC, sample size adjusted Bayesian Information Criteria; VLMR-LRT(p), p-values for the Vuong-Lo–Mendell–Rubin likelihood ratio test for K versus K- 1 profiles; LMRA-LRT (p), p-values Lo–Mendell–Rubin adjusted likelihood ratio test for K versus K-1 profiles.

Factor	Profile					
	Low SRL (*n* = 120)		Moderate SRL (*n* = 165)		High SRL (*n* = 93)	
	Mean	SD	Mean	SD	Mean	SD
(1) Extrinsic Goal Orientation	4.65	0.88	5.21	1.07	6.10	0.78
(2) Task Value	4.80	0.66	5.90	0.47	6.47	0.37
(3) Control for Learning Beliefs	4.19	1.23	5.15	1.21	5.68	1.12
(4) Self-Efficacy for Learning and Performance	4.27	0.78	5.24	0.85	5.92	0.79
(5) Test Anxiety	4.09	1.01	4.37	1.35	4.47	1.47
(6) Time Management	4.20	0.90	4.91	1.18	5.39	1.24
(7) Effort Regulation	4.52	0.73	5.73	0.68	6.32	0.52
(8) Simple Cognitive Strategy Use	4.19	0.53	4.95	0.65	6.13	0.51
(9) Contact with Others	3.94	0.95	3.92	1.28	5.10	1.22
(10) Academic Thinking	4.17	0.59	4.62	0.67	5.64	0.61

Online learners can take the tests almost anywhere they have electronic devices and internet connection. Thus, they can choose an environment less likely to evoke their anxiety experienced in the traditional classroom in the past (Stowell and Bennett, 2010). Taking the test online may also decrease the memory retrieval signals available to the online learners and thereby balance any performance improvement based on the context-dependent memory influence (Godden and Baddeley, 1975). Allowing students to control their test-taking environment may help learners reduce their test anxiety (Lazarus, 1999; Yang and Taylor, 2013). Apart from these possible explanations, it is possible that test anxiety in the online environment is associated with other variables, for example, students' perceptions of course difficulty in the online context (Neroni et al., 2019). Other influencing factors should be potential subjects of future research to explain the low test anxiety found among online learners.

Notably, compared with those in the *high SRL* group, learners in the *low* and *moderate SRL* groups rated significantly lower on contact with others. Unlike traditional face-to-face classroom learning, where students meet each other daily, online learning requires them to undertake extra actions to reach out to their peers or teachers (Meijs et al., 2019). Learners may be discouraged from seeking help in an online course because physical proximity to their teachers and classmates is limited (Yang and Taylor, 2013). Lane and Henson (2012) found that students in online classes reported less attachment to their classmates and university than did students who study in the traditional classroom. Especially for struggling learners, like those in the *low* and *moderate* SRL groups with low self-efficacy, they may be less likely to contact others for help when they do not believe that making the extra effort would lead to better performance (Roussel et al., 2011). The results are consistent with previous findings that low self-efficacy results in avoiding help-seeking, further inhibiting success (Roussel et al., 2011; Yang and Taylor, 2013).

The SRL profiles yielded in LPA underline the urgent need to promote SRL in online language courses as over 30% of the students in this study are categorized into the *low SRL* profile. The 30% share of low SRL learners may still underestimate the actual situation, as previous studies indicate that students were likely to overestimate their SRL behaviors in self-report questionnaires (Boekaerts and Corno, 2005; Heirweg et al., 2019). Prior research shows that SRL can be promoted in the traditional classroom context by implementing instructional skills (Perry et al., 2004; Dignath-van Ewijk et al., 2013; Dörrenbächer and Perels, 2016; Heirweg et al., 2019). For example, teachers may support students' SRL by using a cognitive strategy while verbalizing or describing the usefulness of a learning strategy while encouraging students to apply it (Perry et al., 2004; Heirweg et al., 2019). Since online learning is more complicated than traditional classroom learning, in which students receive less support and guidance from their teachers and peers, more intervention-based research is needed to explore how teachers can effectively implement their instruction to promote SRL in online Chinese language courses.

CONCLUSION

This study explored the SRL characteristics of international students in online CFL language courses in mainland China and further investigated the variability of these SRL characteristics using a person-centered perspective. The results showed five distinct factors for the scales of motivation and the learning strategies, respectively, supporting the context-dependent nature of SRL. Three groups of online learners were identified, indicating that not all online learners owned similar SRL characteristics, even from the same learning context.

Despite the significance of the findings in this study, two aspects may be optimized in future studies. First, the data are only collected through the self-reported SRL questionnaire. As the self-reported questionnaire usually depends on learners' general understanding of their behaviors, it tends to be memory distortions (Veenman, 2011). Future studies are recommended to combine the data collected from the self-reported questionnaire with other more objective data, such as interviews, peer ratings, or observations. Gaining more objective data allows for cross-validation of the findings of online learners' SRL behaviors in Chinese language courses. Second, two factors only have two items loaded and one factor has three items, which may

explain the low reliability of the respective factor. The limited number of indicators may be caused by removing items with low factor loadings (i.e., control of learning beliefs) and separating one factor into two (i.e., management of time and effort into factors of time management and effort regulation). Although these factors had high theoretical relevance themselves and showed relatively low and non-significant correlation with other factors, their reliability coefficients did not reach 0.70 and therefore, should be cautiously interpreted (Taber, 2018). Future studies are recommended to add more items to enrich these factors and further validate MSLQ among online learners. Third, online learners' general SRL characteristics in Chinese language courses are explored instead of specific courses. Different courses, focusing on different language skills, such as speaking, listening, or reading, may result in learners' various SRL behaviors (Duncan and McKeachie, 2005). It is better to measure online learners' SRL characteristics at a course level instead of a general level. At the same time, longitudinal research is needed to examine the influence of online SRL experiences on the participants' motivational sustainability and their language proficiency development (Gong et al., 2020d).

Despite these limitations, there are several implications for future research and Chinese language education. First, the motivation and learning strategies that emerged from online learners in this study contribute to understanding SRL in different contexts. Second, SRL training programs need to be tailored to different learners for online Chinese language education. Language teachers are recommended to pay attention to each group of learners' specific needs and design the programs to foster their SRL more effectively (Gong et al., 2020b, 2021b,c). Last, the accessibility and understanding of SRL theories can be advanced using a person-centered approach.

With the popularization and application of online language education in China, it is of great significance to understand how learners self-regulate their motivation and behaviors in the online learning context. This study provides a preliminary result concerning international students' SRL in the online Chinese language courses. Future research could investigate this group of learners' SRL alongside their academic performance to better understand the relationship between SRL and language achievement. Future studies may also compare the SRL characteristics of online learners and traditional learners in learning Chinese to explore possible models using MSLQ inventory across different learner groups.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Faculty of Education, The University of Hong Kong. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

LL conceived and designed the analysis, performed the data, and wrote the manuscript. YG revised the manuscript. NX collected the data and designed the analysis. All authors contributed to the article and approved the submitted version.

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APPENDIX

Appendix A | Participants by country.

Country	Frequency	Percent
Antiguan	1	0.3
Argentina	4	1.1
Armenia	3	0.8
Azerbaijan	1	0.3
Bangladesh	5	1.3
Belgium	1	0.3
Brazil	2	0.5
Burma	3	0.8
Cambodia	5	1.3
Chile	1	0.3
Cyprus	1	0.3
Ecuador	3	0.8
Egypt	9	2.4
El Salvador	1	0.3
Estonia	3	0.8
Fiji	1	0.3
France	2	0.5
Georgia	1	0.3
Guinea	1	0.3
Hungary	2	0.5
Indonesia	23	6.1
Italy	2	0.5
Japan	17	4.5
Kazakhstan	10	2.7
Korea	30	7.9
Kyrgyzstan	9	2.4
Laos	12	3.2
Madagascar	1	0.3
Malaysia	24	6.3
Mauritania	1	0.3
Mauritian	1	0.3

(Continued)

Appendix A | (Continued)

Country	Frequency	Percent
Mexico	3	0.8
Mongolia	5	1.3
Morocco	1	0.3
Mozambique	2	0.5
Myanmar	1	0.3
Nepal	5	1.3
Netherland	1	0.3
New Zealand	1	0.3
Nigeria	2	0.5
Pakistan	5	1.3
Peru	5	1.3
Philippines	9	2.4
Poland	1	0.3
Portugal	1	0.3
Romania	1	0.3
Russia	27	7.1
Rwanda	1	0.3
Singapore	1	0.3
Spain	2	0.5
Sri Lanka	2	0.5
Sudan	2	0.5
Syria	2	0.5
Tajikistan	8	2.1
Tanzania	1	0.3
Thailand	57	15.1
Turkey	3	0.8
Turkmenistan	2	0.5
Ugandan	1	0.3
Ukraine	12	3.2
United Kingdom	4	1.1
United States	4	1.1
Uzbekistan	8	2.1
Vietnam	17	4.5
Yemen	1	0.3
Total	**378**	**100.0**

Chinese Self, Australian Other: Chinese as a Foreign Language Teacher Identity Construction in Australian Contexts

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Research in the field of Chinese as a foreign language (CFL) education has been increasing in the past decades. However, the number of studies on CFL teacher identity is limited. To bridge the gap, this study employed a qualitative method to explore Chinese CFL teachers' identity formation and reformation in Australian contexts. A Chinese-Australian language program was studied to examine the challenges, struggles and developments of Chinese CFL teachers who came to Australia to pursue professional growth. Five Master's theses and three interview participants were included to paint a picture of how Chinese CFL teachers interact internally and externally with a new environment. Guided by Mead's theory of self and other, we found that Chinese CFL teachers' identity formation and reformation in Australian classrooms are deeply influenced by their self-identification and their integration with others in the community. Cultural connectedness is a key for organizational attitudes in the relationship of self and other. Chinese CFL teachers were found lacking the wholeness of self in Australian contexts, which led to obstacles in teacher identity construction. Insufficient communication between self and other resulted in their positioning crisis.

Keywords: CFL teachers, teacher identity, Chinese self, Australian other, social whole

INTRODUCTION

Internationalization in education has brought an increase in global teacher mobility (Sun, 2012). Chinese as a Foreign Language (CFL) education is one of the key sectors following the trend due to the growing demand for Chinese language education (Wang et al., 2013). Accordingly, there is a high demand for CFL teachers to satisfy the need. However, the fact is that "teacher shortage is one of the most significant challenges that policymakers have to face" (Ma et al., 2017, p. 824). Chinese native speakers are the main teacher force to satisfy the need. However, moving across cultures with divergent educational systems, CFL teachers face new problems and issues, which also offer chances for shaping them to become international language teachers. Professional identities and beliefs of foreign language teachers have been studied much in general, but not much attention has been paid to Chinese language teacher identity entering into Western educational contexts (Gao, 2010; Wang and Du, 2014). CFL teachers' professional identity issue is one of the key fields under-researched.

Chinese as a foreign language teachers play a vital role in the implementation of CFL curricula and improvement of the effectiveness of Chinese language teaching. Therefore, professional development should be a priority in CFL research (Gao et al., 2014). However, the fact is that there are insufficient studies on teacher development in the area. Gong et al. (2020) reviewed CFL literature published by leading journals in mainland China from 2014 to 2018 and revealed that only five out of 60 empirical studies focused on teacher development, mainly in university contexts on in-service teachers rather than pre-service teachers. Comparatively, international studies on CFL teacher development has been increasing since 2004, when the first Confucius Institute was established in South Korea. However, international publications in the CFL teacher development field are few despite an increasing number of studies on CFL education, focusing more on content teaching and learning (Pinyin for instance) as well as students' learning attitudes (Gong et al., 2018).

In Australia, CFL teachers have been in continuous demand, because the number of language learners has increased more than five times in the last 50 years and language accessibility is increasingly regarded as a factor for all-around development (Black et al., 2018). Communities are shifting from a traditional monolingual mindset to language-integrated education ideology (Fielding, 2016). Thus, many schools invest affluently in language promotion to satisfy the need and to foster globally competitive citizens. CFL learning has been soaring and ranks top five among foreign languages since 2015 (Orton, 2016). However, the need for CFL teachers cannot be met domestically. Fortunately, the burgeoning CFL market has driven vigorous development of teacher professionalization and mobility across cultures. CFL teachers from China meet part of the demand and become transnational language teachers, during which process their teacher identity has been shaped and reshaped mainly under the influence of divergent cultural factors. Against this background, it would be beneficial to investigate the roles that these transnational CFL teachers and others play in their construction of teacher identity in this unfamiliar cultural and educational context, which might offer a tiny hint to future CFL teacher education globally.

LITERATURE REVIEW

Theoretical Framework

Mead's self and other theory is the theoretical foundation of this study. While examining self, Mead (1934) suggested that it is something of a developmental characteristic. Resultant of social experiences and relations, the individual objectifies self to complete a reflexive conversation. By being an object to itself, self enters impersonal reasoning of communication. It is the sort of communication with significant symbols that features the engagement of not only others but also individuals themselves. Conversing with self about what others are saying, one develops awareness of what they are going to say. Self and other communicate dynamically by community norms. Instead of operating self to demonstrate individual differences,

recognizability of self is key for one to fit in and combine with other (Larrain and Haye, 2019). Ideological engagement occurs through the process of discourse where dialogical and dynamic meanings are communicated across boundaries. Mead and Deegan (2017) reported the role and value of self in social engagement and its positioning in education. Self-individuation takes on various forms with subjective agencies and objective consequences that lead to multiplicity of identity formation. Thibault (2019) coined the term "selving" to represent both entity and activity of self, indicating interdependent selves and multilateral influences.

In our mechanism, there is a tendency to view ourselves through others' perspectives and to address ourselves like others do (Mead, 1934). As a consequence, others' attitudes are taking over unconsciously and we use them in our actions. This is of great importance in the realization of self-consciousness. Different from animals that do not think from others' perspectives, we take in others' responses and make them our own experiences with specific meanings. Others' responses can be called as a stimulus for our acts. Mead termed the mechanism "thought" and insisted that controlling one's actions regarding others' participation is key for thought. Social processes that involve communications are responsible for the construction and development of new thoughts. Meaning, instead of consciousness conceived outside experience, exists entirely within social relations.

To understand one's position in a society, one needs to be viewed regarding both "I" and "me" (Mead, 1934). In preparation of "I" and "me," gestures arouse in individuals the attitudes of others; "The taking of all of those organized sets of attitudes gives him his 'me;' that is the self he is aware of" (Mead, 1934, p. 175). "Me" takes others' attitudes, knows the consequences of actions, and assumes responsibility for situations. "I," on the other hand, is the response one performs concerning the attitudes of others. Therefore, "I" and "me" are not in the same position, but they are parts of a whole. "I" reflects uncertainty and freedom, while "me" represents the organization of attitudes. They collectively form a personality in the process of social experience. The two different elements of self, "I" and "me," bring about novelty and conscious responsibility, respectively.

In the understanding of the development of self, several theories were proposed to approach different aspects of it. Positioning Theory (Davies and Harré, 1990) focused on intergroup interaction. Consistent with Montiel and De Guzman (2011), Davies and Harré recognized multifaceted selves and negotiation of positions. Dialogical Self Theory by Hermans (2001) emphasized psychological process while self assumes various positions. "I-positions" was studied to reveal linkages between self-internalization and societal progress. Three assumptions were made that contribute to the Position Exchange Theory (Gillespie and Martin, 2014): society has multiple positions (Durkheim, 2014), social positions contribute to different perspectives (Ross and Nisbett, 2011), and people move between positions (Dreier, 2009).

We take the attitudes of others in controlling our responses; thus, "The organized community or social group which gives to the individual his unity of self may be called 'the generalized

other"" (Mead, 1934, p. 154). To develop a full self, one must bring other's attitudes into oneself, bring social processes into one's experience, take the attitudes of all members of a social group toward others in the same group, take their attitudes toward social activities, and generalize all the attitudes as a whole to which actions are called for. In the process of attaining a complete self, the social whole is a prerequisite through which activities are organized about all individual attitudes. Generalized other, encompassing social processes and individual thinking, influences the conduct of each member in a society. Social bearings and systematic patterns are reflected in the building of self through other.

Targeting the understanding of cultural dialogue and its responsiveness toward social life, Bandlamudi (2015) found that the penetration of culture from within is believed to influence the achievement and multiplicity of "outsideness." Self-consciousness and self-organization (Friston, 2018) were also important in explaining the generation and recognition of changes in environments and the awareness of the ever-changing self. Body movement in society and accumulated experience were studied about integrated mind and mediation of movement (Wagoner et al., 2015) where body and mind took contextual shapes and interacted in different positions.

Moving to a foreign society, language teachers have to adapt to the new environment in which self and other collaboratively contribute to the formation of their new identity. By this theoretical guidance, we intend to explore the value of CFL teachers' self-identification and factors that impact it. To understand who they are and how they work, the individual and social identities they are assigned have to be accounted for. Transformative as these identities are (Weedon, 1987; Sarup, 1996), negotiations of identity across contexts define the formation and development of language teachers' core identity, the one at play for self-identification.

Teacher Identity

Teacher identity has been widely regarded as an important factor that influences the way teachers view themselves and, to a large extent, how they interact with students. It is and could be shaped and reshaped under the impact of various factors and in different contexts (Beauchamp and Thomas, 2009). Global mindset and intercultural capability play an important role in shaping language teacher identity (Neilsen and Weinmann, 2020). Based on Australian pre-service teacher programs to Chile, Neilsen and Weinmann demonstrated the role that teacher identity plays in responding to the diversity of multicultural classrooms; specifically, self-examination in the context of social, economic, and political similarities and differences impacts how they teach, and mutual in-depth understanding was believed to be a key for connecting the unfamiliar with the familiar. Thus, self-critical examination was promoted to increase intercultural capabilities and decrease biases, since the distance between self and other was not only geographical separation but also identity difference.

Administrative management and professional learning could also shape and reshape teacher identity. Bradford and Braaten (2018) investigated teacher evaluation processes and their impact on teacher identity, and found that rigid evaluation activities with bureaucratic agendas deteriorated teacher identity rather than facilitated professional growth: teachers who were consistently challenged to meet systematic orientations would experience demoralization. Teachers' vision of high-quality teaching was part of their understanding of teacher identity, which contributed to professional practice and learning. If measurement tools fail to authentically reflect the diversity of teacher identity, they would produce biased information; thus, the degree of inclusiveness in the evaluation system is a key factor that defines the recognition and construction of teacher identity.

Identity could be shaped by recipients and contextual factors. Teacher identity, thus, is closely related to students and environments. From a sociological point of view, Miller (2009) pointed out that teacher identity must be accounted for with consideration of such factors as the discourse in self-representation and sociocultural contexts, which is consistent with Gee and Gee (2007) opinion that "it's not what you say or even how you say it, it is who you are and what you are doing while you say it" (p. 3). Students' degree in accepting or denying a teacher's message could shape a teacher's identity; contextual factors like workplace conditions, social demographics, curricula, and resources are also believed to play a powerful part in constructing teacher identity. Negotiation with these factors, thus, has been regarded as a transformational interaction that enables the systematic development of teacher identity. The shifting of focus from internal psychological process to external social communication reflects the practicality and malleability of identity in incorporating with varied subjects.

As for language teacher identity, Duff and Uchida (1997) noted:

> Language teachers and students in any setting naturally represent a wide array of social and cultural roles and identities: as teachers or students, as gendered and cultured individuals, as expatriates or nationals, as native speakers or non-native speakers, as content-area or TESL/English language specialists, as individuals with political convictions, and as members of families, organizations, and society at large (p. 451).

Positioning of self and other in a complex social and cultural context is crucial for language teachers, because it involves power relationships and mainstream discourses that determine the legitimacy of their languages and teaching. This is in agreement with Peirce's (1995) notion that identity is a site of struggle, which changes continuously.

Chinese as a Foreign Language Teacher Identity

Divergent, if not contradictory, findings have been revealed in the field of CFL teacher identity studies in cross-cultural contexts. Some find that CFL teachers are impacted strongly by Chinese educational culture situating in a cross-cultural context, and have reported that under the influence of Confucianism their professional identities tend to be authoritarian and teacher-centered (Pratt et al., 1999; Moloney and Xu, 2015; Han and Han, 2019). While others report that transferring to another culture has resulted in CFL teachers' transformation

of professional identity from "a sage on the stage" to "a guide by the side" considering to cater students' needs. However, this transformation did not bring good effects and put CFL teachers in a dilemma and self-questioning (Han et al., 2019). Wang and Du (2014) studied immigrant Chinese teachers' professional identity transformation in an intercultural context (Danish) and found that the professional identity of Chinese teachers is shaped both by their previous experiences of teacher-student relationship in the Chinese culture and their new experience as teachers in the Danish culture.

Pedagogical and linguistic authority is an important theme in the study on CFL teacher identity. The interactions between native resources, such as Chinese textbooks and interests of new learners, reflect the negotiation of education systems (Li, 2016). Old-fashioned teachers, referring to those with the identity of traditional methods and values, need innovation through which new learners of no cultural familiarity can establish connectedness. In the understanding of self in new contexts, CFL teachers adapt pedagogically to fulfill roles and goals. Intercultural similarities and differences have to be viewed with an open mindset so that CFL teacher identity and learner identity contribute to each other's growth, as Ma (2014) pointed out that "The purpose of learning about and from each other is not to lose one's own identity or just to become the other" (p. 173). CFL education in Australia has been growing and becoming more diversified (Moloney and Xu, 2015); thus, there is no longer a fixed role for CFL teachers to play or a defined parameter on how Chinese is to be taught.

Teacher identity was identified as one of the key factors impacting CFL pedagogy in a book concentrating on exploration of innovative CFL pedagogy edited by Moloney and Xu (2016). In her chapter, Wang (2016) contended that CFL teachers need to develop their identity beyond school to see the relationship between Chinese and Australian societies, which is the basis for cultivating their students to gain learner autonomy beyond the classroom and to be life-long learners. Following the same path, Tsung and Hooper (2016) found that Chinese native speakers' social network in Australia plays a major role in the development of linguistic competence and confidence. It is, therefore, reasonable to believe that CFL teachers' social identity in Australian contexts contributes to their professional identity. Diaz (2016) approached teacher identity from the perspective of teaching resources and stressed the importance of active implementation in the selection and adaption of resources according to their availability, suitability, and readiness. Teacher identity in this respect includes the competence from decision-making to bridging resource gaps, which can also be viewed as the representation of one culture to approach another. In Tasker's (2016) chapter, CFL teachers' technological identity was discussed. Their innovative pedagogies and technological beliefs enable collaborations and flexibilities of a wider range than traditional teaching. Effective engagement of technology in the Australian universities promoted attendance, teamwork, and independent learning of CFL. Zhen Li, through conducting a life-history narrative study of three CFL teachers who had over 20 years teaching experience, found that successful teacher identity construction in Western-based school contexts requires

"an effective blend of Eastern and Western cultural values and pedagogical practices" (2016, p. 177).

As a country of diverse cultural backgrounds, Australia has witnessed the complexity of teacher identity interaction and transformation. CFL teachers, as one of the groups, are situated in the context of multilateral negotiations of power relations and language ideologies (Moloney and Xu, 2015). Understanding of them and their teaching requires systematic comprehension of their experience. Previous studies have revealed cultural influence on CFL teachers' professional identity where experiences from both cultures play a role in the development of their understanding of the relationship. However, there was no specific mention of how diverse cultural elements interact with one another in the formation of new subjectivity and why individuals' sense of unity influences their behavioral tendency. Former studies also covered CFL teachers' negotiation with foreign education systems and their identity diversification. While CFL teachers have been researched widely about how they learn to teach in foreign environments, little has been done to research CFL teachers' sense of belonging and its impact on their teaching. CFL teachers' confidence has been studied in such areas as social network and learner autonomy; however, purposeful conversation between CFL teachers and their colleagues has not received study in depth. Therefore, we would like to argue that research in CFL teachers' social organization of self is lacking in the field, leading to insufficient understanding of their struggles of positioning in cross-cultural contexts and identity construction and crisis. This study aims to add to the knowledge of how CFL student-teachers of Chinese background shape and reshape their professional identity in Australian contexts and its theoretical implications of self and other.

MATERIALS AND METHODS

Program Setting

A Chinese-Australian bilateral provincial program is the focus of this study. Each year, a group of graduates (around 10) from Chinese universities (mostly in the same province due to the local government's promotion of the program) is recruited to come to Sydney pursuing a Master's degree in Education. Research-based as it is, the 2-year study includes practices of teaching Chinese in Western Sydney primary and secondary schools. As a start of the program, the graduates, who predominantly majored in Teaching Chinese as a Foreign Language and English as a Foreign Language (the English degree in Chinese universities refers to learning English language and culture as a major), need to take up International English Language Test System (IELTS), designed by the University of Cambridge and measures a person's ability to listen, speak, read, and write English at the level that is necessary to go to universities mainly in Britain, Australia, Canada, and New Zealand where English is the native language, to ensure a reasonable English proficiency. There is a series of workshops to inform the candidates of Australian culture and potential environments. After arriving at the university in Sydney, the CFL teacher candidates undertake another series of workshops where teaching and culture are specified regarding local schools.

Allocation to schools was random, depending partially on accommodation distance and transportation availability.

Data Collection and Analysis

Eight participants of this study were from the above-mentioned program. Five of them are indirect participants, which means they did not participate in the study in person; instead, their reflective journals from their theses are resorted to as research data for this study. The other three participants, two males and one female, were involved in this study in person, from whom interview data were collected. One interviewee was enrolled in 2016 and the other two in 2017. They volunteered to participate in this study and liked to share their experiences. Formal consent forms were signed by the three interview participants.

Data for this study cover both theses data and interview data, which contribute to data triangulation (Maxwell, 2008). As for the theses data, the authors went through a total 17 theses of the program between 2013 and 2017 (the recent 5 years when data for this study were collected) and selected five of them with reflective journals that were most relevant to the focus of the study (one in 2013, one in 2015, and three in 2016). In terms of interview data, one author conducted all the semi-structured interviews in 2018, while the other author collated transcripts. Face-to-face interviews were employed in Chinese, as both the interviewer and the interviewees are native Chinese speakers. Terms, such as "different," "respect," "authority," and "manage," were frequently used in conversations. Each participant was interviewed twice with a 2-week gap, and each session lasted 50–70 min, totaling 372 mins.

The reason why there was a gap between interview and reflective journal data sources is that the CFL teachers who wrote the reflective journals in their theses had graduated and went back to China while the data for this study were being collected; the interview data came from another three participants from the same program who were conducting their CFL teaching and studying at the time and, thus, were available for interview participation. It is believed that this gap would not harm the reliability and validity of the study, because the same linguistic and cultural backgrounds they come from and the same linguistic and cultural contexts they enter into would bring them similar experiences and issues. The quotes demonstrated in the "Findings" section were both from reflective journals in their theses and interviews, with the interview data marked.

As a source of data, all the self-reflective journals in the CFL teachers' thesis between 2013 and 2017 were resorted first as a general pool for consistency and randomness. It is noteworthy that only a few of them mentioned their struggles extensively as they were not the focus of their study. Accounts from candidates C1 to C5 were organized according to relevance toward the Chinese self, Australian student, and Australian environment (see **Table 1** with key ideas from the theses). These are the variances manageable for the communication of two cultures and the basis of our organizational coding (Maxwell, 2008). Further elaboration of the organizational concepts (Richards and Morse, 2007) brought us to substantive implications of underlying themes that govern the direction of social interactions. After several

TABLE 1 | Data coding (theses data).

Substantive implications	Organizational concepts (needs/strategies)	Key ideas
Learn Australian culture	Change Chinese self	● China and Australia were totally different (C2)
		● My pronunciation mistake caused a lot of misbehavior (C3)
		● Grammatical mistakes in the classroom instruction languages (C3)
		● I felt depressed and wanted to quit (C5)
		● I was afraid to give instructions (C5)
		● I was influenced by Chinese belief (C5)
		● I felt I was not a real teacher (C5)
		● My authority was ruined (C5)
		● I didn't receive automatic respect (C1)
		● I doubted myself (C5)
		● I had never gained power in their eyes (C5)
		● I wanted to stand up and shout "get out of the door" (C1)
		● No hierarchy between teachers and students (C1)
		● Not sure if I should ignore it (misbehavior) (C1)
		● I was confused what instructive words to use (C1)
		● Cultural shock (C1)
Enforce Chinese culture	Change students	● They are not interested at all (C4)
		● They ignored my instruction (C5)
		● How could they be so rude (C5)
		● Totally out of control (C5)
		● They ignored me (C5)
		● No students greeting (C1)
		● No automatic respect (C1)
		● Whisper and distraction never ended (C5)
		● They were too noisy (C5)
		● Laughed with other students and talked without my permission (C5)
		● Students lost patience (C1)
Connect the two cultures	Change environments	● Without class teacher, I had to lift my voice (C5)
		● Classroom teacher took over the class (C4)
		● It's like a vicious circle (C5)
		● Shocking classroom (C1)
		● Classroom environment not satisfying (C1)
		● Did not have positive classroom atmosphere (C1)

rounds of discussion between the authors, it was believed that the prioritization of culture was key to self-identification and relationship with others; teaching skills played a conducive role as well. In the process of data organization, patterns emerged, and structures formed for themes and concepts to

be further explained. The coding structure demonstrated not only categorical but also hierarchical connectedness. Self, other, and intercultural positionings were aligned dialogically with consideration of context and agency. How does Chinese thinking work in CFL teachers' Australian teaching and how, in turn, understanding others in Australian contexts works for their Chinese thinking were the practical questions that we need to answer for our research questions. Here, Chinese thinking refers to CFL teachers' internalized Chinese culture and its way to respond to other.

Research Questions

To understand the dynamics related to the establishment of CFL teacher identity from the perspectives of self and other in Australian schools, this study targets the following research questions:

(1) What role does CFL teachers' Chinese self play in the formation of their Australian teacher identity?
(2) How do social relations with Australian other affect CFL teacher identity?
(3) How to negotiate between self and other in Australian contexts for CFL teachers to develop a favorable teacher identity?

FINDINGS

Based on categorizations and connections of data, the findings of this study were structured into three sections to display the meaning of self-other relationship to CFL teachers in Australian classrooms, variant factors that contribute to different identities, and implications as well as results of different approaches.

Self: Chinese Ideology That Impacts CFL Teacher Identity Construction

Chinese self refers to the self developed in China over time as the CFL teachers experienced the social network there. "Both subject and object" (Mead, 1934, p. 137), their Chinese self is a collection of social rules and interpersonal processes in which Chinese culture and customs are embedded. When exposed to Australian social structure and relationships, they experienced discomfort and disconnectedness to which most people referred as "culture shock."

> I remember I had to work hard and listen to the teachers when I was a student. Therefore, it is to me that that should be the norm of the teacher-student relationship. It is in my culture. But I found students here wouldn't care that much about you. In this culture, students do not listen to what you say. They do whatever they like and that causes conflicts. I feel I'm not a real teacher here (T1, interview data).

"Culture" was T1's keyword in describing troubles and his teacher identity was severely compromised. Consistent with the theses data key ideas (e.g., "I had no power" and "I felt I was not a teacher"), different attitudes from Australian students have caused issues on self-communication. The self they acquired from

China in understanding education was that students need to show respect to teachers and that teachers possess unconditional authority. Although the CFL teachers were informed about the cultural differences beforehand, no one expected the reality to be "so bad" (T3) and it "hurts" (T1). All the participants mentioned the title "teacher" should at least have a certain meaning to students rather than being treated as "nothing" (T2). T2 viewed the cultural clash in a positive sense and took it as a chance to learn Australian culture. He thought it was fine to start from "zero" and believed in his "adaptability." T1 said he did not feel good being a teacher in Australia and would look for other professions. He was weary of "surviving" when "so much have been paid" to be a teacher. T3 did not feel as bad because she had "low expectations" for both herself and the students from the beginning. There was no need for Australian teacher identity and her aim was to "survive."

> I might not be respected; so what? I don't really care about it that much. This is a journey to experience something and I want things to be natural. My goal is to finish the degree. When I go back to China, students there will respect me anyway (T3, interview data).

Other: Australian Factors That Contribute to Chinese as a Foreign Language Teacher Identity Formation

Students were regarded as the key "problem" (T1) that "burned" (T2) the CFL teachers out. As a major determinant of the CFL teacher's Australian "me," they displayed different ways through which teacher identity could be shaped. While "no respect" was the main concern of all the CFL teachers, they have different views toward it. These data mostly revealed frustration from gauging students with Chinese standards (e.g., "no greetings" and "ignored me" indicated in **Table 1**), while the interviews captured more subtleties. T3 believed students not only care less about her and Chinese but also "hate" school. She observed other classes and concluded that "that's just how it is." Some students "set up limits of what they are willing to do" (T2) and it challenged the CFL teachers' ability to engage and interact. T1 was thrilled that his "silly joke worked, and the lesson went pretty good." He prepared more interesting "stuff" and learned how to offer more variety. However, English was always a challenge for him both in giving instruction and random communication. T2 approached the students differently, although he also considered his English "not enough." He worked on improving himself with challenges and wished to "make a change." His goal was to go back to China and teach English in high school, so he valued this "opportunity" deeply and wanted to "learn something to bring back there." T2 observed local teachers' lessons and realized "their English was not complicated at all but very smooth, so it's more of how you use it." He admitted, "a lot of time was used on copying other teachers' classroom language and try them in my lesson."

> We are not going to be speaking English as well as them [class teacher], at least not at the moment, but I do think there is more than that [English struggles for teaching]. Maybe we can change them [students] if we are good enough [as a teacher] (T2, interview data).

Another interesting issue discovered in the process of the interview was that mentor teachers/supervisors played an important role in the CFL teachers' connection to Australian culture, especially about schooling. As mentioned once in these data, mentors seemed invisible in the CFL teachers' life, so we focused on them during the interviews. While T3 said her mentor was a "happy person" and "pretty helpful" in giving her some advice, T1 and T2 believed their mentors were "not that helpful." They viewed the mentors as their "teachers" and were hesitant to talk about their problems. They thought it was from their culture that "mentors are our teacher and should be respected." "The respect means no questioning even when things are not that great" (T2). "Personality" was mentioned as a key that "makes difference" (T1).

> I know this sounds harsh but to be honest, we do not connect. She [my mentor]is very busy and I understand that, but since she is a mentor, doesn't she think there's a role to play? I feel that she was waiting for me to ask questions; I was too shy. Anyway, maybe I'm overthinking (T1, interview data).

> Well, she doesn't know much about Chinese, and I don't know what's going on here, so we don't know what to talk about. There are conversations now and then but not that much (T2, interview data).

Environment: Contextual Impact Factors for Chinese as a Foreign Language Teacher's Identification

While intrapersonal and interpersonal factors were essential for the construct of CFL teacher identity, environmental elements also played in the self-other interaction. Both theses data and interviews revealed the forms of environment and corresponding influences. There was a mention about learning atmosphere as well as resource issues in theses data. "Not satisfying" was the keyword that indicated environmental challenges. Interviewees mentioned "lack of academic" (T1) and "low level of persistence" (T2). The overall learning culture was "unsatisfactory" (T2), and Chinese learning was "the worst" (T3).

> A student was silly, and I got angry. Instead of helping me to manage him, the class teacher said, "he's low and sometimes acts like that to me too." I didn't argue with her, but definitely that's an excuse. Well, others were not much better (T2, interview data).

> I heard students say, "no one likes this subject" or "I'd rather stay home." They don't see the point of school (T1, interview data).

Lack of resources was another issue that reflected contextual challenges. T1 said he could not find anything from the school library for language learning and everything was designed from scratch. T3 mentioned the amount of money she spent on materials and equipment. While T2 supported the idea that "no textbook means flexibility for teachers," he argued that "there should be a pool available to choose from."

> I would give CFL teachers something and let them try and see what materials are contributing to what skills of students. Then we can build on that and make adjustments. Records should be kept of what is useful (T2, interview data).

DISCUSSION

Drawing on theses of 5 years and interviews of three participants of the CFL program, the foregoing part offered a picture of CFL teachers' construction of teacher identity in Australian contexts. Although the sample size is limited, this study reveals a new angle to approach existing issues. On the whole, our findings support the existing literature (e.g., Chen, 2015; Moloney and Xu, 2015; Han et al., 2019; Han and Han, 2019) that CFL teachers experience various challenges while teaching in foreign contexts, and that their institutional life and teacher identity have to be reorganized according to new social norms. However, instead of examining external factors, such as social environment, pedagogy, and curriculum, we delved into CFL teachers' internal operation of social interaction and found divergences of self and other in CFL teacher identity development in Australia, which not only includes objective relational process between individuals but also ideological and axiological factors that influence the wholeness of CFL teachers. Such finding has not been explored in depth by previous studies.

In searching for answers to our first research question, CFL teachers' cultural identity stands out and poses questions of self-other interactions interculturally. First, CFL teachers are equipped with Chinese self that they acquired over the years from social networks in China. The self is a collection of social processes of Chinese characteristics. Viewing Australian students from the Chinese self, CFL teachers may think they are not respected when students do not greet them. There was a mention of "no greeting" (C1) and "ignoring" (C5) in theses data. Such desire for "automatic respect" (C1) comes from the Chinese self where Chinese students' attitudes to teachers formed the "me" (Mead, 1934; Chen, 2015). Another problem for the CFL teachers is their "authority issue" (T1, C5) that derives from and contributes to their teacher identity (Walkington, 2005; Pinter, 2017). T3 believes authority means "control students' behavior,", while T1 thinks "it reflects how much are taught.". Their English proficiency is a major concern both for class management and learning instruction (Varghese, 2000; Orton, 2016). T1 and T3 struggle to express themselves comprehensively in giving instructions, while T2 focuses on what to say to manage students effectively. This is consistent with the theses data [e.g., "My pronunciation mistake caused a lot of misbehavior" (C3); "I was afraid to give instructions" (C5)]. We then conclude that requirement for Australian students to change their "me" according to CFL teacher's attitudes of "respect" is not practical, and that expectation of it may lead to dissatisfaction or even frustration (Mead, 1934; Chen, 2015; Orton, 2016).

Most CFL teachers choose to adapt to the Australian culture by changing the self, while T2 wants to change other as well. He believes students' attitudes toward him as a CFL teacher are manageable and it is part of his "mission." As a "significant symbol," language (English) enables adjustments (Mead, 1934). T1 and T3 target class teachers' fluency and accent, which cause them distress and hopelessness. T1 wonders how he can be as "native" as class teachers with "perfect English," while T3 thinks she "just cannot do it." T2 focuses on what he needs for particular purposes and improves his English through "copying

what they say and adapting to what I need." He finds the class teachers' English was "not hard in vocabulary or grammar," so he takes notes and prepares his Chinese lessons with them, and "it helped a lot." This reflects CFL teachers' growth-mindset for improvement and intercultural sensitivity to discern where and how to improve (Jin, 2017; Dweck and Yeager, 2019). Therefore, it is safe to say that setting an achievable target in "me" is important for the establishment of the teacher identity of CFL teachers.

Adding to previous studies on mentor teachers' contribution to CFL teachers' growth (Lai et al., 2015; Wang and Bale, 2019), we find that systematic communication can be lacking because of different backgrounds. T2 reveals that the mentors of the program are Australian teachers who do not know much about Chinese culture, and that he does not know much about Australia. "Having little to talk about" leaves him to struggle to "fit in," and he admits his personality is "not that open to initiate." T1 worries about his accent although hopes to talk more with his mentor. Such a gap can be bridged by mentors if they know what their mentees need. T3's mentor is too busy to be found and talk with, which she thinks reduces connectedness. Interestingly, all the three participants, while possessing questions about their mentor, take them as their "teacher" and show "unconditional respect." As part of Chinese culture, the self disallows them to respond to mentors with "questioning attitudes" (T2), which leads to a gap of understanding and needs unmet.

The second research question brings us to the functional side of social relationships. In order to have a "complete self," CFL teachers need "various aspects of the structure of the social process as a whole" (Mead, 1934, p. 144). Lack of interaction with mentors, colleagues, and students leads to insufficient understanding of collective attitudes in contexts. The incomplete self causes confidence issues in teacher identity and limits self-identification (Neilsen and Weinmann, 2020). When the CFL teachers "don't know what to do with students" (T3) or "wanted to stand up and shout 'get out of the door'" (C1), it is the lacking of "reference to the community" (Mead, 1934, p. 142) that disables them. They need a new self that is responsible for social reactions and relationships as "we are one thing to one man and another thing to another" (Mead, 1934, p. 142). Therefore, Australian other provides a new self for CFL teachers to know their audience and how to teach.

Finally, in searching for ways to negotiate between the Chinese self and the Australian other to develop teacher identity, we find that the CFL teachers struggle mostly with acquiring a new self to connect with the new environment. While English proficiency is a major challenge mentioned across the theses and interviews, "purposeful contextual improvement" (T2) seems more achievable and beneficial than trying to be "as local as class teachers" (T1), which may cause distress. Understanding what to use in specific situations allows CFL teachers' appropriate me to respond to other. Instead of struggling to change accent and fluency, the focus should be on the practical function of English in expressing the Chinese self. Using appropriate English for the communication of Chinese cultural identity is crucial for the construct of teacher identity. Therefore,

although English proficiency is key for communication, a specific selection of areas to improve defines the progress of self-identification. CFL teachers' mindset is also integral for the shaping of their identity (Dweck and Yeager, 2019), as the cases of T2 (growth-mindset of self-development in challenges) and T3 (fixed mindset of validating her low ability and avoiding challenges) attested to.

CONCLUSION

This study examines new CFL teacher identity transformation in Australian contexts and factors that lead to various forms of self-other relationships. Coming from Chinese culture and social relationships, the CFL teachers' Chinese self dominates the way they respond to the new environment. When looking for the Chinese type of respect from Australian students, the Chinese self is not satisfied, and discomfort arises. To connect with the new other, understanding of self is a prerequisite to having proper positioning. Culture shock in this sense is the result of self-other mispositioning. The desire for "unconditional respect" (T3) from the Chinese self is adjusted to "earned respect" (T2), and Australian students' attitudes toward teachers reshape the "me" of the Chinese self. Furthermore, the relationship between other teachers and students also contributes to the self of CFL teachers, as "me" is a collection of organizational attitudes. Lack of communication with other teachers has not only given the CFL teachers a sense of disconnectedness but has also led to lack of information on how students are viewed and treated in specific contexts.

When approaching Australian other, English was a challenge to the CFL teachers, although they had an English-related degree and sat English tests for the program. Lack of practical use of English leads to confidence issues such as "don't know what to do" and "afraid of giving instruction" (theses data). Mentor's help and CFL teacher's growth-mindset are important in facing this challenge, which may benefit both CFL teacher's English skills and student's learning. Another finding is that CFL teachers are shy to seek help even when they know that it is needed. This cultural presentation of Chinese self limits CFL teacher identity development. On this point, we suggest different sessions for programs and the like to explore intercultural communication needs both inside and outside of classrooms and find ways to promote proactiveness of all parties.

Limitations of this study should be highlighted on two fronts: first, the small-scale research focuses on the need of new CFL teachers in Australian schools for identity construction based on a self-other relationship without consideration of personality, which could be a factor influencing self; second, there is a gap between the theses data and interview data, because identity issue is rarely discussed in depth in the former. We suggest that future research should have more CFL teachers included and take their individualities into account for a more comprehensive picture of this issue. Moreover, it is also advisable to look into CFL teachers' personalities in the future regarding their identity formation.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Western Sydney University Ethics Committee. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

Both authors listed have made a substantial, direct, and intellectual contribution to the work, and approved it for publication.

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Language Interfaces in Adult Heritage Language Acquisition: A Study on Encoding of Nominal Reference in Mandarin Chinese as a Heritage Language

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According to the Interface Hypothesis in the field of bilingualism, the interface connecting a linguistic module with a language-external domain (e.g., syntax-discourse) will present prolonged difficulties for adult bilingual learners, as compared with the interface connecting language-internal modules (e.g., syntax-semantics). This study tested whether the Interface Hypothesis is applicable to the acquisition of Mandarin Chinese as a heritage language. An internet-based acceptability judgment task (AJT) was administered to 58 advanced and intermediate adult Chinese heritage speakers to collect data in accuracy and reaction time to investigate the adult heritage speakers' mastery of referential nominal expressions regulated at the syntax-semantics and syntax-discourse interfaces, respectively, in Mandarin Chinese. The target linguistic phenomena involved three nominal expressions (i.e., the bare N(oun), the [Cl(assifier)-N], and the [Num(eral)-Cl-N]) under four interface-regulated referential readings (i.e., type-denoting, quantity-denoting, indefinite individual-denoting, and definite individual-denoting). In terms of accuracy, the results showed that (i) for the N and the [Num-Cl-N], regardless of the interface type, the advanced group acquired the target phenomena to a nativelike level, who significantly outperformed the intermediate group; (ii) for the [Cl-N], the advanced group exhibited nativelike attainment at the syntax-discourse interface but not at the syntax-semantics interface, and performed significantly better than the intermediate group at both interfaces. Regarding reaction time, no significant differences were reported between the advanced group and the native group for the target structures at either the syntax-semantics or the syntax-discourse interface, while the advanced group performed significantly better than the intermediate group, regardless of the interface type and the structure type. The findings suggest that the nature of the language interface, i.e., whether it pertains to language-external domains

(i.e., the external interface) or not (i.e., the internal interface), should not be a reliable factor for predicting the (im)possibility of nativelike attainment of bilingual grammar knowledge, contra the predictions of the Interface Hypothesis. The present study provides new empirical evidence to show that language-external interface properties are not necessarily destined for prolonged difficulties in heritage language acquisition, and that it is possible for adult heritage speakers to make developmental progress in both accuracy and processing efficiency at different types of interfaces.

Keywords: heritage language, Interface Hypothesis, syntax-semantics/syntax-discourse interface, nominal reference, Mandarin Chinese

INTRODUCTION

In the field of bilingualism research under the generative linguistic framework, an issue that has been of immense scholarly interest in the past decade is the discrepancy of learning difficulties exhibited by different linguistic modules. To account for the patterns of non-convergence and residual optionality shown by bilinguals, an influential hypothesis, i.e., the Interface Hypothesis (IH hereafter), is proposed in the literature. The IH was first put forth to explain the non-nativelike attainment at the end stage of adult second language (L2) acquisition, which claimed that the language structures involving an interface between syntax and other domains would exhibit persistent vulnerability as compared with those involving purely syntactic properties (i.e., the so-called "narrow syntax") (Sorace, 2000, 2005; Sorace and Filiaci, 2006; Belletti et al., 2007). A later version of the IH makes an internal vs. external interface distinction, predicting that adult L2 learners may eventually achieve nativelike acquisition at the internal interface, i.e., the interface connecting language-internal modules, such as syntax-semantics, whereas there will be prolonged optionality for adult L2 learners at the external interface, i.e., the interface connecting a linguistic module with a language-external domain, such as syntax-discourse (Tsimpli and Sorace, 2006; Sorace and Serratrice, 2009; White, 2011).[1]

In addition to the advanced stage of adult L2 acquisition, the IH has also been extended to early bilingual first language

(L1) acquisition and the early stage of L1 attrition [See Sorace (2011) and the references therein], and later to heritage language acquisition (e.g., Lardiere, 2011; Montrul and Polinsky, 2011; White, 2011).[2] As such, currently, the IH provides a unifying framework for bilingual language acquisition. While the IH has generated a fruitful body of empirical research in the field of bilingualism, the results obtained so far were highly mixed, with some studies verifying the IH whereas others not, no matter for the much-studied area of L2 acquisition at interfaces or for the lately emerging area concerning heritage language acquisition at interfaces. The present study will contribute to the ongoing debate on the IH *via* presenting new evidence from the perspective of adult heritage speakers' acquisition of interface-regulated referential nominal expressions in Mandarin Chinese as a heritage language, which remains an under-explored area in the prior studies.

To begin with, a brief introduction to the definitions of "heritage speakers" and "heritage languages" is warranted. By "heritage speakers," it means bilingual speakers who grow up in an asymmetrical bilingual environment where the language spoken at home, i.e., the heritage language, is not the dominant language of the society, i.e., the societal language (Montrul, 2008, 2016; Rothman, 2009). Heritage speakers are early bilinguals

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[1]Take the word order of prenominal modifiers in the numeral classifier construction in Mandarin Chinese to illustrate interface phenomena. Generally, a modifier that denotes a stable, non-episodic property of the modified noun can only occur in between [Num-Cl] and the head noun but cannot precede the [Num-Cl] sequence in Mandarin Chinese, a restriction applied at the syntax-semantics interface, as shown in (i) below.

(i) a. yi   ge   chang-toufa de   nüsheng
        one   CL   long-hair   DE   girl
        "a long-haired girl"

    b. *chang-toufa de   yi   ge   nüsheng
        long-hair   DE   one   CL   girl
        Intended: "a long-haired girl"

However, such a restriction can be overridden at the syntax-discourse interface: a modifier denoting a stable, non-episodic property of the modified can be allowed to appear in front of [Num-Cl] if the modifier is associated with a contrastive focus reading (Jin, 2020). As exemplified in (ii) below [adapted from Jin (2020)], when there are three long-haired girls that

contextually receive a contrastive focus (i.e., contrasting with the two short-haired girls), the modifier *chang toufa de* "long-haired" can precede the [Num-Cl] sequence.

(ii) Context: A and B just passed by five girls, three with long hairs and two with short hairs.

A: ni   renshi   zhe   wu   ge
    you   know   this   five   CL
    nüsheng ma?
    girl   Q
    "Do you know these five girls?"

B: wo   renshi   chang-toufa de   san   ge   nüsheng,
    I   know   long-hair   DE   three CL   girl
    dan   bu   renshi na ji   ge   duantoufa de.
    but   not   know   that several CL   short-hair DE
    "I know three long-haired girls, but do not know those short-haired ones."

For an empirical study of adult L2 Chinese acquisition of the above word order phenomenon at the syntax-semantics and syntax-discourse interfaces, readers are referred to Jin and Ke (2021).

[2]For the similarities and differences between L2 acquisition and heritage language acquisition, interested readers are referred to Lynch (2003) and Montrul (2010a,b, 2012), and the references therein.

as they are exposed to both the heritage language and the societal language since their birth or in childhood. As heritage speakers "have been raised with a strong cultural connection to a particular language through family interaction" (Van Deusen-Scholl, 2003, 222), the heritage language is commonly perceived as representing familial, cultural, and ancestry ties of heritage speakers (Berardi-Wiltshire, 2018). However, heritage speakers may undergo a shift in linguistic dominance and ultimately exhibit a stronger command of the societal language—with the heritage language as a weaker language—by the time they reach adulthood as a result of a much wider adoption of the societal language for purposes of education, work, daily social, etc. As indicated by many studies, heritage speakers' competence in the language *L* as a heritage language tends to be different, both quantitatively and qualitatively, from that of monolingual speakers of *L* as a native language, and heritage language grammars display representational and processing differences from monolingual grammars [see Montrul (2012, 2016) and the references therein].

Given the extensive scope and scale of Chinese people's migration and mobility all over the world nowadays, and the changing perceptions about the utility and importance of the Chinese language (He, 2006; Duff et al., 2017), there are of both theoretical and pedagogical values to extend the scope of research on interface grammar to Chinese heritage speakers, an under-examined population in the literature on the IH. As indicated in a review by Ma et al. (2017), researchers and teachers may draw on the similarities and differences between Chinese heritage speakers and non-Chinese heritage speakers in order to understand what the two kinds of learners have in common and how they differ. The present study is aimed to investigate adult Chinese heritage speakers' mastery of interface-regulated referential nominal expressions, which remains an under-explored area in the prior studies. The study will advance the current discussion on heritage language acquisition at interfaces in three dimensions: (i) target language: while most of the prior research targeted Indo-European heritage languages, this study extends the scope of exploration to an under-researched heritage language, i.e., Mandarin Chinese as a heritage language; (ii) target phenomenon: while the target phenomena of the existing studies were mostly concerned with the external interface only, the present study features a comparison of heritage speakers' mastery of internal interface and external interface grammar knowledge in the heritage language; and (iii) methods: while the instruments adopted in previous studies were mainly restricted to offline tasks, this study evaluates heritage speakers' performance at interfaces *via* real-time paradigms examining both accuracy and processing proficiency.

The content of this paper is organized as follows. Section "Previous Studies: Bilingual Acquisition at Interfaces" briefly reviews previous studies examining bilingual acquisition at interfaces, particularly heritage language acquisition at interfaces; Section "Linguistic Phenomenon: Referentiality Encoding of Chinese Nominals" provides a brief description of the linguistic phenomenon targeted by the present study; Section "The Present Study" presents the "Research Questions and Hypotheses," "Methods," "Results," "Discussion," and "Conclusion" of the present work.

PREVIOUS STUDIES: BILINGUAL ACQUISITION AT INTERFACES

With the increase of empirical investigations testing the IH with different populations *via* different tasks, it has been noted that bilingual learners' mastery of internal vs. external interface knowledge exhibits a quite complicated picture. This section will provide a brief review of previous studies on the IH, with a special focus on heritage language acquisition at interfaces.

As the IH was originally proposed to account for the end stage of adult L2 acquisition at interfaces, so far, L2 acquisition at interfaces has received particularly considerable attention. The results reported in the literature were mixed: while some studies showed that advanced L2 learners could achieve nativelike attainment only at the internal interface but not at the external interface, which borne out the IH (e.g., Lozano, 2006; Valenzuela, 2006; Belletti et al., 2007), others found that advance L2 learners could also master the external interface knowledge to a nativelike level, which constituted evidence against the IH (e.g., Donaldson, 2012; Ivanov, 2012; Leal, 2016). Moreover, it was observed that other variables such as L1 background and task design may also affect the results of the experiments on interface grammar acquisition in that, differences in these variables might lead to inconsistent observations regarding whether L2 learners' performance at interfaces would be comparable to that of the native speakers' (Hopp, 2007; Slabakova and Ivanov, 2011). Recently, the processing dimension regarding interface grammar has attracted growing interest among scholars (e.g., Sorace and Serratrice, 2009; Wilson, 2009; Slabakova and Ivanov, 2011; Laleko and Polinsky, 2016; Leal et al., 2017). The latest version of the IH has explicitly attributed non-convergence and residual optionality at the external interface to a greater processing burden for interfacing linguistic modules with language-external domains (Sorace, 2011). Such perspective is, nevertheless, not without controversy. For instance, regarding adult L2 Chinese acquisition of the interface-regulated word order rules of prenominal modifiers in the numeral classifier construction as demonstrated above in footnote 1, the reaction time data from the advanced L2 Chinese speakers did not report significant differences between the word order phenomenon conditioned at the syntax-semantics interface and that conditioned at the syntax-discourse interface, which showed that the internal vs. external interface distinction did not suffice to determine whether a given interface grammar property (e.g., an interface-regulated rule on word ordering) would require more (or less) processing efforts for adult L2 learners (e.g., Jin and Ke, 2021).

Besides L2 acquisition, empirical investigations on the IH have also been extended to heritage speakers' acquisition of interface grammar properties. Similar to the cases of L2 acquisition at interfaces, inconsistent results have been reported regarding heritage language acquisition at interfaces. On the one hand, there are studies providing evidence to support the IH. For example, Keating et al. (2011) adopted an offline questionnaire to examine adult Spanish heritage speakers' antecedent preferences for null and overt pronouns in ambiguous complex sentences that consist of a main clause followed by a subordinate clause, a syntax-discourse interface phenomenon in Spanish. It was

found that the resolution of intrasentential anaphora was a locus of instability for the heritage speakers, a result well bearing out the prediction of the IH. Pascual y Cabo et al. (2012) used an offline scalar judgment felicitousness task to probe into adult Spanish heritage speakers' knowledge of non-obligatory subjunctive mood as complements of epistemic predicates, which is also a syntax-discourse interface phenomenon in Spanish. Data showed that while the heritage speakers exhibited full competence of the syntax of volitional subjunctive, they exhibited non-nativelike performance in modality selection (indicative vs. subjunctive) for complements of epistemic predicates, which confirmed the prediction of the IH.

On the other hand, there are a considerable number of studies on heritage language acquisition arguing against the IH. Most of these studies examined Spanish as a heritage language, with the target phenomena including the use of definite articles (Montrul and Ionin, 2010), subject position preferences with intransitive predicates across informational contexts (De Prada Pérez and Pascual y Cabo, 2012), clitic right dislocation (Leal et al., 2014), presentational focus (Hoot, 2017), etc., all of which are regulated at the external interface in Spanish. A few studies addressed acquisition at interfaces in East Asian languages as heritage languages, with the target phenomena examined so far including topic markers in heritage Korean and Japanese (Laleko and Polinsky, 2016) and null objects in heritage Mandarin Chinese (Chou et al., 2020).[3] In terms of methods, these studies all adopted acceptability/felicity judgment tasks as the main instruments (although the specific design of each study may vary). The results showed that heritage language acquisition at the external interface was more complicated than was assumed under the IH and could not be simply attributed to generalized interface-related deficits.

Meanwhile, there are studies partially confirming the predictions of the IH. For example, Yan (2020) adopted a set of instruments including the acceptability judgment task (AJT), the dialog completion task, and the translation task to investigate adult Chinese heritage speakers' mastery of the syntactic and discourse features of the sentence final particle *ba* in Chinese. The results showed that while the "suggestion" discourse feature of *ba* imposed prolonged difficulties for the heritage speakers, which was consistent with the IH, the "question" discourse feature of *ba* could be eventually acquired to a nativelike level, which contradicted the IH. This suggested that the claimed vulnerability in the syntax-discourse domain for heritage speakers (e.g., Montrul, 2012) may not be applicable across the board.

Albeit various attempts have been made to test the IH with heritage speakers in the literature, the existing empirical investigations are far from conclusive. To be specific, there are

three main research niches. First, the target heritage languages in previous studies were highly limited. As reviewed above, most of the prior research targeted Indo-European heritage languages (particularly Spanish), whereas East Asian languages were notably under-explored. Second, the target phenomena of the existing studies mostly pertained to the external interface only. For a more precise understanding about the predictability of the IH, studies featuring a comparison of heritage language acquisition at the internal interface vs. the external interface are called for. Third, the experimental instruments adopted were mainly restricted to offline tasks. Compared with the research on L2 acquisition at interfaces, there is an evident scarcity of research adopting online tasks to scrutinize the real-time processing of heritage speakers' interface grammar knowledge.

To fill the above gaps, the present study will investigate adult learners' performance of referential nominal expressions regulated at internal vs. external interfaces in Mandarin Chinese as a heritage language. The present study is aimed to advance the current discussion on heritage language acquisition at interfaces in three aspects: (i) to extend the scope of exploration into the under-researched heritage language (i.e., Chinese), (ii) to conduct a comparison of heritage speakers' mastery of internal vs. external interface grammar in the heritage language, and (iii) to examine heritage speakers' performance at interfaces in both accuracy and processing proficiency.

LINGUISTIC PHENOMENON: REFERENTIALITY ENCODING OF CHINESE NOMINALS

The target linguistic phenomenon of the present study concerns encoding of different referential meanings by nominal expressions in Chinese. The present study targets this phenomenon because referential nominal expressions are essential building blocks of languages for making reference, the correct interpretation and appropriate use of which are crucial for ensuring smooth communication. The referential meanings tested include four types: (i) the type-denoting reading, i.e., the nominal refers to an entity type, (ii) the definite individual-denoting reading, i.e., the nominal refers to the contextual discourse referent(s) simultaneously identifiable to both the speaker and the hearer, (iii) the indefinite individual-denoting reading, i.e., the nominal refers to the referent(s) only contextually identifiable to the speaker but not to the hearer, and (iv) the non-referential, quantity-denoting reading, i.e., the nominal expresses the amount/number of something (cf. Heim, 1982).

The nominal structures examined include the following three types:

(I) Bare N(oun)s. At the lexical semantic level, Chinese bare Ns denote a type meaning, as shown in (1a); while in certain contexts, they could also be used as indefinite or definite individual-denoting expressions, as given in (1b) and (1c), respectively (e.g., Chierchia, 1998; Liao and Wang, 2011; Jin, 2013). When under the individual-denoting usage, Ns are compatible with either plural or

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[3]Likewise, much less attention has been paid to L2 acquisition at interfaces in East Asian languages if compared with the research on L2 acquisition at interfaces in Romance, Germanic, and Slavic languages. Regarding language interfaces in L2 Chinese, specifically, the target phenomena touched upon in previous studies include *wh*-topicalization (Yuan and Dugarova, 2012; Dugarova, 2014), the *shi...de* cleft construction (Mai, 2013), *daodi ... wh*-questions (Yuan, 2013), the overt pronoun *ta* "he/she" or a null element as an anaphora resolution (Zhao, 2014), word ordering of prenominal modifiers in numeral classifier sequences (Jin and Ke, 2021). Interested readers are referred to these studies for details.

singular readings, depending on the context in which they are uttered. The quantity-denoting meaning is not available for bare Ns.

(1) a. ta   hen   xihuan   **che**.   (type-denoting)
      he   very   like   car

"He likes cars very much."

  b. lai   **che**   le.   (indefinite individual-denoting)
     come   car   PERF

"Here comes a car/There are cars coming."

  c. **che**   huai   le.   (definite individual-denoting)
     car   broken   PERF

"The car is broken/The cars are broken."

(II) [C(lassifier)-N(oun)]. [Cl-N] can only be used as an indefinite individual-denoting expression in Mandarin Chinese (Cheng and Sybesma, 1999; Jin, 2013), as shown in (2). Type-denoting, definite individual-denoting, and quantity-denoting readings are all unavailable for [Cl-N].

(2)   wo   mai   le   **ben**   **shu**.
      I   buy   PERF   CL   book
                        (indefinite individual-denoting)
"I bought a book."

(III) [Num(eral)-Cl-N]. The [Num-Cl-N] sequence in Mandarin Chinese is compatible with two uses, one as an indefinite individual-denoting expression, under which it is associated with some existential referent(s), the other as a quantity-denoting expression, under which it is for cardinality counting purposes (Li, 1998), as given in (3a) and (3b), respectively. Neither the definite individual-denoting nor the type-denoting reading is available for [Num-Cl-N] (Cheng and Sybesma, 1999).

(3) a. wo   mai   le   **yi**   **ben**   **shu**.
       I   buy   PERF   one   CL   book
                        (indefinite individual-denoting)
"I bought a book."

  b. **yi**   **ben**   **shu**   tai   shao,   **shi**   **ben**
     one   CL   book   too   few   ten   CL
     shu   cai   gou.
     book   then   enough
                        (quantity-denoting)
"One book is too few; ten books are enough."

The various uses of the three expressions represent a case of complex interface phenomenon in Mandarin Chinese. To be concrete, for bare Ns, while their use as a type-denoting expression is lexically semantics-regulated (Chierchia, 1998; Liao and Wang, 2011; Jin, 2013, 2018), the definite and indefinite individual-denoting uses are determined at the discourse level, regulated by factors such as context, the cognitive status of interlocutors, the co-occurring predicates, etc. (Li and Thompson, 1981; Simpson et al., 2011). For [Num-Cl-N], the quantity-denoting meaning is determined at the lexical semantic level due to the existence of the numeral, while the indefinite individual-denoting meaning is introduced at the discourse level when the quantity has been contextually associated with existential referents (Li, 1998). For [Cl-N], due to the absence of the numeral, the quantity-denoting use is inherently unavailable at the semantic level (Jin, 2013); however, its use as an indefinite individual-denoting expression can be licensed at the discourse level when a referential relationship has been contextually established between [Cl-N] and an existential referent. Based on the internal vs. external interface distinction assumed under the IH, depending on whether the referential meanings encoded by the structures are licensed at the discourse level (i.e., the external interface) or at the lexical-semantic level (i.e., the internal interface), the various uses of the three nominal expressions can fall under the interface subcategorization as summarized below:

(4) Interfaces associated with the uses of Ns, [Cl-N], and [Num-Cl-N] in Mandarin Chinese[4]

a. Ns   Type-denoting: ✓ (internal interface)
               Quantity-denoting: ✗ (internal interface)
     Definite individual-denoting: ✓ (external interface)
     Indefinite individual-denoting: ✓ (external interface)
b. [Cl-N]   Type-denoting: ✗ (internal interface)
               Quantity-denoting: ✗ (internal interface)
     Definite individual-denoting: ✗ (external interface)
     Indefinite individual-denoting: ✓ (external interface)
c. [Num-Cl-N]   Type-denoting: ✗ (internal interface)
               Quantity-denoting: ✓ (internal interface)
     Definite individual-denoting: ✗ (external interface)
     Indefinite individual-denoting: ✓ (external interface).

THE PRESENT STUDY

Research Questions and Hypotheses

The present study is guided by the following three research questions (RQs): (1) Can advanced adult Chinese heritage speakers master the syntax-semantics and syntax-discourse interface knowledge of referential expressions to a nativelike level? (2) Does the overall Chinese proficiency affect adult Chinese heritage speakers' mastery of the target referential expressions at the syntax-semantics and syntax-discourse interfaces? (3) Is the heritage speakers' acquisition of the target interface-regulated referential expressions mediated by syntactic structure complexity?

In the spirit of the IH, the present study formulates the following hypotheses: (1) the advanced adult heritage speakers can achieve target-like attainment of the target expressions at the internal interface but not at the external interface; (2) the

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[4]Specific examples of each target expression under different referential meanings can be found in the **Appendix**.

heritage speakers' performance at the syntax-semantics interface, but not at the syntax-discourse interface, is positively related to the heritage language proficiency level; (3) the more complex the syntactic structure is, the more difficult for the heritage speakers to master the interface constraints on the use of the structure.

Methods
Participants

The study recruited 58 adult heritage speakers of Chinese coming from overseas and 29 native speakers of Chinese. The heritage speakers, 42 female and 16 male, were students of four universities in mainland China enrolled in a variety of programs, including Chinese as a second language, international trade, business administration, computer science, communication, food science, architecture, etc. At the time of the study, their age ranged from 18 to 28. They came from 11 nations, including six Spanish-speaking countries (Venezuela, $n = 14$; Peru, $n = 9$; Panama, $n = 3$; Columbia, $n = 3$; Bolivia, $n = 1$; Ecuador, $n = 1$), two English-speaking countries (Canada, $n = 3$; Australia, $n = 3$), as well as Malaysia ($n = 18$), Brazil ($n = 2$), and Indonesia ($n = 1$), each with its own official language. Given that initial exposure to the heritage language—which in turn subsumes the important factors such as age of acquisition, nature/timing of input, etc.—is crucial to heritage speakers' mastery of this language (Montrul, 2010a, 2012), the heritage speakers under the present study were divided into an advanced group ($n = 29$) and an intermediate group ($n = 29$) according to the age at which they were initially exposed to Mandarin Chinese learning at school, a classification which was in the meanwhile validated against the heritage speakers' self-rating of their own overall Chinese proficiency. To be specific, those who started learning Mandarin Chinese in primary school were designated as the advanced group, while those who started in secondary school or college were designated as the intermediate group, i.e., the initial exposure to Mandarin Chinese provided a natural boundary between the two groups of heritage learners, and served as a proxy measure of Chinese proficiency. To cross-validate this measure, the heritage learners were asked to rate their own overall Chinese proficiency (including listening, reading, and speaking) on three 10-point Likert scales.[5] The resulting composite scores (alpha = 0.916) of the two groups were compared through an independent-samples t-test (one-tailed), according to which the advanced group ($M = 25.93$, $sd = 4.15$) had significantly higher proficiency than the intermediate group ($M = 18.64$, $sd = 4.08$), $t = 6.69$, $p < 0.001$.

The 29 native speakers of Chinese, 28 female and one male, were all undergraduate and post-graduate students from two universities in mainland China, aged between 17 and 32 at the time of the study. They were all natives of the northern provinces of mainland China, where dialects of Mandarin Chinese are spoken.

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[5] The Chinese learners were invited to self-evaluate the level of Chinese proficiency along three 10-point Likert scales in listening, reading, and speaking: 0–totally not understand; 1–very poor; 2–poor; 3–fair; 4–slightly less than average; 5–average; 6–slightly more than average; 7–good; 8–very good; 9–excellent; and 10–perfect. The 10-point Likert scale follows Marian et al. (2007) design with our adjustments.

Instruments

An internet-based AJT was administered to all the participants. The task comprised 84 stimuli, of which 24 involved bare Ns, 24 the [Cl-N] structure, and 24 the [Num-Cl-N] structure. Each category consisted of 12 internal interface-regulated items and 12 external interface-regulated items (please refer to see section "Appendix: Sample Items of the Online Acceptability Judgment Task" for examples). Each set of 12 items made up a distinct scale in subsequent data analysis. Also included were 12 fillers irrelevant to the present study. For each item, the participants were given a hypothetical context followed by a short question and an answer containing the target expression. The participants were asked to judge in the shortest possible time whether the presented expression was acceptable or not by pressing the relevant keys on the computer keyboard; if they did not understand a certain stimulus, they were allowed to choose the "I don't know" option (Hopp, 2005). The 84 stimuli were presented in random order so that the order of presentation was different across participants. Both their responses and reaction times were recorded.

A typical item was presented in two steps. First, the context was presented in written form on the computer screen (in Chinese only), as exemplified in (5). For ease of the participants' understanding, the hypothetical contexts adopted in the AJT were all closely related to situations commonly experienced in everyday life (e.g., eating, shopping, cooking, etc.).

(5) A和B在讨论食物。("A and B are talking about food.").

No time limit was imposed on the context instruction (Taguchi, 2007). After reading, the participants could press any key on the keyboard to proceed to step two, when a question-and-answer conversation between speakers A and B were presented on the screen in written form (in Chinese only). For example:

(6) A: 你喜欢吃什么? ("What do you like eating?").
     B: 我喜欢吃个西红柿。("I like eating a tomato.").

The participants were asked to judge whether speaker B's answer is correct or not without time constraints (Taguchi, 2005, 2007) according to the context and speaker A's question. They pressed the F-key for a correct answer, the J-key for an incorrect answer, and the spacebar if they were unsure. After the participants made a judgment, the test proceeded to the next item automatically.

Data Collection Procedures

The internet-based AJT was administered to each of the participants one by one *via* the Gorilla online platform (Anwyl-Irvine et al., 2020). Prior to the AJT, the participants were required to ascertain that they had sufficient time to complete the task in a single trial and that they had good access to internet. As reaction time data were to be analyzed, they were also required to use a desk-top or lap-top with a standard physical keyboard, instead of a tablet or smartphone, so as to minimize the effect of hardware on their reaction time. The participants also signed an informed consent form online prior to the AJT. As the participants were all new to the online platform, and social

Structure	Number of items	Acceptability judgment task		Reaction time	
		Internal	External	Internal	External
Bare N	12	0.713	0.705	0.751	0.887
Cl-N	12	0.899	0.708	0.903	0.904
Num-Cl-N	12	0.817	0.763	0.886	0.876

distancing due to COVID-19 prevented physical contacts, three measures were taken to make sure the right procedures were followed by the participants. First, the online directions were presented in two languages (Chinese and English) and proofread by the first four participants to make sure they understood the procedures. Second, the directions were sent to the participants *via* an instant messaging platform with one example item, so that they could request clarification should they have any doubt. Third, a practice session with four extra items was administered prior to the AJT, and the participants were encouraged to seek help from the administrator on the instant messaging platform should they encounter any problems. Most participants were able to complete the AJT within 30 min.

The Gorilla platform automatically recorded the responses and the reaction times, which were downloaded as a Microsoft Excel file. Despite the aforementioned efforts, data screening discovered a few irregularities, including unexpectedly short reaction times (within one second for many items), interrupted trials (with item reaction times that lasted more than 30 s), and patterned responses, such as the same response for all items. Furthermore, a few participants were found to be disqualified as participants, either because they were born and raised in China in their early years, or because they were not studying in Chinese universities, which may bring in construct-irrelevant variance (Messick, 1995). Originally 94 participants were invited, but after deleting the cases of irregularities, the data from 87 participants (including both heritage and native speakers) were retained, whose demographic details were reported above.

Data Analyses

The response dataset included the mean accuracy rate and the mean reaction time of each participant on each 12-item scale featuring a distinct intersection between interface (internal vs. external) and structure (bare Ns, [Cl-N], and [Num-Cl-N]). The "I don't know" responses were excluded from the calculation of these mean values. Of the 87 (participants) × 6 (scales) = 522 mean values of either accuracy rate or reaction time, only one was calculated with six "I don't know" responses, one with five unsure responses, five with four unsure responses, and eight with three unsure responses. Due to the scarcity of the "I don't know" responses, the effect of excluding them from the calculation of mean values on the reliability of the scales was considered negligible [see also Hopp (2005)].

The internal consistency reliability was estimated for each 12-item scale. As **Table 1** shows, the coefficient alpha estimates ranged between 0.705 and 0.904, and were considered sufficient for subsequent analyses.

Repeated-measures ANOVAs were conducted in SPSS 24 to answer the research questions, treating the mean accuracy rate of each participant as the dependent variable in one series, and the mean reaction time of each participant in the other. In Model 1 of each series, interface was entered as the within-subject factor, participant group (native, advanced, and intermediate) as the between-subject factor, and the group × interface interaction effect was estimated to answer RQ1 and RQ2. In Model 2 of each series, syntactic structure was added as another within-subject factor, and the three-way interaction (group × interface × structure) was estimated to answer RQ3.

Results
Descriptive Statistics
Table 2 shows the mean accuracy rate and reaction time and the corresponding standard deviation for each group in each interface, and each interface-structure combination. The means are also graphically presented in **Figure 1**.

Figure 1 provides some initial information for planning the statistical modeling. As **Figure 1A** shows, there was some group × interface interaction in mean accuracy rate, but only in the case of the [Cl-N] structure, not for the other two structures. This was taken as a sign of three-way interaction. In **Figure 1B**, however, there seemed to be no apparent group × interface interaction in mean reaction time, regardless of structure.

Interface Knowledge of Referential Expressions Among Adult Native Speakers, Adult Advanced Heritage Speakers, and Adult Intermediate Heritage Speakers
To reiterate, to answer RQ1 and RQ2, interface was treated as a within-subject factor and group as a between-subject factor. As the within-subject factor had only two levels, the sphericity assumption was automatically sustained. In the case of accuracy rate, the two-way repeated-measures ANOVA (group × interface) discovered a significant main effect for group, $F_{(2,84)} = 30.810$, $p < 0.01$, $\eta^2 = 0.423$, and a significant main effect for interface, $F_{(1,84)} = 8.775$, $p < 0.01$, $\eta^2 = 0.095$, but no significant two-way interaction was found, $F_{(2,84)} = 0.210$, $p > 0.05$, $\eta^2 = 0.005$. Pairwise comparisons were conducted to identify the specific differences between the groups.

As shown in **Table 3**, the mean accuracy rate of the advanced group was significantly lower than that of the native group, and the mean accuracy rate of the intermediate group was significantly lower than that of the advanced group, regardless of interface type. The omnibus test yielded similar results for reaction time, with a significant main effect for group, $F_{(2,84)} = 51.188$, $p < 0.01$, $\eta^2 = 0.549$, and a significant main effect for interface, $F_{(1,84)} = 8.063$, $p < 0.01$, $\eta^2 = 0.088$, but no significant two-way interaction, $F_{(2,84)} = 0.250$, $p > 0.05$, $\eta^2 = 0.006$. The mean reaction time of the advanced group was not significantly longer than that of the native group, but the mean reaction time of the intermediate group was significantly longer than those of the advanced and native groups, regardless of interface type.

In sum, to answer RQ1, nativelike attainment was observed in reaction times in advanced heritage speakers, but not in

TABLE 2 | Descriptive statistics of accuracy rate and reaction time by group, interface and syntactic structure.

Structure	Proficiency	n	Accuracy rate mean (sd) in%		Reaction time mean (sd) in msec.	
			Internal	External	Internal	External
Bare N	Intermediate	29	81.20 (17.92)	80.97 (17.28)	8695.73 (6698.94)	8483.29 (3338.28)
	Advanced	29	96.64 (7.44)	93.55 (8.38)	3426.20 (1788.91)	4092.54 (2267.07)
	Native	29	94.25 (7.08)	95.06 (7.32)	3180.37 (1132.69)	3459.97 (1247.06)
	All	87	90.70 (13.62)	89.86 (13.34)	5100.77 (4755.79)	5345.27 (3294.89)
Cl-N	Intermediate	29	53.43 (26.96)	60.06 (16.18)	8497.31 (2888.19)	8909.44 (3399.61)
	Advanced	29	72.35 (25.98)	76.61 (16.74)	4073.55 (1711.95)	4224.96 (2336.38)
	Native	29	91.88 (14.10)	86.05 (14.23)	3155.59 (939.15)	3433.58 (1138.42)
	All	87	72.55 (27.76)	74.24 (18.95)	5242.15 (3075.55)	5522.66 (3445.21)
Num-Cl-N	Intermediate	29	76.75 (18.78)	61.99 (15.58)	7774.36 (3046.84)	9504.40 (3847.66)
	Advanced	29	91.01 (13.90)	79.72 (17.83)	4470.85 (2863.57)	4725.14 (2618.78)
	Native	29	97.07 (9.56)	88.06 (15.94)	3132.14 (860.19)	3904.00 (1131.95)
	All	87	88.28 (16.76)	76.59 (19.62)	5125.78 (3127.87)	6044.51 (3693.07)
Total	Intermediate	87	70.46 (24.62)	67.68 (18.75)	8322.47 (4528.54)	8965.71 (3519.75)
	Advanced	87	86.67 (20.24)	83.30 (16.51)	3990.20 (2203.05)	4347.55 (2399.69)
	Native	87	94.40 (10.74)	89.72 (13.46)	3156.03 (972.72)	3599.18 (1180.07)
	All	261	83.84 (21.77)	80.23 (18.77)	5156.23 (3721.54)	5637.48 (3480.91)

their accuracy rates. In response to RQ2, there was a significant developmental progress in both accuracy and reaction times as proficiency levels increased from the intermediate to the advanced level among heritage language speakers.

Effect of Syntactic Structure Complexity

To answer RQ3, repeated-measures ANOVA incorporated syntactic structure as an additional within-subject factor. Mauchly's test discovered some violations of the sphericity assumption, $W = 0.662$, $p < 0.01$ for the structure factor in the accuracy rate model, $W = 0.755$, $p < 0.01$ for the structure factor, and $W = 0.482$, $p < 0.01$ for the interface structure interaction in the reaction time model. Therefore, results based on the Greenhouse-Geisser correction were reported where applicable. The key to RQ3 is the three-way interaction between group, interface, and structure, which was significant in the case of accuracy rate, $F_{(3.757, 157.774)} = 3.068$, $p < 0.05$, $\eta^2 = 0.068$, but not for reaction time, $F_{(2.634, 110.641)} = 1.439$, $p > 0.05$, $\eta^2 = 0.033$. **Table 4** reports the results of the *post hoc* contrasts (Sidak) of estimated marginal means conducted to identify the specific differences that were significant.

Concerning the differences between the intermediate group and the other two groups, the pairwise comparison results reported in **Table 4** were the same as those related to RQ1 and RQ2, i.e., the intermediate group performed significantly worse than the advanced and native groups regardless of syntactic structure and interface. However, the difference between the advanced group and the native group was more complex than the results associated with RQ1. The advanced group performed significantly worse than the native group at the intersection between the internal interface and the [Cl-N] structure, but no significant difference was found at other intersections. In other words, the advanced group has achieved nativelike attainment of the target expressions in most cases, except the internal interface of the [Cl-N] structure. In summary, to answer RQ3, the evidence above indicated that the heritage speakers' acquisition of the

target interface-regulated referential expressions was mediated by syntactic structure complexity.

Discussion

To recapitulate, three hypotheses have been posed under this study in accordance with the IH: (1) the advanced adult heritage speakers can achieve target-like attainment of the target expressions at the internal interface but not at the external interface; (2) the heritage speakers' performance at the syntax-semantics interface, but not at the syntax-discourse interface, is positively related to the heritage language proficiency level; and (3) the more complex the syntactic structure is, the more difficult for the heritage speakers to master the interface constraints on the use of the structure.

Hypothesis 1 is not confirmed by either accuracy data or reaction time data. Specifically, for accuracy, the advanced adult Chinese heritage speakers did not master either the syntax-semantics or syntax-discourse interface knowledge to a nativelike level, which suggests vulnerability of both internal and external interfaces. For reaction time, the advanced group exhibited nativelike performance at the syntax-discourse interface, hence not indicating a greater processing burden of the external interface knowledge. Likewise, Hypothesis 2 is not supported by accuracy and reaction time data, given the observation that the heritage speakers' performance at both syntax-semantics and syntax-discourse interfaces could be improved—in terms of accuracy and reaction time—with the development of their Chinese proficiency.

The picture related to Hypothesis 3 is rather complicated. Upon taking into consideration the factor of syntactic structure complexity, the accuracy data revealed that the use of the [Cl-N] structure regulated at the internal interface, but not that at the external interface, presented prolonged difficulties for the advanced group; while the other two structures (i.e., bare Ns and [Num-Cl-N]) could be mastered by the advanced group
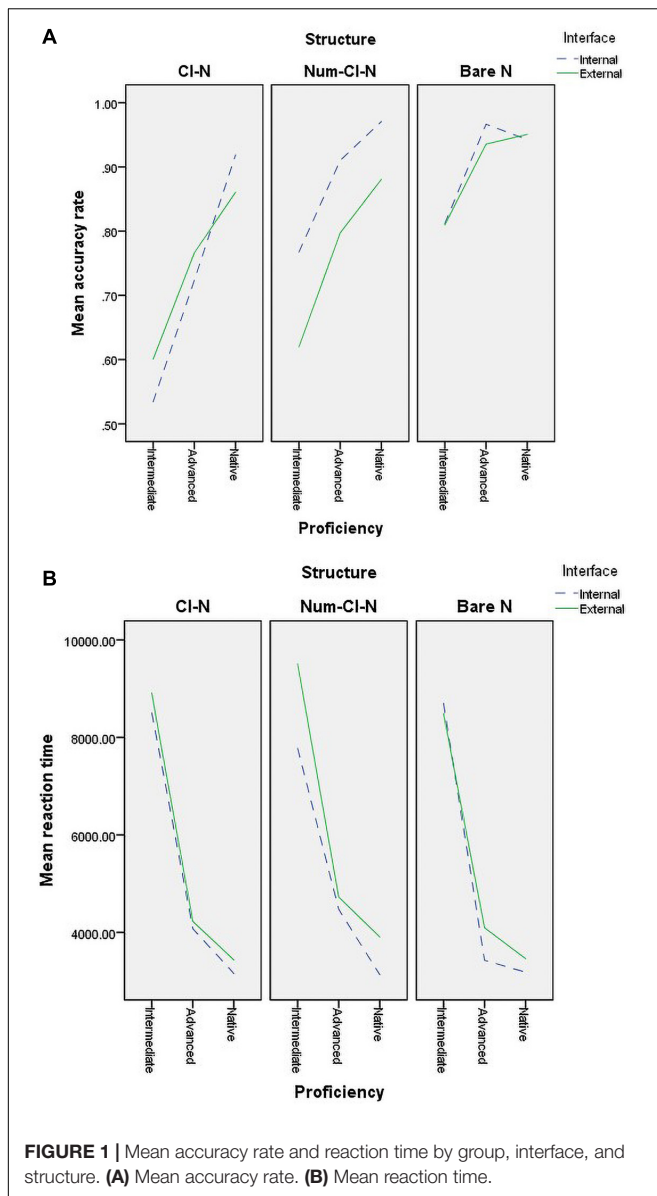
FIGURE 1 | Mean accuracy rate and reaction time by group, interface, and structure. (A) Mean accuracy rate. (B) Mean reaction time.

revealed that the internal interface could also be a locus of non-convergence for even the advanced adult heritage speakers, as evidenced by the observation that the mean accuracy rate of the items related to the internal interface was significantly lower than that of the native group (cf. **Table 3**). This suggests that the type of interface should not be taken as a determinative factor for predicting the vulnerability of bilingual grammar knowledge.

Second, the present study did not lend support to a viewpoint underpinning the latest version of the IH, that is, the external interface imposes a greater processing burden for bilingual learners, which has been considered to be the fundamental reason for non-nativelike performance at the external interface (Sorace, 2011). In accordance with the reaction time data collected, no significant differences were observed between the mean reaction times the advanced group and the native group spent on the external interface items (cf. **Table 3**). This strongly indicates that the external interface should not necessarily be more taxing in processing.

Third, the intersection between interface (internal vs. external) and syntactic structure complexity points out a direction of inquiry worth future exploration. Under the present study, the use of the [Cl-N] structure regulated at the internal interface was found to be particularly difficult, even for the advanced group. Notice that this could be due to various possible reasons. For example, it could be partly explained in that the linguistic properties located at the internal interface might not be equivalently easy for learners, due to which some internal-interface properties could be more easily acquired to a nativelike level whereas others may not (cf. White, 2011). Along this line, the pattern regarding [Cl-N] could be considered in that the internal interface condition on the use of [Cl-N] happens to belong to the particularly difficult ones. Alternatively, this might be brought about by the fact that the learners did not receive sufficient or effective instruction on the use of [Cl-N], or that the input of this construction they had been exposed to was quantitatively/qualitatively insufficient. In fact, as has been pointed out in previous linguistic research, the appropriate use of [Cl-N] as an indefinite individual-denoting expression in Chinese would additionally be subject to complex genre- and prosody-related restrictions (Li and Feng, 2015). Since these restrictions are largely generalized under theoretical linguistic frameworks which Chinese language instructors may not be so familiar with, it is highly possible that the instructors themselves have not been fully aware of the using conditions of [Cl-N], hence the difficulty to provide precise descriptions and pedagogical explanations for this structure in class.

In addition to the theoretical implications, there are three pedagogical implications yielded by the present study. First, as both syntax-semantics and syntax-discourse grammar knowledge could possibly be a locus of learning difficulties for learners of Chinese, it is important for teacher educators and teachers to enhance their pedagogical awareness for precisely identifying and diagnosing the types of errors made by learners, and provide explicit, effective instruction on the observed challenging expressions. Second, upon the observation that it is not impossible for heritage speakers of Chinese to master the external interface grammar knowledge to a nativelike level, it is

to a nativelike level, irrespective of the interface type. This refuted Hypothesis 3 in two ways. First, Hypothesis 3 assumes that the advanced group would achieve nativelike attainment at the internal interface but not at the external interface, but our findings regarding [Cl-N] suggested the opposite. Second, Hypothesis 3 assumes that the more complex the syntactic structure is, the more difficult it is for the heritage speakers to acquire, according to which the [Num-Cl-N] is supposed to be the most challenging structure; nevertheless, the results showed that the syntactically less complex [Cl-N] was the most difficult one for the advanced group.

The above observations bring about several important implications to our understandings about the IH. First, the findings did not testify the claimed internal vs. external interface distinction regarding heritage language acquisition. Rather, it was

TABLE 3 | Pairwise comparison results for the two-way interactions.

Measure	Interface	Intermediate vs. Advanced		Intermediate vs. Native		Advanced vs. Native	
		Mean difference	SE	Mean difference	SE	Mean difference	SE
Accuracy rate	Internal	−16.21**	3.73	−23.94**	3.73	−7.73*	3.73
	External	−15.62**	2.93	−22.05**	2.93	−6.43*	2.93
Reaction time	Internal	4332.27**	600.77	5166.43**	600.77	834.17	600.77
	External	4618.16**	596.21	5366.53**	596.21	748.37	596.21

*$p < 0.05$; **$p < 0.01$.

TABLE 4 | Pairwise comparison results for the three-way interaction in accuracy rate.

Structure	Interface	Intermediate vs. Advanced		Intermediate vs. Native		Advanced vs. Native	
		Mean difference	SE	Mean difference	SE	Mean difference	SE
Bare N	Internal	−15.45**	3.13	−13.06**	3.13	2.39	3.13
	External	−12.57**	3.12	−14.09**	3.12	−1.52	3.12
Cl-N	Internal	−18.92**	6.07	−38.84**	6.07	−19.53**	6.07
	External	−16.55**	4.14	−25.99**	4.14	−9.44	4.14
Num-Cl-N	Internal	−14.26**	3.83	−20.31**	3.83	−6.06	3.83
	External	−17.73**	4.33	−26.07**	4.33	−8.34	4.33

**$p < 0.01$.

worthwhile exploring more innovative ways to teach discourse-related grammar rules (involving "variations" of language use) in class, which might be passed unnoticed by students. Last but not least, while linguistic research and language teaching have long been taken as two separate camps, the present study suggests that synergy between the two would be beneficial for language instructors *via* enriching their knowledge about linguistic subtleties, which can help to better inform pedagogy [see also Tao, 2016]. To realize such synergy, undoubtedly, more communication and cross-border collaboration are called for between linguists and teaching practitioners in the future (Gong et al., 2018, 2020).

Conclusion

This paper tested the influential IH from the perspective of acquisition of Chinese as a heritage language. An internet-based AJT was administered to a total of 58 advanced and intermediate adult Chinese heritage speakers to examine their accuracy and real-time processing of referential nominal expressions regulated at the syntax-semantics and syntax-discourse interfaces. The target linguistic phenomena involved three nominal expressions in Chinese (i.e., Ns, [Cl-N], and [Num-Cl-N]) under four interface-regulated referential readings (i.e., type-denoting, quantity-denoting, indefinite individual-denoting, and definite individual-denoting). For accuracy, the results showed that (i) for bare Ns and [Num-Cl-N], regardless of the interface type, the advanced group mastered the target phenomena to a nativelike level, who significantly outperformed the intermediate group; (ii) for [Cl-N], the advanced group exhibited nativelike attainment at the syntax-discourse interface but not at the syntax-semantics interface, and performed significantly better than the intermediate group at both interfaces. For reaction

time, no significant differences were reported between the advanced group and the native group regarding the learning of the target phenomena at either the syntax-semantics or the syntax-discourse interface, while the advanced group performed significantly better than the intermediate group, regardless of the interface type and the structure type. The present study adds new empirical evidence in heritage language acquisition to argue against the predictive power of the IH. The data suggest that the internal vs. external interface distinction cannot be taken as a reliable predictor for the possibility of nativelike performance in accuracy or real-time processing.

There are three main limitations of the present study. The first limitation is about the criterion adopted for dividing participants. We categorized the heritage speaker participants into advanced and intermediate groups based on their age of initial exposure to Chinese learning at school coupled with the participants' self-rating on their overall Chinese proficiency. While the current division of the participant groups based on the age of onset of Chinese language learning was well validated by the participants' self-evaluation of their Chinese proficiency, this measure may not be adequately rigorous and objective. Second, the present study did not look into the correlation, if any, between individual difference (ID) variables and the learners' performance at the language interfaces, hence a lack of attention to possible compounding effects brought about by learner-related factors. Lastly, the Chinese heritage speaker participants were recruited from universities in mainland China. It is important for future research to compare findings in and outside of mainland China (Gong et al., 2018, 2020). We expect to further enrich the research in the future in three directions. First, for a more rigorous evaluation of the participants' proficiency levels, in future research we may incorporate a separate Chinese

proficiency test for dividing participant groups. Second, to obtain a holistic understanding about heritage language acquisition, there is a need to further take into consideration the heritage speakers' family dialect background (e.g., Cantonese, Hakka), the dominate language of the country in which they were raised and grew up, and possible interactions in using heritage and societal languages in various contexts when examining heritage speakers' mastery of interface knowledge in Mandarin Chinese. Third, the present experiment could be repeated with L2 Chinese learners in different educational contexts, and then the data of the L2 Chinese learners could be compared with the data collected under the present study to further explore whether there are any differences between L2 speakers and heritage speakers in acquiring bilingual grammars at interfaces. Pedagogically speaking, evidence of this study suggests that the use of certain interface-regulated expressions (e.g., [Cl-N]) may require more formal and contexualized instruction in heritage Chinese classrooms. With the experimental results showing the learnability of different types of interface knowledge for heritage speakers, the present study calls for more efforts to enhance Chinese language teachers' linguistic awareness of the discourse-related grammar rules and their pedagogical awareness in teaching these rules in a way that could effectively cater for learner diversity.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

ETHICS STATEMENT

The study involving human participants was reviewed and approved by The Education University of Hong Kong. All the participants signed an informed consent form online to participate in this study.

AUTHOR CONTRIBUTIONS

All the authors listed have made a substantial, direct, and intellectual contribution to the work, and approved it for publication.

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APPENDIX: SAMPLE ITEMS OF THE ONLINE ACCEPTABILITY JUDGMENT TASK

I. Bare Ns

(a) Type-denoting (internal interface; acceptable reading)

> 语境: A 和 B 在谈论水果。
> A: 你最喜欢什么水果?
> B: 我最喜欢香蕉。

(b) Quantity-denoting (internal interface; unacceptable reading)

> 语境: A 和 B 在谈论做蛋糕。
> A:你做这个蛋糕放了多少糖?
> B:我放了白糖。

(c) Indefinite individual-denoting (external interface; acceptable reading)

> 语境: A 和 B在谈论早饭。
> A: 你今天早饭做了什么吃?
> B: 我煮了鸡蛋。

(d) Definite individual-denoting (external interface; acceptable reading)

> 语境: B 新买了一双球鞋和一双皮鞋。
> A: 这两双鞋贵吗?
> B: 球鞋很便宜, 皮鞋贵一点。

II. [Cl-N]

(a) Type-denoting (internal interface; unacceptable reading)

> 语境: A 和 B 在谈论动物。
> A: 你最怕什么动物?
> B: 我最怕只猫。

(b) Quantity-denoting (internal interface; unacceptable reading)

> 语境: A 和 B 在谈论借书。
> A: 你昨天在图书馆借了多少书?
> B: 我只借了本书。

(c) Indefinite individual-denoting (external interface; acceptable reading)

> 语境:A 和 B 在讨论周末的安排。
> A: 你上个周末做了什么?
> B: 我看了部电影。

(d) Definite individual-denoting (external interface; unacceptable reading)

> 语境: 桌子上有一支钢笔和一支铅笔。
> A: 这两支笔你想要哪一支?
> B: 我想要支铅笔。

III. [Num-Cl-N]

(a) Type-denoting (internal interface; unacceptable reading)

> 语境:A 和 B 在谈论花。
> A: 你喜欢什么花?
> B: 我喜欢一朵玫瑰花。

(b) Quantity-denoting (internal interface; acceptable reading)

> 语境: B 参加了唱歌比赛。
> A: 你比赛时一共唱了几首歌?
> B: 我只唱了一首歌。

(c) Indefinite individual denoting (external interface; acceptable reading)

> 语境: B 的样子看起来不太开心。
> A: 发生什么事了?
> B: 我打碎了一个花瓶。

(d) Definite individual-denoting (external interface; unacceptable reading)

> 语境: A 在 B 的家里看到一只猫和一只狗。
> A: 它们都是你买来的吗?
> B: 不是, 一只狗是朋友送的。

Relational Agency of University Teachers of Chinese as a Second Language: A Personal Network Perspective

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Relational agency is pivotal for understanding how language teachers seek and utilize relational resources in different contexts and grow to be agents of change amid various educational challenges. This study explored how three university teachers of Chinese as a second language (CSL) enacted their relational agency to enhance their research capacity and sustain their professional development. Data on their personal network development was collected through concentric circle interviews, life-history interviews and written reflections over three months. Thematic analysis was adopted for iterative coding and interpretation of the data. The findings revealed that teachers' personal networks provided them with value guidance, emotional support and academic support, which exerted differential levels of impact on them to make agentic choices and actions. The study suggests that personal network analysis may serve as a suitable theoretical lens to achieve a multi-layered understanding of relational agency. The study also calls for more efforts to create learning opportunities and spaces in the relational context for teachers to build their career as agentic academics in language teacher education and development programs.

Keywords: Chinese as a second language (CSL), relational agency, personal network, relational resources, professional development

INTRODUCTION

The notion of teacher agency as teachers' "socioculturally mediated capacity to act" (Ahearn, 2001, p. 112) has provided a critical lens for researchers to explore and understand how university teachers invested efforts in "(building) their career as academics" (Tao et al., 2020, p.13). Research has examined the critical role that teacher agency has in initiating and sustaining teachers' professional development. As teacher agency often occurs through interactive positionings and social interactions depending upon others, it is relational in nature and sometimes shared (e.g., Edwards, 2005; Kayi-Aydar, 2015; Priestley et al., 2015; Leijen et al., 2020; Molla and Nolan, 2020), prompting researchers to examine how relational agency works in university teachers' professional development especially in regard to enhancing their research capacity.

The majority of the existing literature focused mainly on teachers' professional communities (e.g., Wang et al., 2017; Chang et al., 2021; Prain et al., 2021). For example, Tao et al. (2020) investigated eight university LOTE (Languages other than English) teachers' collective agency and relational knowledge development in a multilingual research center. Prain et al. (2021) examined

three cases of team teaching and explored the nature of teacher collaboration through strategic use of relational resources. Teachers may develop relationships within and beyond their immediate social and professional milieu (Edwards, 2011), and language teacher agency is perceived as an iterative, dynamic, complex and emergent process (Gao, 2019) as well as spatially and temporally sensitive (Kayi-Aydar et al., 2019). Therefore, more research is needed to expand the understanding of how agency is exercised through the bonding with and support from language teachers' multi-layered personal relationships at different levels and with differential degrees of impact on their professional development (Tao and Gao, 2017; Vähäsantanen, 2015; Gong et al., 2021). By adopting the personal network perspective to unravel the multi-layered and context-specific relational agency embedded in the constellation of teachers' personal networks, we may gain a holistic understanding through visual presentations of teachers' all-round social relationships in a clearer and more direct way.

For more than 40 years, China's Opening-Up Policy and the recent *Belt and Road* initiative has greatly promoted the Chinese language learning worldwide. Consequently, the rising number of international students has resulted in both long hours of teaching and publication pressure to CSL teachers in the Chinese higher education (Guo et al., 2020). In response, sustained professional development of CSL teachers is crucial at the heart of Chinese language teaching and learning research (Ma et al., 2017; Gong et al., 2020a) and have been extensively discussed both at the institutional and pedagogical levels, including agency research on CSL teachers (Gong et al., 2018a,b, 2020b; Bao et al., 2020; Chang et al., 2021). For example, Gong et al. (2021) investigated the value of agency-oriented approach which fostered Chinese language teachers' adaptation to online teaching amid the COVID-19 pandemic. Lai et al. (2015) examined how professional identity and social roles shaped agency to enhance professional learning of Chinese language teachers. While the existing studies have yielded useful insights, scant attention has been paid to explore how CSL teachers' professional development with different learning experiences may develop personal networks and exercise their relational agency (Edwards, 2005; Gong et al., 2020a; Tao et al., 2020). Therefore, this study examines teachers' all-round social life and hopes to generate insights into the ways in which CSL teachers in a university in China dynamically constructed social relationships and the interactions with their relational agency enactment.

UNDERSTANDING REALTIONAL AGENCY

Relational agency has been conceptualized in a variety of ways. Gergen (2011) views it from the psychological perspective and regards it as a relational phenomenon inherent in actions within relationships. Edwards (2005, 2011) discusses the notion from the socioculturally grounded activity theory to inform the analysis of agency enactment. Further, a growing body of studies investigate teacher agency achieved from the interplay between individual capacity and contextual conditions with agentic

choice/action during the spatiotemporal processes (Billett, 2006a; Priestley et al., 2015; Tao and Gao, 2017; Tao et al., 2020). Relations which foster a variety of coordinated activities tend to become the resources to make agency intelligible (Sugarman and Martin, 2011). These relational resources afforded by social networks and relations are highlighted as an essential prerequisite for enhancing teacher agency (Priestley et al., 2015). This helps to expand the conceptual scope by adding the personal network perspective to the present study in order to highlight the role of dynamic social interactions that shape teachers' social experiences and professional development. We then conceptualize relational agency as involving teachers' capacity to purposefully interact with others, make choices and take actions to achieve their personal goals. Such a capacity can be developed from capitalizing on different relational resources in the personal networks, which may include projective and intellectual dimensions (Ibarra, 1993; Edwards, 2005; Tao et al., 2020).

Relational agency has a projective dimension. By enacting relational agency, individuals can shape and visualize their future professional goals (Priestley et al., 2015; Hadar and Benish-Weisman, 2019). Human aspirations and the capacity to act may be contingent on the relational context within which people take actions (Annala et al., 2020). Dynamic relationships in the immediate context are likely to initiate and enact individual capacities to articulate shared goals (Pantic, 2015). Moreover, individuals may develop varying degrees of such capacities, and their professional pursuit may accord with their values, choices and aspirations (Hadar and Benish-Weisman, 2019). For example, Chang et al. (2021) demonstrated that Chinese bilingual teachers' relational agency development tended to promote the goals of bilingual education. The existing literature has so far confirmed the forward-looking nature of relational agency in the way that language teachers may take agentic actions and work toward their valued goals due to the mutually supportive relationships in their personal networks (Kayi-Aydar, 2015; Molla and Nolan, 2020).

Moreover, relational agency highlights the intellectual dimension of interactive learning characterized by critical reflection, increased expertise and capacity to act (Edwards and D'arcy, 2004; Edwards, 2005; Eteläpelto et al., 2013; Feucht et al., 2017). Studies have demonstrated that agentic teachers intentionally interact with others as a resource for learning and are active learners to reflect critically on actions (Billett, 2006b; Pyhältö et al., 2015; Toom et al., 2015; Yang, 2021). Such learning capacity leads to the expanded object such as enriched understanding of the problems and increased expertise which is loaded with intelligence for enhanced action (Edwards, 2005, 2011). Known as scholars of inquiry who engage in research and teaching with critical reflections (Leijen et al., 2020), university language teachers may need to enact relational agency in their research engagement for learning (Priestley et al., 2015; Pyhältö et al., 2015). Such a research process and knowledge production is generally a collective endeavor (Luo and Hyland, 2021), because the nature and extent of the personal relationships that teachers experience is likely to impact on the level of relational agency they enact (Priestley et al., 2015). Therefore, it is necessary

to identify and investigate how relational agency enhances university language teachers' learning capacity and help them become active agents of inquiry.

PERSONAL NETWORK PERSPECTIVE

This study adopts personal network perspective as the theoretical foundation to examine the emergence and development of individual teachers' relational agency. Personal network is defined to place a focal individual (ego) at the center and examine the immediate social relations or a set of people (alters) with whom the individual interacts and connects (Marin and Wellman, 2011; Perry et al., 2018). It does not limit an individual's relations only to his/her alters but helps to investigate the close connections that the individual identifies so that researchers can explore the in-depth information hidden in the chosen ego-alter ties. By this means, personal network perspective not only ensures the anonymity of any alter that the ego connects but also produce richer, more detailed and nuanced data about each individual's nascent personal network (Borgatti et al., 2013; Li et al., 2020). For example, Bidart et al. (2018) collected detailed data on young French people in a longitudinal study and build the personal network typology with an in-depth analysis of the vicissitudes and characteristics of their relationships.

Moreover, personal network perspective fits relational agency research and helps to identify the web of social relations that surrounds an individual. According to Crossley (2021), agency is integral and central to the network where interaction, interdependence and relations develops. That is to say, the interplay between agency and the network is supported by the dynamic interpersonal relations and interactions. It is therefore important to investigate an individual's multi-layered social relations so as to uncover the relational agency enacted from the network. Also, relational agency evolved in the personal networks may influence individual learners and teachers' academic and professional development significantly. Zappa-Hollman and Duff (2015) found the individual network of practices may provide a research perspective to examine agency and strength of relationships among a group of Mexican students who were actively engaged in the academic English socialization at a Canadian university. Penuel et al. (2012) revealed that personal network helps to identify effective teacher learning and improved practice through various forms of interactions with colleagues inside and outside a writing workshop.

Further, personal network perspective helps to identify the quality, the types and the characteristics of relationships from the network (Levula and Michael, 2016; Rapp et al., 2019; Yang and Markauskaite, 2021). Existing research (Ibarra, 1993) found that personal network has two distinctive types of relationships: instrumental and expressive. Tao et al. (2020) adopted this categorization and found that instrumental relationships rendered teachers intellectual support for knowledge transfer and sharing whilst expressive relationships afforded emotional support. Zappa-Hollman and Duff (2015) elucidated that individual students invested in their individual network in hopes of gaining academic and affective support developing

various types of relationships. Therefore, more research is needed to identify the specific types of relationships and the corresponding relational supports in the personal networks and refine our understanding of how these relationships impact on the emergency and development of relational agency.

Collectively, these studies have demonstrated that the existing research mainly focuses on teacher collaboration within the professional learning communities where the strategic use of the relational resources facilitated the enhancement of collective and relational teacher agency (Tao et al., 2020; Chang et al., 2021; Prain et al., 2021). However, few studies have explicitly explored the possible links between relational resources and relational agency extended from professional communities inclusive of teachers' life world and all-round social experiences (Priestley et al., 2015). Molla and Nolan (2020) argued for the necessity to extend the agency research to a wide set of relationships so as to investigate teacher agency achieved in the context-specific, temporal and relational setting. To this end, our present study tapped into the complexities of the CSL teachers' professional learning processes during which they constructed their personal networks, capitalized on the relational resources and enacted their relational agency.

Gong et al. (2021) emphasized that CSL teacher agency generally has various manifestations "with multi-levelness and context specificity" (p.87). Therefore, more research is needed to examine different types of social relationships embedded in the constellation of CSL teachers' professional and social networks, and how these relationships generate resources with which teachers enact their relational agency. To address the above concerns, the present study set out to explore CSL teachers' relational agency from the personal network perspective. It aims to investigate the diversified ways in which the enactment of relational agency may facilitate CSL teacher professional development and CSL teacher education in different educational contexts. This study thus adopted the personal network perspective which treated the individual CSL teachers as the ego, while the alters were those whom they regarded as resourceful people in their networks. We will address the following research question:

How does relational agency emerge and develop in the CSL teachers' personal networks?

METHODOLOGY

The study was conducted at the School of Chinese Language and Exchange (SCLE) in a language studies university in China. The school was upgraded from the *Chinese Language Teaching and Research Office* after the incentive of China's opening-up policy, which resulted in the expansion of student population and the growing demand for CSL teaching and learning. Up to now, the School has offered both undergraduate and postgraduate programs, as the recent *Belt and Road* initiative brought a surging number of students to the school, which has amounted to 500 undergraduate and 280 postgraduate students. The workload per person has reached 14 hours of teaching a week. Moreover, to be promoted to the associate professorship, teachers need to publish

at least five international journal articles listed in the Social Science Citation Index (SSCI) or Chinese key journal articles listed in the Chinese Social Science Citation Index (CSSCI) as well as a book. In addition, they have to apply for the research grant at the provincial level. Under such an evaluation scheme, they are confronted with huge pressure of promotion and the tenure track of employment. The present study sought to investigate how these teachers exercise agency and take agentic actions in order to cope with these challenges. Therefore, SCLE was selected as the research site for data collection because it was suitable for us to conduct the investigation into individual CSL teachers' relational agency.

We adopted purposive sampling method in the data collection and recruited three focal participants on a voluntary basis. Our selection was based on the following criteria: first, these CSL teachers were active and agentic academics. All in their mid-thirties and with doctoral degrees prior to joining this school, they actively engaged with research and teaching by publishing high-quality papers and participating in academic activities. In this sense, they have fully experienced the phenomenon being studied (Creswell and Poth, 2018). Second, they were all pre-tenure novice teachers, and aspired to advance their professional development, and become top scholars in their field of research. Such a shared vision for the furture and imagined professional identity may well demonstrate that they were agentic in taking up their research duties. The following table (see **Table 1**) presents their basic background information.

The study combined the procedures of concentric circles (CC) interviews (Waes and Bossche, 2020) and life history interviews (Creswell and Poth, 2018) for "a qualitative reflection exercise" (Langler et al., 2020, p. 54) in our data collection. Data were collected through conducting three rounds of individual CC interviews with the teachers over three months. Each interview lasted about one and a half hours. We strictly followed the protocol of CC interviews and combined with life history interview questions at times when necessary. Altogether interview hours were 8 hours.

Concentric Circles Interviews. The purpose was to map out the teachers' personal networks and delineate the interactions between their evolving relational agency as well as the ways to use these relational resources in the network. While different from other types of social network research that have often been criticized for emphasizing on quantitative features and lacking the examination on the quality of social relations (Bellotti, 2014), CC interviews explore the type, quality and the affective or the instrumental nature of the social relationships. Through visual presentations of the participants' network, we can therefore identify the relational resources and probe into the dynamic interactions in order to gain a holistic and insider view of the three focal teachers' relational agency. There are three steps during the CC interview process: (1) boundary setting: the nominalist approach was applied (Langler et al., 2020) to set the boundary specification and focus on the teachers' immediate relations which contributed to her academic achievements and growth. The first author asked the participants to talk briefly

FIGURE 1 | Adapted from concentric circle (CC)map. Source: Van Waes et al. (2015).
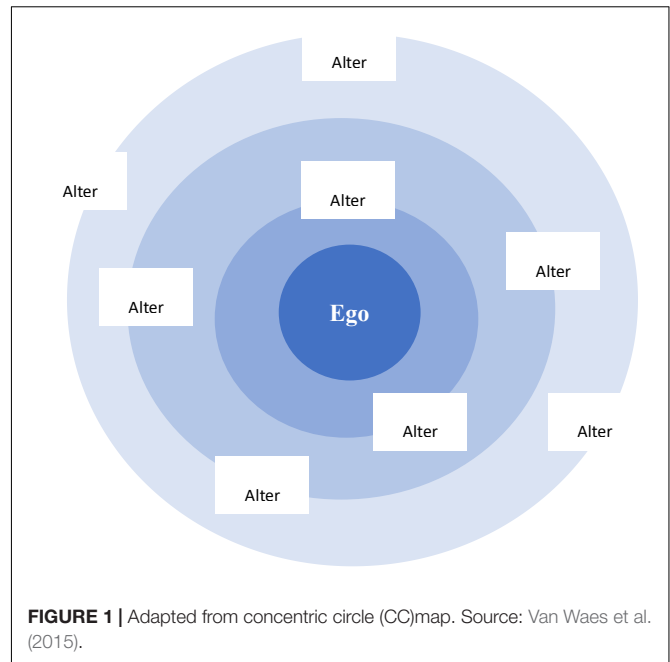
about their educational background and academic experience as a way to collect their academic life history and help them to think about the chosen alters. Then, they were asked to generate the names from the boundary of their personal network and stick the notes of their names on one of the three circles according to the strength of the relations and degree of impact. Finally, they gave the proxy reports about the attributes of the alters on the concentric circles, such as the composition of the relations, the proximity, and types of support. Moreover, they supplied the information regarding the properties of ego-alter ties such as emotional closeness, duration of acquaintance, frequency of contact and degrees of impact (Marin and Wellman, 2011). They further delineated the specific content of their personal relations, vicissitudes and narrative incidents which were perceived and valued as important for them to make agentic choices and take agentic actions in their academic pursuits.

In order to follow the procedure, we started with a piece of A3 paper, a pencil and some sticky notes. The piece of paper contained a central dot which represented the participant (the ego) and three layers of concentric circles (**Figure 1**). The participants were asked to imagine themselves at the center of these circles and then identify and place the stickers on either the inner circle and middle circle. Till the end of the interview, participants were asked to put stickers on the circles. For example, they placed in the innermost circle the names of the alters who had the greatest impact on them. Those whom they did not feel very close but still fairly important were on the middle circle.

Life-History Interviews. These interviews were self-retrospective and focused on tracking the possible changes in the participants' personal relations with their chosen alters. The life-course notion of agency may be achieved from the combination of context and time (Eteläpelto et al., 2013; Tao and Gao, 2017). In the form of spatiotemporal space, it is important to explore the

Pseudonym	Age	Weekly Chinese language teaching hours	Research directions	Number of Publications
T1	34	Undergraduates: 8 hours for three courses Postgraduates: 6 hours for two courses	Chinese as second language teaching	5 articles published in journals listed in SSCI
T2	31	Undergraduates: 10 hours for four courses Postgraduates: 4 hours for one course	Chinese phonetic acquisition, Chinese language assessment	3 articles published in journals listed in CSSCI
T3	32	Undergraduates: 8 hours four courses Postgraduates: 6 hours for 2 courses	Chinese language experimental phonology, Chinese phonetics, psycholinguistics	4 articles published in journals listed in SSCI

choices and actions that they took in the fluid and evolving structure of personal networks. Thus, better understanding was achieved as to how these agentic language teachers constructed their life course by making use of the opportunities and constraints offered from history and immediate social contexts (Emirbayer and Mische, 1998).

Written Reflections. The participants were also asked to write down their reflections about why and how they developed social relationships with people in their network. Each participant was required to write eight entries of reflections. Altogether there were 24 entries. Through data reduction, 22 entries were used as the data source for triangulation to supplement the missing information about their narratives and kept a record of their various forms of interactions with the people they placed on the concentric circle map (May and Perry, 2014).

The concentric circles interviews combined with life-history interviews were analyzed using thematic analysis to identify agency enacted from various relational resources and the level of impact of these resources on agency enactment (Waes et al., 2016). Then the interview data was converted to three matrices so as to extract and signpost the most salient themes between ego and alters (Miles et al., 2020). Saldana (2016) thematic analytic approaches was used to focus on interrogation, connection, synthesis and abstraction of the data. The first round of concept coding was conducted on the matrices with a focus on the type of support and the development of teachers' agentic capacity. The broad themes emerged so that the interview data was reorganized into transcript according to emerging themes. The second round of narrative coding analysed the incidents behind the descriptive data. After several rounds of iterative coding, three types of relational resources were identified for agency to develop: value guidance, emotional support and academic support (**Table 2**). The three researchers read through the codes and themes back and forth several times in order to achieve consensus and to ensure the inter-rater reliability of the data analysis. It is worth noting that while collective agency is often exercised from the colleagial collaborations within the professional communities (Tao et al., 2020), our investigation into participants' relational agency tapped into the complexities of their all-round social lives beyond the professional milieu.

TABLE 2 | Relational resources that emerged in the process.

Relational resources	Indicators of enacting relational agency
Value guidance	• Values, beliefs, working attitude, working style • Working attitudes and style as exemplary role model • Praises and encouragements
Emotional support	• Affective empathy • *tucao* (venting and whining) • Life support from family members
Academic support	• Co-publishing • Group study • Supervisors' academic supervision • Supervising postgraduate students

FINDINGS

In light of the analysis of the concentric circles and life-history interview data, three types of relationships which the focal participant developed in their personal network were identified, namely, projective relationship, expressive relationship, and instrumental relationship. Moreover, relational resources gradually emerged in the form of value guidance, emotional support and academic support from each type of these relationships. To be more specific, the findings revealed that: (1) the participants were inspired by their previous teachers, supervisors and family members who offered value guidance by sharing their educational philosophy, exemplifying their work ethics, and offering encouragements; (2) they received emotional support from their family members, close friends and colleagues who exerted a positive effect on their emotional well-being; (3) they also received academic support from research fellows who encouraged them to engage in interactive learning through scholarly activities and reflective practices. In this section, the findings will be presented to illustrate how they appropriated these relational resources to their advantage.

Value Guidance From Projective Relationships

The analysis identified the projective dimension of relational agency as fairly salient in regard to unpacking the dynamic

interaction between the resources in the personal networks of the focal participants and the ways they utilized these resources. More specifically, such a projective dimension of relational agency was displayed in the form of value guidance, which can be regarded as a type of relational resource. The participants strategically appropriated and agentively sought these resources in pursuit of their career aspirations. These relational resources were generated from the personal network they constructed from their concentric circles, for example, their parents, previous teachers and doctoral supervisors as well as the faculty dean in the department. These people in their innermost circle greatly influenced their decision making and helped enhance their capacity to act by sharing their value beliefs and educational philosophies, exemplifying their work ethics as role models, and offering constant encouragement. Through such value guidance, the participants developed projective relationships that enabled them to become the type of scholars they aspired to be (Pantic, 2015; Priestley et al., 2015). T1's concentric circles map in **Figure 2** may serve as an illustration. According to the degree of impact, T1 placed husband, undergraduate teacher Sarah, and parents in the inner circle. Former Ph.D. supervisor, SCLE study group and postgraduate study group were put in the middle circle.

First, parents and teacher's educational philosophy served as the compass to guide the participants' scholarly pursuit and confirm their decisions of being a university teacher. **Figure 2** showed that T1 considered her parents and teacher Sarah as the most inner circle in her personal network, who shared their educational philosophy with her and helped her to choose the scholarly road. She received her parents' value guidance when she was at life turning points, such as choosing the university major and continuing her postgraduate study. She benefited from their educational philosophy and enjoyed the freedom of life decisions:

[1] My parents are liberal and supportive. They believe interest gives people everlasting learning momentum. Most parents persuaded their children to major in economics or finance which seemed have a good job prospect. But my parents cared most where my interest located. I am fond of Chinese, history and geography. With their support I chose Chinese language education as my major (CC interview).

Another influential person to T1 is Teacher Sarah, who taught a year-four undergraduate course *Critical Reading* and offered

FIGURE 2 | T1's CC map.

advice to T1 on her decision to continue her postgraduate study. T1 reflected in the following excerpt that she had no idea of critical reading and thinking before taking Sarah's course as she was the first to guide students to challenge and critique the published articles:

[2] Sarah's own research was groundbreaking. She was a teacher with charisma, talking with sense and bringing students new perspectives and enlightening ideas. Upon graduation, I found I had many potential research topics, so I decided to carry on postgraduate study. Up to now, she still influences my teaching to be pin-pointing and evidence-based (life history interview).

Similarly, T2 shared with us her appreciation of her father's firm belief in the values of academic work and much encouraged by her father's perception of women's role in the academia:

[3] My father works in university as a scholar himself. He gives credit to this profession. That's why he fully supported me to be university teacher. He has high hopes on my academic achievements. Other parents may think when their daughters reach thirties, they should give birth first. My father never thinks so. He asked me not to let my academic work delayed by bearing a child (life-history interview).

Second, the participants' previous Ph.D. supervisors set an exemplary role model for them, because they shared their work ethics that underscored the importance of being serious toward teaching and research. For example, both T3 and T2 both highlighted the word "seriousness" during the interviews to describe their supervisors' working style.

[4] T3: I was strongly influenced by my supervisor's serious working attitude. He was the elite scholar in our field, because he was extremely hardworking and was the most meticulous person. When he read my draft, he even corrected my punctuation and article use (CC interview).

[5] T2: My supervisor was a serious person at work. He discussed with me the problems in my research project and taught me how to revise. We kept close and intensive interactions. I had to keep up with his serious working style and dared not be lazy (CC interview).

The above excerpts showed that the participants appreciated their work ethics and followed their value guidance to fulfill the tasks. The projective relationship thus shaped their work ethics and motivated them to become serious and responsible scholars.

Moreover, the positive verbal confirmations from the participants' supervisors or the faculty dean also offered guiding values. For example, T3 mentioned being grateful for the dean's encouragement toward early-career teachers' enthusiasm in research as the CSL teachers in the department had fairly heavy teaching loads and usually did not have much time for research. She felt encouraged to engage actively in research. Therefore, the encouragement from supervisors and the dean generated their working momentum, which in tandem evoked their agentic actions for research progress.

The above analysis showed that as a type of relational resource, value guidance conduces to the enactment of relational agency, which ignited participants' aspirations and enabled them to visualize themselves as becoming their aspired scholars (Hadar and Benish-Weisman, 2019). In this regard, the findings
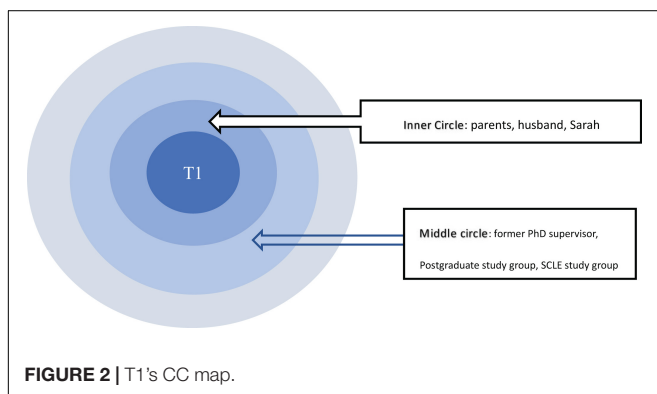
confirmed the importance of the projective dimension of relational agency (Pantic, 2015; Priestley et al., 2015; Annala et al., 2020) as the participants became agentive to make decisions and take actions when being directed and inspired by the people who shared their educational philosophy, exemplified their work ethics, and offered encouragements.

Emotional Support From Expressive Relationships

The data revealed that emotional support was flowing through expressive relationships among the participants' personal networks (Ibarra, 1993; Waes and Bossche, 2020; Yang and Markauskaite, 2021). Emotional support was manifested in the network of kinship, close friends and colleagues. As an evident and important type of relational resource, emotional support was offered through affective empathy, *tucao* (Tao et al., 2020) and life support from family members which had a positive effect on participant emotional well-being. These forms of support may empower the participants to enact their relational agency in expressive relationships. T2's CC map in **Figure 3** showed that husband, father, and close friend Tina were in the inner circle with the highest degree of impact on her, while former PhD supervisor, former post-doc supervisor at the middle circle were also important relational ties to her.

First, the data showed that empathy was usually rendered by those who fully understand participants' hardships. **Figure 3** demonstrated that empathy from people in the innermost circle of her personal network impact her to the greatest extent. These people included her husband and one of her closest friends. She reflected in the interview that her husband's support was empathetic and touching. He was also a university teacher and understood the hard times she had been through. She considered herself as extremely lucky to have such a husband as being able to share all the ups and downs on the journey:

[6] When I got rejections from journals, my husband's comfort was not that important. I have already been used to these failures. But when I successfully published articles and won the research funding, my husband was truly happy for me. That was the biggest comfort to me, because he knew how much this

success meant to me. He understood the deep value of my hard work (CC interview).

The expressive relationship as shown in the above excerpt was built on the basis of their shared understanding of the situations. The empathy from her husband helped T2 to confirm the value of academic work and further enact her agency to strive for the challenging yet rewarding academic profession.

Furthermore, **Figure 3** also showed that T2's high school classmate Tina was another relational resource of her emotional support. They came to the same city for undergraduate studies, which provided them opportunities to be close to each other. But what bonded them was their goal-oriented and enterprising spirits. T2 said in the following excerpt that though they were in different professions, they both had their career ambitions:

[7] We set a goal for ourselves that both of us had to achieve something in our professional areas. When we met, we often talked about our work and what plan we would make for the next step. I cherish to have a friend like her (CC interview).

The empathy between T2 and Tina was mutually engaging. They shared the same working style as being hardworking and enterprising. Their friendship continued and emotional reliance grew stronger on the common ground. T2 confessed if she had not had Tina's friendship, she would have not been so agentic. As such, her relational agency was well sustained.

Second, when the participants confronted failures, challenges and pressure, complaining or tucao was only a temporary reaction because they seemed to be able to dilute their negative emotions and took positive actions in response to the setback quickly. For example, the three participants and the other two male young teachers from SCLE formed a study group. In face of the challenging university promotion policy, they were all anxious to get promoted to the associated professorship, but none of them succeeded. Though they complained about the policy, they soon found complaints were useless and got down discussing the ways to meet these tough requirements. Relational agency was thus enacted by taking concrete actions.

Third, family members in the innermost circle of network reduced the participants' emotional burden to a great extent and made sure they were able to keep engaged in their research practices by helping with the household chores and problems. For example, T1 shared that her husband took good care of the family so that she was able to concentrate on the revisions of her paper:

[8] I told him I received a feedback from the journal and had to finish major revisions within a month. He supported me without any complaint, took care of our 8-month-old daughter and did all the housework. This was the most invaluable support to me as a woman researcher. My nerves were greatly pacified. I then completed the task in due course and got the paper published (life history interview).

Such support from the husband also made the participants feel respected. T1 was sent by the faculty to teach Chinese in the Overseas Confucius College in the United States. Her husband was again supportive for her decision to leave the family for 1 year, as he knew it would benefit her professional development. T1 confessed such respect was precious to her, and served as the bedrock which helped solve real problems and offered encouragement.
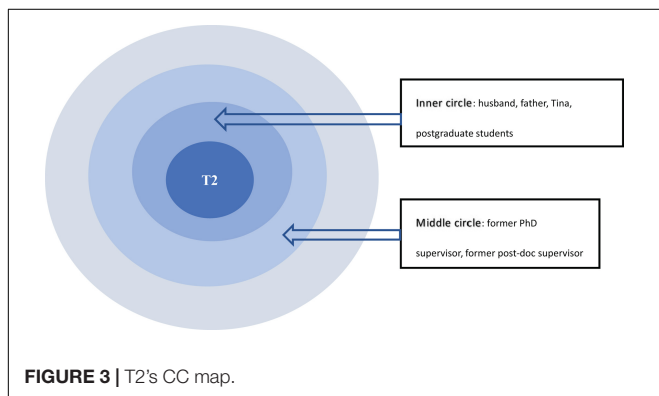

FIGURE 3 | T2's CC map.

The findings revealed that expressive relationships may generate agency for teachers to release from anxiety and move toward their goals with agentic actions. It is worth noting that *tucao* was identified within a teacher learning community as the instant emotional comfort. The emotional support in the present study extended from the whining and venting form of *tucao*, which played a significant role in enacting participants' relational agency. Participants utilized relational resources through *tucao* of this type for affective empathy and practical solutions in response to different challenges.

Academic Support From Instrumental Relationships

The data revealed that the intellectual dimension of relational agency was specifically enhanced by different types of academic support as a dynamic form of relational resource in participants' networks to shape instrumental relationships. Academic support encouraged interactive learning (Edwards, 2005) when the participants were engaged in research collaboration, group study and academic supervision. These scholarly activities (see **Figure 4**) constructed a mutually constitutive personal network by means of sharing and building their distributed intelligence and expertise (Edwards and D'arcy, 2004; Yang, 2021).

First, research collaboration connected the participants with coauthors by making joint efforts to meet deadlines and fulfill the tasks. They were able to enhance their relational agency by combining their distributed intelligence. For example, T3's collaboration with her co-authors exemplified how she received academic support. Peter was her postgraduate classmate who was conducting research in psycholinguistics while T3 specialized in the Chinese phonetics. They combined their expertise and used the psycholinguistic approach to investigate the Chinese tones. They managed to publish two journal papers using the interdisciplinary perspective. Likewise, T3 worked with her boyfriend Mark in the same way by expanding their research scope across interdisciplinary fields. Mark worked in the theoretical construction of linguistics with no experience in conducting empirical research, so they combined their research expertise and published an article. Thanks to their swift actions and fast working pace, their research collaboration went very well, as T3 shared in the interview:

FIGURE 4 | T3's CC map.

[9] Peter and I are both quick in action and collaborate for clear shares of tasks. He wrote the literature review, and I finished the experiment and wrote up the research findings. We then worked together to write the discussion for a few days. Then the first draft was done. Mark is remarkably swift in action. I can't write when I am occupied with different tasks and need a week free of any burden to write. Mark just sits down and write right away. Both of us have our own working pace (CC interview).

Figure 4 showed that Peter and Mark were in the innermost concentric circle of T3's social network and relational agency was enacted through the goal-oriented collaborations, well-distributed research expertise and compatible working pace. This mutually constitutive relations helped them to make agentic choice and actions (Billett, 2006a; Toom et al., 2015).

Group study enhanced interactive learning and collaborative inquiry where expertise was effectively distributed and shared within the groups. T2 said she benefited from her postgraduate group study:

[10] In the group, every one has to share their own research expertise. I used to present how to use SSP for variance analysis. Some group mates were good at statistics of non-parametric tests and taught us this analytical skill. I stayed in the group after graduation and my research knowledge was updated timely. Recently some group mates have presented the technology of brain electromagnetism; Some shared ERP statistical analysis. We often discuss heatedly during the meetings. Last month I shared my experience of how to write English articles (life history interview).

These interactive learning activities helped to expand the knowledge so that relational agency was enhanced by active participation of sharing and acquiring new skills and technology. In addition, more than knowledge acquisition, group study also shaped inquiry mind and scholarly thinking (Leijen et al., 2020). For example, T1 found that the group study in postgraduate years cultivated her thinking ability:

[11] Three years of postgraduate study influenced me a lot. Every Tuesday we had group study. We had to report what articles we read and discover the deep meaning embedded in the article. I was trained to articulate my thoughts, ask questions, inquire into problems and deepen my understanding. My logic was intensively trained during that time (life history interview).

The study groups provided a favorable environment for knowledge building and intellectual progress. These instrumental relationships involved participants in profound interactions to share expertise and shape an inquiry mind. Thus, relational agency was enhanced in a way that the participants become active learners and researchers.

In addition, the data revealed that the participants kept frequent contact with their previous doctoral supervisors and developed instrumental relationships with them because the academic support from their supervisors helped cultivate their research capacity in the long run and they benefited greatly from critically reflect on their learning. For example, T1 and T3 in the life history interviews talked about their supervisors' strategic guidance. They did not tell the students what to research but let them search on their own. Their patient guidance and strict tutorials finally helped the students identify their research
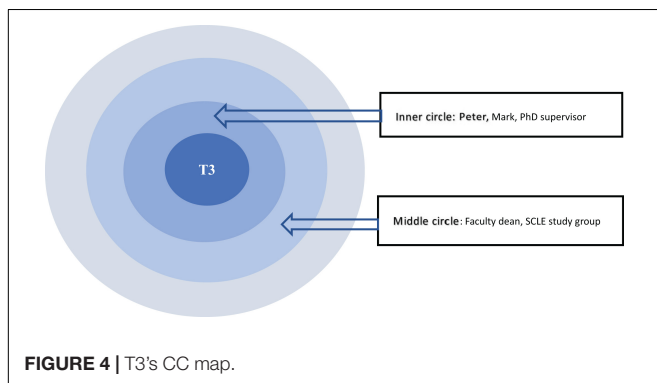
topics. T1 then followed the same style and supervised her own postgraduate students to explore research questions step by step. She argued if the supervisor told the students directly what topic to do and what measures to take, it was quick to complete the task while the students may be left in the mist without fully understanding the subject:

[12] When I guided them strategically, they would form the habit of inquiry and delve into the deep meaning. They might go the wrong way but they would learn from their mistakes and be clearer about what they were targeting (life history interview).

Further, both supervisors and students can improve their academic ability in tandem in the instrumental relationships. T2 regarded supervising postgraduate students as an experience of growing to be a real scholar:

[13] When students decided to do a project, I had to take time to learn and assess the validity of the project. This is challenging but motivating. Also, when students had a different research finding, I needed to find out why they gained different results. This inquiry process was motivating, too. Sometimes their writing was unclear. I had to research what caused them to understand in a different way. After this exploration, I would gain much new insights (CC interview).

The above data showed that the process of being supervised and supervising others engaged the participants in reflective practices (Leijen et al., 2020) and improved their own research capacity. Relational agency was enhanced through research engagement and accumulation of expertise with concerted efforts. Instrumental relationships helped to connect intellectual beings in a mutually constitutive and supportive way. Their reciprocal and collective endeavor became the relational resources not only to shape and strengthen instrumental relationships but also to make agency intelligible and enhanced (Sugarman and Martin, 2011).

DISCUSSION

The present study investigated how three focal CSL teachers exercised their agentic choice/action in their personal networks as being cultivated and empowered to become reflexive and reflective agents for their sustainable professional development. Three types of relational resources were identified through our analysis of their concentric circle networks. These resources were manifested in the form of value guidance, emotional support and academic support, which emerged from projective, expressive and instrumental relationships respectively. These findings confirmed with the previous studies that such relationships highly facilitated dynamic interpersonal interactions (Gergen, 2011; Priestley et al., 2015; Pyhältö et al., 2015; Hadar and Benish-Weisman, 2019). Individual language teachers thus agentively appropriated these resources in different ways to enhance their agentic choice/action capacity through these interactions (Billett, 2006a; Toom et al., 2015). The study contributes to the teacher agency literature in three major ways: It incorporates the method of using concentric circles interviews as one of the predominantly qualitative social network analyses into relational agency research and offers a more articulate picture of the complex mechanisms

behind the agency development. The second unique feature is that the research scope has been expanded to examine the CSL teachers' all-round social life and experiences beyond the traditionally bounded professional community, and therefore achieved a more nuanced and refined understanding of the emergency and development of relational agency mediated by contextual conditions. More importantly, a concentric circles model of individual teachers' relational agency is proposed in an effort to establish an explicit conceptual link between the resources and types of support embedded in the social relationships with relational agency. Future empirical research may consider building on such a model for investigations into language teachers in different societal contexts.

While resonating with Edwards (2015) advocacy for exploring teacher agency from relational and collective perspectives, the study contributes to the literature by expanding the conceptual understanding of relational agency, and argues that relational agency tends to go beyond the psychological interpretation of personal dispositions and the physical boundaries of language teachers' professional communities (Edwards and D'arcy, 2004; Chang et al., 2021). By taking into a fuller consideration of the role that all the important people and resources in their personal social network may play, we delved into depth the different ways that individual teachers capitalized on a diversity of relational resources to enhance their agentic choice and actions as well as the capacity to interact with others (Priestley et al., 2015). The findings suggest that personal network may play a critical role in the development of relational agency to sustain language teachers' professional growth.

First, the study identifies an emerging new type of relational resource in the projective relationship that the participants developed in their social network, in addition to instrumental and expressive relationships (Ibarra, 1993). The findings lend empirical support to the projective dimension in the ecological model of teacher agency (Priestley et al., 2015) and answers the call of Molla and Nolan (2020) to extend the agency research to a wide set of relationships across the boundaries among teachers' professional and personal networks. Our analysis has demonstrated that the projective relationship plays a fairly salient role because the enactment and enhancement of relational agency may be mediated by the value guidance from this type of relationship with parents, previous supervisors and the faculty dean in the innermost circle of the participants' network. By sharing their own values and aspirations (Annala et al., 2020), these people provided guidance oriented toward the future by imparting their educational philosophy, exemplifying their work ethics, and offering encouragements. The study suggests that the personal network may help visualize a diversity of projective relationships and thus supports Hadar and Benish-Weisman (2019) that values and aspirations relate to agentic capacity and can be applied to enhance teachers' agentic behavior and actions and consequently reshape their identity commitment as to become aspired scholars (Priestley et al., 2015; Tao and Gao, 2017).

Second, while echoing Zappa-Hollman and Duff (2015) identification of affective support in the individual network, our study further unveiled "the inherently social, affective, and

human nature of the networks" (p. 360) through the combined procedures of concentric interviews and life history interviews. We argue for an expansive form of emotional support provided timely by the participants' family members, close friends and colleagues. These people in the expressive relationships shared their understanding of and respect for language teachers' work situation and demonstrated considerable empathy toward them. For example, T2's husband understood the deep values of her academic work; her best friend Tina strongly aligned with her working spirits as being goal-oriented and enterprising. The empathetic nature of the emotional support emerged from their concentric circles greatly encouraged them and well sustained their relational agency. The findings also complement Tao et al. (2020) taxonomy of *tucao* in the way that teachers may go beyond merely venting and whining about things by resorting to the relational resources and adopting practical strategies to cope with challenging situations. Consequently, they were able to release pressure and felt emotionally supported at the same time. Additionally, our study indicates that family members' timely and practical solutions of some urgent problems in life provides these teachers with an alternative form of emotional support so that they can stay focused on research without being distracted. Such action support has reduced the female teachers' dual duties of having to usually juggle with work and effectively enhanced their emotional well-being for robust academic growth.

Moreover, the findings have highlighted the importance of collaborative inquiry between the language teachers and the people in their personal network, which may considerably enhance their agency to engage in research practices by sharing distributed expertise, building knowledge together and developing the ability to ask critical questions (Edwards and D'arcy, 2004; Toom et al., 2015). Through such collaborative inquiry, they received academic support from the instrumental relationships that they developed in their concentric circles network. For example, T3 was highly motivated by research collaborations with Peter and Mark and managed to publish papers in journals. Nevertheless, such interactive learning does not remain at the level of knowledge building and expertise exchange but are extended to engage teachers in cultivating their inquiry ability. Both T1 and T2 reported their critical thinking and research capacity were improved because of their active participation in group studies and academic supervisions. The study highlights the importance of critical reflective practices on learning as being emphasized by Leijen et al. (2020) who called for effort to strengthen the conditions for achieving teacher agency. Furthermore, in accordance with Luo and Hyland (2021) tenet to assist researchers to identify and use networked resources, the findings point to the need for language teachers to consider developing a social network from which they seek potential research collaborators and construct instrumental relationships that may provide them with immediate academic affordances.
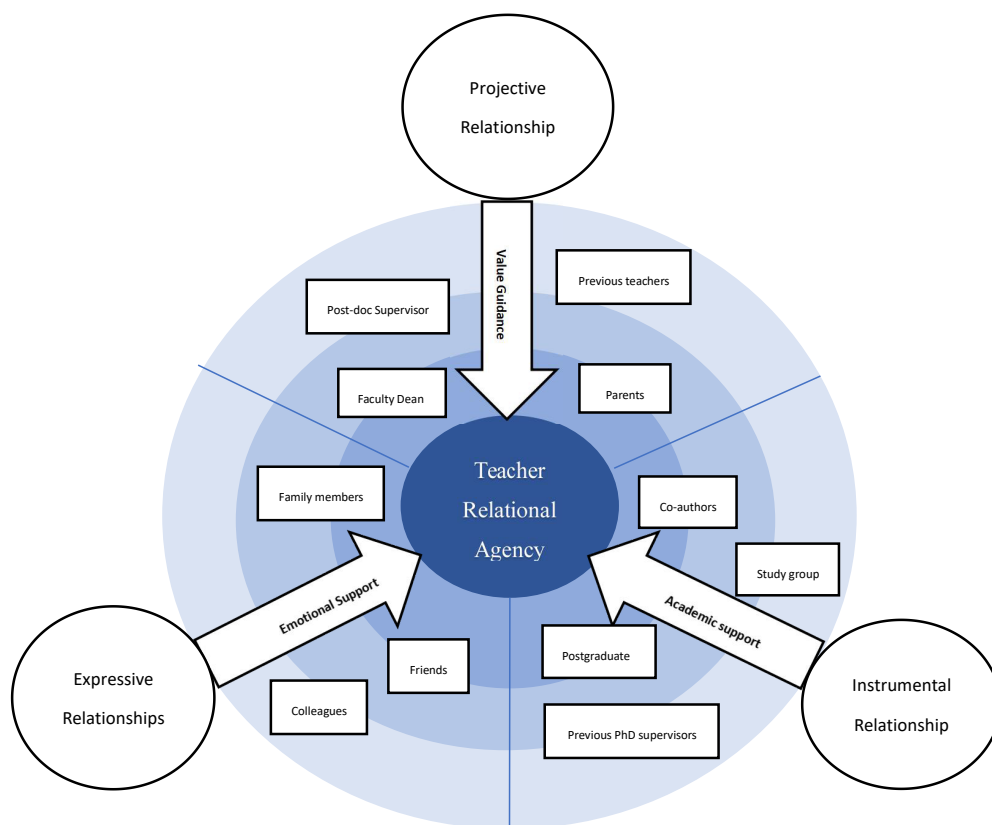

FIGURE 5 | A concentric circle model of relational agency.

Thus, we may reasonably speculate that with these affordances and resources, teachers can be agentively engaged in the process of collaborative inquiry that may go beyond merely knowledge building but more importantly, cultivate them to be active agents of inquiry.

In light of the above findings, a concentric circle model of individual teachers' relational agency is proposed in **Figure 5** that reflects the dynamic interaction between language teachers' relational agency and their personal network. The three concentric circles in different shades denote the strength of the relations and degrees of impact, which are imbued with the dynamism of individual teachers' social participation and interactions. The inner circle signals the most intensive degree of interaction and the strongest impact, whilst the middle circle and the outer circle are of relatively lower level of interaction and impact.

As displayed in the model, three types of relational resources are manifested in the form of value guidance, emotional support and academic support and may emerge from the projective, expressive and instrumental relationships respectively. Value guidance is usually provided by people with a high social and academic status as well as abundant social experiences so that they can impart their educational philosophy, exemplify their work ethics, and offer encouragements to enhance language teachers' agentic capacity (Annala et al., 2020). Emotional support may be provided by their family members or people who can understand the value of their work, respect their work situation, demonstrate considerable empathy and offer action support. Relational agency achieved from this type of support not only sustains teachers' emotional well-being but also enhances their agentic actions to achieve goals. People who provide academic support offer research assistance for collaborative inquiry may help enhance their agentic capacity to engage with other academics for knowledge sharing and research collaborations. No matter what relational resources individual teachers appropriate and utilize, the model can effectively visualize and conceptualize how relational agency emerges and develops through multi-layered constructions of relationships. Future research may consider using this model to continue the inquiry into language teacher relational agency situated in individual teachers' personal networks.

CONCLUSION

This study explored the ways to empower CSL teachers to achieve their academic goals and sustainable professional development through the theoretical lens of relational agency enactment in the personal networks. More specifically, it examined the multi-layered relational resources embedded in the concentric circles network that constitutes their professional communities and life world. Moreover, the type, extent and nature of these relationships in terms of the degree of relational impact was investigated. In light of the findings, the projective, affective and instrumental dimensions of the social relationships were identified, from which relational agency gradually emerged from the language teachers' engagement in the interpersonal interactions.

The study has thus demonstrated the conceptual and analytical strength of personal network in teacher relational agency research that contributes to our understanding of language teachers' relational agency. It provides practical implications for language practitioners and educators to understand how to enact and enhance relational agency so as to sustain their professional development. The findings also confirm that such efforts are fairly important because fostering appropriate relationships in teachers' professional life has become a prerequisite for teacher agency to emerge and develop. Language teachers are encouraged to interact with people who may render value guidance, emotional and academic support so that these relational resources not only shape conducive relationships but also enhance their agentic capacity to make decisions, meet challenges and agentively fulfill their academic aspirations.

We thus call for more efforts to purposefully enhance relational agency of university language teachers by creating opportunities and spaces for quality interpersonal interactions so as to empower them and build their career as aspired academics. More than that, separate attention and efforts should also be paid to university CSL teachers in order to generate theoretical and practical implications for relational agency research. By so doing, we hope CSL teachers' professional competence can be enhanced and their identity commitment as scholars in response to various educational changes reshaped. In this sense, the research may contribute to the limited and even peripheral CSL teacher agency research by deepening our understanding of Chinese language teachers in the local educational context.

This study is a retrospective small-scale exploration based on the research of three CSL teachers' personal networks. As the findings may not be generalized to a wider scope of academic lives, future studies are to be conducted on CSL teachers as well as other different types of language teachers in a variety of pedagogical contexts including teacher education and development programs in order to gain a holistic understanding of the development of language teacher relational agency. It is nevertheless hoped that the present study will encourage university CSL teachers and other language teachers become resourceful academics with agentic capacity to take initiative and participate in social interactions so as to enhance the dynamic interplay between relational agency and the immediate social context.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Shanghai International Studies University.

The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

WY conceived and designed the study, collect and analyzed the data, and wrote the manuscript. CL conceived, designed the study and wrote the manuscript. XG conceived the study and offered suggestions for revisions. All authors contributed to the article and approved the submitted version.

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Factors Affecting Online Chinese as a Foreign Language Learning Stickiness: A Study on International Students in China

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This study explored international students' online Chinese as a foreign language learning stickiness in a Chinese university context. A new theoretical model was designed and verified to serve the mixed-method investigation. Participants were a group of 194 international students learning CFL online in a Chinese university. Data were collected through an online questionnaire for all the students and semi-structural individual interviews with eight volunteer participants. The structural equation modeling was conducted to analyze the collected quantitative data, and content analysis was used for the qualitative interview. Findings revealed that the online learning stickiness was significantly impacted by students' learning expectancy confirmation, which was closely correlated with three key factors: academic integration, social integration, and technological factors. Moreover, social integration was found to be a direct contributor to learning stickiness. These results highlighted the importance of the high quality of the curriculum, the harmonious learning atmosphere, and the need for technical preparations and training for online Chinese language teaching and learning. The study also emphasized the need of integrating social interaction into Chinese learning in an online context. Investigation of a wider range of Chinese learners was recommended for future studies on learning stickiness and the new online approach.

Keywords: learning stickiness, Chinese as a foreign language, expectancy confirmation, online teaching and learning, international student

INTRODUCTION

Over the past two decades, Chinese as a foreign or second language (CFL/CSL) has been widely taught and learned within and outside China (Ma et al., 2017; Gong et al., 2018, 2020a,c). Up to 2019, more than 500,000 international students have been enrolled in 820 higher educational institutions across China (Ministry of Education China, 2018). To fulfill international students' academic and causal needs in China, various Chinese language learning programs have been set both in-class and online. In recent years, online CFL teaching and learning has served as an important approach in addition to routine in-class one, helping many international students achieve their language development goals (Jin, 2018; Gong et al., 2020b). However, to achieve teaching and learning CFL online also faces a range of challenges, such as technical problems, learning habits and strategies, and some socioeconomic factors (Simamora, 2020). To keep

students' learning sustainable and to decrease their dropout rates is one of the key considerations for all participants, including administrators, teachers, courseware developers, and students, in teaching and learning.

A dropout in online learning refers to a student that he/she inconspicuously discontinues participation in any learning activities, and he/she will not return to learning in any way in the future (Rodríguez, 2012). Studies have noticed that for most Massive Online Open Courses (MOOCs, such as Coursera, Udacity, and EdX), students' completion rates are only around 10% (Lushnikova et al., 2012; Harrison, 2013), meaning that the overwhelming majority of their online students dropped out. A large-scale investigation of 58 online courses also figured out 86.5% dropout rates of 188,802 registered participants (Scopeo, 2013). A similar challenge is noticed in CFL teaching and learning. Teachers have a complaint about international students' high dropout rates, particularly in an online context (Tsui et al., 2017).

Recently, the concept of learning stickiness is employed to explore dropout issues in the online context (e.g., Chen, 2014; Liu and Pu, 2020). Learning stickiness refers to the ability of online learning to attract and hold the attention of learners (Robinson and Cook, 2018). With high learning stickiness, a student would have a compelling and magnetic reason to engage in learning activities actively and return to learning in the future autonomously (Geer and Barnes, 2006). When a student becomes sticky with the learning, he/she is usually more deeply and frequently involved in learning and practice. Compared with peers, intensive exposure to learning and practices would benefit a sticky learner's language knowledge and skills development in return (Hsu and Liao, 2014).

For online learning, stickiness can serve as an important way to explore students' learning willingness and engagement. Previous studies investigating students' learning stickiness have been conducted in general education contexts (Geer and Barnes, 2006; Xu et al., 2017; Robinson and Cook, 2018). However, few studies have attempted to investigate the factors that may have an influence on CFL students' learning stickiness in an online context. In addition, most current studies have explored students' engagement in learning from a qualitative perspective (Wang et al., 2019). Yang et al. (2018) highlighted the importance of a combination of both quantitative and qualitative methods in the investigation of learning stickiness, particularly in a new online context where several latent factors might be intertwined. To echo the call for facilitating language development of international students in the new era, it is important to explore the factors that may encourage students to become sticky with the new online approach with new designs.

Given the above-mentioned gaps, the present study explored the learning stickiness of international students in an online teaching and learning context. It aimed at figuring out factors that had an influence on international students' participation in online CFL learning activities. The study also examined how these factors interacted with each other, as well as their collective contributions to students' willingness of future engagement in online learning. This hopefully helps students and teachers improve the quality of online courses, select appropriate teaching strategies, and pave the way for sustainable development of online CFL teaching and learning.

LITERATURE REVIEW

Learning Stickiness

The concept of stickiness is originally used to describe the characteristics of commercial websites, referring to the relationship between websites and users. A website with high stickiness often attracts users to visit repeatedly, to spend a long time on it, and to purchase its products and services (Zott et al., 2000). Users, in the meanwhile, are satisfied with the experience. They intend to be "loyal customers," and usually have a greater likelihood of revisiting and reusing their sticky website. A number of empirical studies have been conducted by employing the concept of stickiness in various fields, indicating its uses to reveal the mutual relationship between the provided services and users (Lin et al., 2010; Xu and Liu, 2010). Ways to increase user stickiness were also highlighted in these studies, such as the promotion of the website quality, the quick responses of user services, and the easy access for online users. Drawing from these empirical investigations, it has been generally accepted that stickiness can be used as a key factor to effectively predict the engagement of users in online activities, as well as their willingness of future return to the platform (Lin, 2007).

Online learning shares common points with website visits: students log in, select the content, enjoy the learning, acquire some information, and return in a few days (or never return). In this respect, the concept of stickiness could be extended to the field of online learning. From a learner perspective, with stickiness, he/she usually learns online repeatedly and continuously, with more investment into learning activities before achieving his/her learning goals. From a learning perspective, to increase stickiness, online learning caters for the needs of its "loyal learners": to modify its content in accordance with learners' expectations, to provide user-friendly services, and to help solve potential obstacles. As Robinson and Cook (2018) have elaborated, learning stickiness means the "Velcro sort of relationship" (p. 5) between learning and learners. On this train of thought, the present study used the concept of learning stickiness to explore the mutual relationship between online learning and international students from both the learner and the learning dimensions.

Dropout has long been a concern in language learning for both teachers and students, particularly in an online context where less teacher supervision was implemented (Chen, 2021). Learning stickiness, as one of the external realizations of students' intention of learning desire and engagement, could play a role in predicting students' learning dropout. It hopefully helps teachers and students to locate factors leading to learning dropout and to figure out ways to increase students' stickiness and to get them back to learning activities.

The Theoretical Model

A wide range of studies have investigated online learning engagement, persistence, and dropout, and confirmed that a

bunch of learner factors, such as learner satisfaction, expectation confirmation, and perceived usefulness of online learning, affected learning stickiness (Lien et al., 2017; Yu et al., 2017; Lü and Lü, 2020). Considering the nature of online learning as a kind of repeated game (Alyaz et al., 2017), the present study highlighted the focuses not only on the learner's first attempt at online learning but also on repeated behaviors after acceptance.

It should be noticed that many previous investigations of online learning stickiness largely ignored the non-learner impacts (Halilovic and Cicic, 2013). These factors, such as learning resources, peers, teachers, devices, learning environment, etc., play an important role in online foreign language learning (Lin et al., 2021). Considering the social nature of online teaching and learning, Social Cognition Theory (SCT) can be applied into the context to serve the exploration of learner's engagement from both learner and non-learner perspectives (Bryant et al., 2005). The theory proposes that the learning decision is made in accordance with the influence of a learner's individual factors and his/her involved social environment. Being enlightened by SCT, this study constructs a new theoretical model and classifies the latent affecting factors of online learning stickiness into three dimensions: learning dimension, social dimension, and learner dimension. Based upon a review of current literature, four constructs were incorporated into the model, which are academic integration, social integration, technological factors, and expectancy confirmation (see **Figure 1**).

Learning Stickiness and Its Affecting Factors

Attempts have been made to find factors influencing learning stickiness in various educational contexts. At the early stage, focuses were placed on traditional in-class learning. For instance, Bean and Metzner's (1985) student attrition model and Tinto's student integration model (1993) guided the early attempts of learning stickiness research. Several factors that might lead to low learning engagement and high dropout rates were specified in those empirical studies, including educational environment, learning content, general individual factors, and psychological stats.

However, considering the differences between the new teaching and learning approaches and the traditional ones, these models have "limited applicability" (Rovai, 2003) in an online learning context. Learning dropout of online learners with more individually different elements could be barely explained by old models. Then several new models contextualized in online teaching and learning were proposed and employed for studies on learning stickiness (Guo et al., 2010; Kim and Lee, 2017; Yu et al., 2017; Leem and Sung, 2019). These models attempted to explain and predict the issues of learning stickiness and dropout via four variables, which are individual factors (learner characteristics and skills), learning internal factors (academic integration, social integration, self-esteem, interpersonal relationship, etc.), and learning external ones (financial support, learning environment, available learning time, etc.).

In light of these theoretical models, researchers have conducted a number of empirical studies exploring the secrets of

stickiness in an online learning context from various perspectives: from a learner perspective, Wu et al. (2010a) and Kim and Lee (2017) portrayed typical successful online learners and highlighted the close relationship between learner's satisfaction and learning stickiness; from a learning perspective, Rienties et al. (2014) stressed the effects of introducing qualified academic content to keep students learning, while Lü and Lü (2020) also highlighted the importance of high quality of learning resources in decreasing dropout rate; and from an environment perspective, Willging and Johnson (2004); So and Brush (2008), and Wu et al. (2010b) listed a series of external affecting factors, including time conflict and technology literacy as key factors contributing to online learning stickiness. Others, including curriculum-related factors, like the organization of curriculum, test scores, in-time instructions, and social factors, like peer interaction and teacher supervision, were also found to be responsible for students' stickiness in an online education context (Choi and Park, 2018).

Learning from previous studies, it can be seen that a wide range of factors may impact online learning stickiness, whereas some factors mentioned by previous studies, like learner characteristics and learner skills, might not be applied to learning due to little solid evidence of their significance (Willging and Johnson, 2004). Contextualized in a new online context, investigation of all scattered factors in one study could hardly provide a systematic picture of learning stickiness, nor supply valuable data for further mining on the topic. Therefore, this study introduced a new theoretical model to serve the exploration of learning stickiness in an online CFL teaching and learning context.

In the learning dimension, academic integration was investigated as the main construct. Academic integration includes the quality of courses, teacher instructions, the organization of learning resources, and other learning-related elements (Choi and Park, 2018). This construct focuses on whether online learning could fulfill learners' academic needs, improve academic performances, and elevate learning efficiency. It has been considered as the most basic demand of learners in terms of using the learning platform. Studies have noticed the influence of academic integration on students' decisions of engagement: Lü and Lü (2020) found a positive correlation between academic integration and learners' interests in online learning; Zheng and Chen (2011) confirmed its contribution to learners' satisfaction; Packham et al. (2004) believed that unsuccessful academic integration would compel learners to leave without returning to online learning.

It should be noted that, however, academic integration is assumed to have no direct impact on students' stickiness of language learning. Stickiness is considered as a kind of mutual relationship between learning and students, not just the unilateral loyalty of one party to the other. "Both the student and the activity each provide the relevant surface to which to adhere; for the student to stick to the learning and the learning to 'stick' to the student" (Robinson and Cook, 2018, p. 5). Studies have noticed that the high quality of online learning attracts students to engage with the learning content, but it may fail to motivate students to act or to interact with others (Bhattacherjee, 2001;
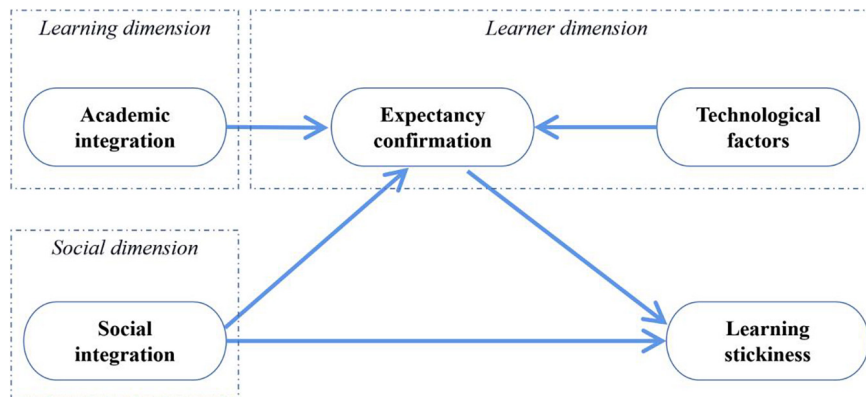
FIGURE 1 | The theoretical model of present study.

Garrett, 2007). That may result in the "one-side stickiness," which is considered as the "incomplete" stickiness (Robinson and Cook, 2018). As the learning dimension focuses on the content and the quality of the learning approach, it is not directly connected with learning stickiness. It is more a concept investigating learners' will and behavior (Waheed et al., 2016). Instead, the learning dimension has an impact on learning stickiness as the learner works as a mediating role. It was hypothesized that with high academic integration, online CFL learning increases learner's satisfaction and recognition, but not directly increases learner's learning stickiness.

Social integration, the interaction between a learner and his/her social environment (Vygotsky, 1978), has been widely recognized as a key facilitator in cognitive development. For foreign language learners, social integration usually creates a supportive environment by incorporating social interaction into learning, including peers, teachers, and extern supports. Studies have indicated the influence of social integration on increasing learning stickiness in an online context: Jiang et al. (2010) believed that interaction with others in an authentic social environment could positively affect online user's trust and engagement in the platform; Wu et al. (2011) found that online interaction increased learner's confidence, motivation, and ability, leading to their willingness to engage in future learning; Yang and Lin (2020) highlighted the importance of interaction as well. In the respect of the social dimension of online foreign language learning, social integration is considered as a key element regarding learners' stickiness.

In the learner dimension, two major constructs were examined in the present study. Technological factors are the basic conditions for online learning. A wide range of factors regarding learning access and support, such as affordable devices for online learning, a stable Internet-connected learning environment, and learners' technical literacy, are latent affecting factors, leading to different learning engagement, experiences, and performances (Rovai, 2003). Although these factors are not directly related to foreign language development, they may result in learners' active or passive withdrawal from learning (Pierrakeas et al., 2004). Learning stickiness is about students' repeated and continuous

engagement in learning activities (Robinson and Cook, 2018). While technological factors may have an impact on students' learning experiences, these factors are not directly affecting learning stickiness for students may find the best ways to access online learning by evaluating their Internet connection and hardware conditions (Chen, 2014). Otherwise, they would abandon the learning after the first or second attempts, instead of investing in learning repeatedly. Assuming their influence on learning stickiness in an online context while this impact is not direct, this study framed technological factors into the model.

Expectancy confirmation is also a factor to assess to what extent online learning could fulfill its learner's expectations. Keengwe et al. (2012) figured out a positive connection between learner's expectancy confirmation and satisfaction, and suggested that learning expectancy confirmation led to learner's retention; Alshurideh et al. (2020) found that expectation confirmation affected students' intention to engage in mobile-based learning; Wang et al. (2021) also draw a similar conclusion in an empirical investigation in China. As Craig et al. (2008) has claimed, when a learner's expectations of online learning are high, he/she will recognize the quality of the learning content, and have active engagement in learning; and in turn, a learner decides to stay when the expectations are achieved through his/her learning with qualified resources. Expectancy confirmation plays a central and mediating role in the emergence of stickiness in students' learning process. Besides, technology-related factors can also have an impact on students' realization of their learning expectations, which may be an affecting factor of their final decisions of persistence in learning. Enlightened by previous studies, the present one incorporated the construct of expectancy confirmation into the framework.

Although there is an extensive body of literature in learning stickiness and factors that may have some influence on it, focuses are seldom paid to a CFL area. Learners, teachers, and educators of CFL have been worried about online learning dropout for a long time, while not many empirical studies have been conducted, with fewer theoretical models being incorporated. Considering these gaps, the present study used the new theoretical model and addressed two research questions below:

RQ1: What factors influenced online CFL learning stickiness of international students in China?

RQ2: What were the relationships among these affecting factors of online CFL learning stickiness?

METHODOLOGY

Research Context and Participants

A total of 200 international students enrolled in a typical public university located in southwestern China voluntarily participated in this empirical study. As a center for Chinese language and culture education, this university provides a wide range of online and offline CFL programs, courses, and resources for international students with diverse educational backgrounds and different native languages. Up to the commencement of the study, all of them had passed Hanyu Shuiping Kaoshi (HSK) Level 5, which is equivalent to Advanced-Mid to Advanced-High of American Council on the Teaching of Foreign Languages (ACTFL). **Table 1** shows the demographic information of the student participants (194 valid responses).

To capture international students' experience and perceptions of their engagement in and withdrawal from online CFL learning, individual interviews were employed in the present study. After their accomplishment of the questionnaire, eight volunteer students with different educational backgrounds and CFL learning experiences were selected and interviewed. The details of the interviewees can be seen in **Table 2**.

Online Comprehensive Chinese courses were investigated in the present study. The courses were compulsory ones for all international students in the university. Students' all four language skills and their knowledge of the Chinese language, history, and culture were trained and improved in the courses. The courses were selected for the study could cater for international students' overall language development, and provide a complete picture of their online language learning of different content. Student participants attended the courses for at least 6 h per week. WeChat and DingTalk were employed as the major tools for online teaching and learning. Affected by the COVID-19 pandemic, all participants had been learning CFL online for at least 1 year. They were supposed to be familiar with the online approach with abundant experiences and personal thoughts on it.

Instruments

Researchers have claimed that a mixed-methods study that combines both the quantitative and qualitative methods is a promising direction for learning stickiness research; hence, this method deserves academic attention (Alshurideh et al., 2020). A mixed-method research design was adopted in the present study, because of its value to achieve an elaborate and comprehensive understanding of international students' learning stickiness in an online CFL context. An online questionnaire for all the participants and semi-structural individual interviews with eight volunteer students were employed. This study adopted a mixed-methods approach. The quantitative data were collected

TABLE 1 | The demographic information of participants (*n* = 194).

Item	Classification	Number	Percentage
Age	Under 20	60	30.9%
	20–29	107	55.2%
	30–39	22	11.3%
	Over 40	5	2.6%
Gender*	Male	71	36.6%
	Female	120	61.9%
Major	Botany	16	8.2%
	Computer science	28	14.4%
	Economics and finance	71	36.6%
	Education	45	23.2%
	Engineering	11	5.7%
	Psychology	23	11.9%
L1 background	English	41	21.1%
	French	50	25.8%
	Spanish	25	12.9%
	Arabic	33	17.0%
	Thai	18	9.3%
	Others	27	13.9%
Experience of CFL learning	1–3 years	47	24.2%
	4–6 years	59	30.4%
	7–9 years	64	33.0%
	More than 10 years	24	12.4%
Experience of online learning	1–2 years	38	19.6%
	3–4 years	88	45.4%
	5–6 years	45	23.2%
	More than 7 years	23	11.9%
Online accessibility and hardware conditions	Excellent	77	39.7%
	Average	86	44.3%
	Poor	31	16.0%

Three participants preferred not to mention their gender in the questionnaire.

via an online questionnaire and analyzed first, and then, the qualitative data were used to explain, clarify, illustrate, and elaborate on the quantitative findings (Dornyei, 2007; Ivankova and Creswell, 2009). The qualitative data from interviewees' descriptions could play a role to figure out what lied behind an educational issue from a learner perspective. Evidence from different data gatherings and analysis methods enhanced the internal validity of the research, which could provide a solid basis for data triangulation in a technology-based context to minimize misunderstanding and to enhance the data validity (Ashour, 2018).

The questionnaire surveyed the student participants' experiences and thoughts on learning stickiness and dropout in online CFL learning. Items were developed by referring to numerous prior relevant studies and modified in accordance with the theoretical model of the current study and the online CFL teaching and learning context. Items for academic integration were derived from Lin (2007) and Wu et al. (2010a). Items for social integration were mainly extracted and modified from Chou and Liu (2005). The technological factors were surveyed via items developed from Venkatesh et al. (2003) and Wu et al. (2010a).

Pseudonym	Age	Gender	Nation	Major	Experience of CFL learning	Experience of online learning
Geng	31	Male	Korea	Economics and finance	15 years	2 years
Qiu	21	Female	Thailand	Computer science	11 years	2 years
Bai	22	Female	Malaysia	Economics and finance	8 years	5 years
Yang	18	Female	Russia	Education	5 years	4 years
Jiang	20	Male	Egypt	Engineering	3 years	3 years
Chen	24	Male	Canada	Psychology	4 years	7 years
Liu	22	Male	Vietnam	Education	4 years	1 year
Zhang	41	Female	Chile	Botany	10 years	3 years

Items for learner's expectancy confirmation were elicited and modified from Chiu et al. (2005) and Wu et al. (2010b). Items for learning stickiness were consulted (Chen, 2014) in developing the questionnaire as well.

The initial questionnaire was refined through iterative consultations with two experts in the field of educational psychology. The process enabled the researcher to gauge the clarity of the instrument and to verify that the items could convey the actual intention of the study. This process continued until no further questions were raised. Minor changes were made to the initial version. The revised questionnaire was employed in the formal investigation of the present study. The final questionnaire for the study investigated the participants' perceptions of online CFL learning stickiness for each latent factor through 20 items. All items are measured via a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Considering the different native languages of all participants, who were from various countries and regions across five continents, the Chinese language was used in the online questionnaire. To ensure that all participants could correctly understand the items, the questionnaire was elaborately prepared for it could best suit participants' current Chinese abilities. Five students with the same language level were invited before the formal investigation to answer the questionnaire. They were asked if they could fully understand the items. Then words and sentence patterns were revised in accordance with their responses. Besides, before the commencement of the online questionnaire, the researcher carefully explained the items to all participants in a tutorial class. That could minimize the misunderstanding of the questionnaire caused by participants' language abilities and knowledge. The questionnaire included information about the procedure of the study and participants' right to refusal. All respondents in the survey were informed that their participation was voluntary. They could withdraw from the study without reason. Their participation would not affect their final grades in the online course. Return of the questionnaire indicated students' consent to participate.

The semi-structural individual interviews with eight students focused on their reflections, considerations, and perceptions of learning engagement and dropout in the online context. Guiding questions were set based upon the theoretical model and developed and modified by referring to student participants'

responses to the questionnaire. The interviews in the present study were organized by referring to the theoretical model and research questions, which allowed room for students to talk freely about their experiences and viewpoints of their online CFL learning.

The interviews were expected to provide some qualitative details about online learning stickiness from the eyes of students to enrich the study. Most previous studies on learning stickiness were conducted from a teacher perspective (Yang and Lin, 2020; Wang et al., 2021). As suggested by Chen (2014), investigating learning stickiness and dropout from a learner perspective is necessary as learning stickiness involves a bunch of learner and social elements related to the individual learning decisions. Incorporating interviews with students into the current study could hopefully take the learner and social dimensions into the investigation and provide a full picture of online learning stickiness. It could help answer the questions that how these latent student-related factors might affect their learning stickiness from multiple perspectives. Therefore, interviews with student participants were adopted in the present study.

Data Collection

To address the two research questions and to enhance the quality of the mix-method research, the empirical data were gathered via an online questionnaire and individual interviews at the end of the spring semester of 2021, when participants had finished at least 1-year online CFL learning. All participants were invited to the survey on a voluntary basis. For each item, respondents were asked to circle the response that best described their level of agreement. They were told that there were no correct or wrong choices in the questionnaire, and their anonymous participation was irrelevant to their grades for the courses as well. By comparing some of the early responses and the late ones of the survey, potential non-response bias was eliminated, as no statistical significance was found in the chi-square values ($p > 0.05$). Eventually, a total of 194 valid questionnaires (97%) were returned to this study.

After the collection and initiative analysis of the raw data from the questionnaire, eight sessions of individual interviews with students were administered. Each interview lasted for around 40 min. Considering their Chinese language levels, Putonghua was used to ensure students' free expressions, as well as the mutual understanding of the interviewees and the researcher. All student participants of the interviews had passed HSK Speaking

(HSKK) Test – Intermediate Level. And of all eight interviewees, five had passed HSK Speaking (HSKK) Test – Advanced Level. That indicated that interviewees could understand the conversations, and express themselves freely in oral Chinese. Notes were taken and all interviews were tape-recorded. The transcriptions of the data were translated by professionals and double-checked with all the interviewees. A back-translation approach also enhanced its validity and reliability.

Data Analysis

A two-step approach was adopted for the statistical analysis of the collected quantitative data: all scale variables were assessed by using Confirmatory Factor Analysis (CFA). Scale item loadings, reliability, and convergent and discriminant validity were performed for the latent variables through the CFA. Relationships among all the four major constructs and other relevant variables in paths across two time points. An oblimin solution was used as the rotation technique, as latent factors involved in this study were about participants' perceptions of online CFL learning, which were likely correlated. The number of components to retain was determined by examining the number of eigenvalues > 1, the scree plot of eigenvalues, significant factor loadings, and the substantive interpretability of the factors (Horn, 1965). Items with low loadings or low communality were removed. Then all involved variables and the relationships within were explored by performing the Structural Equation Model (SEM) for the estimate of the theoretical model. SPSS 26.0 and AMOS 26.0 were employed for descriptive statistics and the SEM, respectively.

As for qualitative data gathered from the interviews, various methods were employed for data analysis, including coding, categorization, and triangulation. Guided by the two research questions, the participants' descriptions in the interviews were coded based on Yang and Lin (2020)'s coding scheme, which considered the factors involved in the learning process. Four themes were adopted: (1) perceived confirmation of Chinese language learning expectancy; (2) quality and perceived usefulness of the online learning; (3) thinking on the effectiveness and efficiency of social interaction during the online learning process; and (4) experiences of technical problems and students' preparation for the online educational technologies. In addition, to enhance the reliability of coding, a colleague of the researcher, who was also an experienced researcher in a related field, was invited to code part of the data. Results were compared. The inter-coder agreement rates for the four themes were 97.8, 96.2, 92.3, and 100%, respectively. That indicated the coding scheme worked well in the present study. After a discussion with the co-coder, the discrepancies were resolved, and the researcher coded the rest of the data. Coding of the data was informed and categorized by the theoretical model employed in the present study, which incorporated four constructs of the affecting factors of learning stickiness in an online CFL context: academic integration, social integration, expectancy confirmation, and technological factors. Data from interviews was analyzed and interpreted through content analysis. Primary findings from both qualitative data and quantitative data were triangulated. The final findings were used to address the two research questions of the study.

RESULTS

Factors Affecting Online Chinese as a Foreign Language Learning Stickiness

Table 3 displays the descriptions and CFA of all scale items in the questionnaire, revealing the affecting factors of online CFL learning stickiness of international students. The loadings for all constructs were above 0.70, meanwhile, data also demonstrated that the internal consistency of the proposed model was good as the reliability values for all five constructs were above the threshold line, as suggested by Hair et al. (2006). These results collectively showed that more than half of the scaled variance had been well captured by the constructs. The statistics could reflect the picture of online CFL learning stickiness and dropout as satisfactory item reliability and good measurement properties were obtained through the scale constructs of the questionnaire.

Regarding the validity of the theoretical model, the values of Average Variance Extracted (AVE) for the variance captured by each construct were evaluated. Also, Composite Reliability (CR) for the convergent and discriminant validity of the five constructs was evaluated. **Table 4** displays the relationships between five constructs conceptualized in the proposed theoretical model and CR coefficients. The data showed that AVE values for all five constructs were stronger than the suggested bottom line of 0.50 (Chin, 1998), and the square root of AVE for each construct was also larger than those of the inter-construct correlations. The evaluation suggested that each construct owned a closer relationship with itself than with others, so the convergent and discriminant validity was therefore supported.

As suggested by Chen (2014), the examination of Common Method Variance in a self-administered questionnaire is necessary. In the present study, one major variable from each construct was selected and assessed by Harmon's one-factor test. The result showed that the highest level of covariance explained by one factor is 28.41%. Considering the 40% threshold (Podsakoff and Organ, 1986), Common Method Bias was not a concern of this study.

The Relationships Among the Factors Affecting Online Chinese as a Foreign Language Learning Stickiness

To explore the relationships among all the latent affecting factors of online CFL learning stickiness, an analysis of the structural model was performed. It assessed the consistency between the proposed theoretical model and those collected data. Data satisfaction was well fitted in the present study (χ^2/df = 2.979, $^{**}p < 0.001$; RMSEA = 0.063; CFI = 0.94; and TLI = 0.91). CFL students' expectancy confirmation had an important influence on online learning stickiness (β = 0.69, $^{**}p < 0.001$). Both academic integration and technological factors of online learning had positively correlated with students' expectancy confirmation (β = 0.61, $^{**}p < 0.001$ and β = 0.66, $^{*}p < 0.05$, respectively) but these two factors were found to have no significant effects on learning stickiness (β = 0.41, p = 0.344 and β = 0.56, p = 0.205, respectively). Social integration had an influential effect on learning stickiness (β = 0.54,

TABLE 3 | Descriptions, loadings, and internal reliability of scale items.

Construct	Code	Scale item	Means	SD	Loadings	Reliability
Academic integration (AI)	AI 1	Online Chinese learning is of high quality.	3.86	0.65	0.84	0.791
	AI 2	By learning Chinese online, I have access to many learning resources.	3.96	0.72	0.81	
	AI 3	Online learning improves my Chinese language skills.	3.24	0.97	0.85	
	AI 4	Learning Chinese online helps my academic development.	3.57	0.89	0.78	
Social integration (SI)	SI 1	Teachers and teaching assistants can help my online Chinese learning in time.	3.76	0.94	0.88	0.843
	SI 2	I enjoy interacting with peers in online Chinese learning.	4.18	0.58	0.71	
	SI 3	I can get assistance from a wide range of sources when learning Chinese online.	4.01	0.66	0.76	
	SI 4	Online learning provides me with a real Chinese language context.	3.53	0.89	0.78	
Technological factors (TF)	TF 1	I have access to online Chinese learning.	3.59	0.74	0.84	0.811
	TF 2	I am able to deal with technical issues by myself.	3.01	0.84	0.86	
	TF 3	I know how to adjust my devices to have a good learning experience.	2.77	0.56	0.70	
	TF 4	Online learning allows me to control over my own Chinese learning progress.	3.40	0.85	0.84	
Expectancy confirmation (EC)	EC 1	I am gratified with the efficiency of online Chinese learning.	3.69	0.69	0.87	0.847
	EC 2	I am gratified with the effectiveness of online Chinese learning.	3.78	0.77	0.81	
	EC 3	Learning Chinese online meets my learning needs.	3.36	0.58	0.78	
	EC 4	I would achieve my language learning goals through online Chinese learning activities.	3.47	0.61	0.79	
Learning stickiness (LS)	LS 1	I would learn Chinese online as often as I can.	3.66	0.60	0.74	0.768
	LS 2	I would recommend online learning for other Chinese language learners.	3.47	0.97	0.79	
	LS 3	I would continue online learning when Chinese courses are finished.	3.25	0.58	0.79	
	LS 4	I do not drop out of online Chinese courses.	3.77	0.96	0.81	

TABLE 4 | Convergent and discriminant validity values of five constructs.

Construct	AI	SI	TF	EC	LS
AI	0.86*				
SI	0.61	0.85*			
TF	0.53	0.41	0.86*		
EC	0.74	0.66	0.41	0.82*	
LS	0.75	0.64	0.44	0.80	0.81*
AVE	0.81	0.75	0.72	0.79	0.77
CR	0.75	0.74	0.67	0.72	0.75

*The square roots of Average Variance Explained (AVE).

$p < 0.001$), and it also had a significant correlation with expectancy confirmation ($\beta = 0.23$, **$p < 0.001$**). Moreover, expectancy confirmation and social integration in the proposed theoretical model accounted for around 68% of the variance in students' online learning stickiness. Academic integration, social integration and technological factors together explained about 74% of the variance in expectancy confirmation. **Figure 2** presents the path coefficients and explained constructs for the theoretical model in this study.

As for the qualitative data, student interviewees mentioned several factors leading to the promotion of learning stickiness or their decisions of withdrawing from the online CFL learning. As recounted by most interviewees (5/8), expectancy confirmation of international students, and their interaction with teachers and peers, were two important factors affecting their stickiness. Like most of the students, Ms. Bai, a learner of Chinese, reported that her learning stickiness was improved as she found the online learning could effectively enhance her performances in the language test:

The online learning is full of surprises. It helps me pass HSK-5.... I believe the online approach is a better way for learning than the traditional in-classroom one. I failed HSK every time when I had to learn in the classroom. (Bai, Int. 3)

Similar results were found in interviewees' descriptions. Students would stay for learning when they found the online approach could achieve their learning expectations, including "improving their performances in HSK" (Geng, Int. 1), "solving some practical problems out of the classroom" (Jiang, Int. 5), "preparing for future job hunting" (Chen, Int. 6), and "knowing better about China and its history" (Zhang, Int. 8). Otherwise, students would "give up" (Liu, Int. 7) engaging in learning when the online learning was considered to be "useless" and "a waste of time" (Chen, Int. 6). It can be seen from the interviews that students' engagement was closely connected with expectancy confirmation of the online CFL learning and usually reflected their learning purposes and their understanding and plans of future academic learning or career development. Online learning, as expected by many international students, was supposed to be useful for their personal needs.

Apart from expectancy confirmation, social integration of the online CFL learning was also found as an affecting factor of students' learning stickiness. Mr. Chen was an advanced Chinese language learner, who majored in Psychology at the university, he provided his thought on social integration in the online learning:

I preferred the online learning as it enabled me to interact with my teachers and peers 24 h 7 days.... In the classroom, I could only employ the class time to communicate with others. That was far from enough for a Psychology student. (Chen, Int. 6)

Like Mr. Chen, a majority of the interviewees (6/8) listed social integration of the online CFL learning as a key factor for
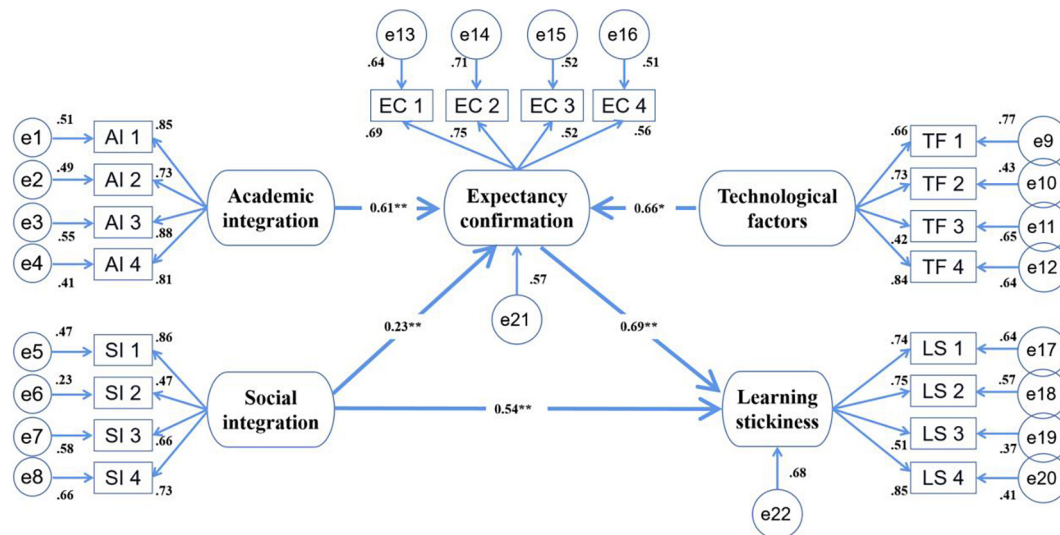
FIGURE 2 | Analysis of the theoretical model. *p < 0.05 and **p < 0.001.

their preference of and engagement in learning. They described the online approach as "a time-saving way" (Qiu, Int. 2) and "a cost-effective way" (Liu, Int. 7) for interaction with teachers and peers. As language learners, they highlighted the importance of interaction using the target language, for it could "provide me with more practices" (Yang, Int. 4), and "give me opportunities to learn from others", which could "correct my mistakes and better my pronunciation" (Geng, Int. 1). Social integration, particularly for foreign language learning, was found to be a key consideration for international students. Besides, some students (3/8) also mentioned that the online CFL learning created "a community" that gave them "a sense of belonging" (Yang, Int. 4). They enjoyed the sense and thus chose to stay for learning.

While expectancy confirmation was considered as a strong affecting factor of learning stickiness of international students in online learning, this study further found that academic and social integration were two influential factors on students' expectancy confirmation. Mr. Geng was a Korean student who had been learning Chinese for more than 15 years. He stressed the importance of the academic quality of the online learning content from the eyes of an advanced language learner:

The most important part, from my perspective, of a Chinese course, is not how fancy the way it presents, but how many things it can teach me. I will stay for the learning, no matter online or offline, as long as it can help achieve my learning goals. (Geng, Int. 1)

In a similar vein, social integration could also enhance the confirmation of students' expectancy of online CFL learning. As students said in the interviews, factors of the social integration dimension, including "making new friends" (Chen, Int. 6), "keeping good interpersonal relationships with classmates" (Yang, Int. 4), and "maintaining regular contact with teachers" (Liu, Int. 7), were some mentioned ones that could fulfill their expectations in the online classes, while "knowing better about the China society" (Qiu, Int. 2) and "practicing

Chinese with native speakers" (Zhang, Int. 8) were some key reasons for their satisfaction with the online community in the learning process. For all student interviewees (8/8), social integration was believed to improve their experiences of online CFL learning.

As for the technological factors, half of the student interviewees (4/8) named them as a concern of their online CFL learning, whereas the factors were "not a major one" (Bai, Int. 3). However, for some students, technological difficulties could be still "annoying," particularly for those who were "in a lack of necessary technical literacy" to deal with the technological problems by themselves (Qiu, Int. 2). Mr. Liu was a student with limited experience in online learning. He described his learning obstacle in the study:

When I found the Internet connection was too unstable to support my routine learning, I was extremely anxious and disappointed. That ruined my online learning, and I did not know what I shall do.. . . I missed the old days in the classroom. (Liu, Int. 7)

For international students like Mr. Liu, who were not fully prepared for the online CFL learning, the employment of new digital learning resources might place them into a context, where they found themselves "abandoned by the majority" (Jiang, Int. 5). The new learning would fail their expectations and bring about less satisfying learning experiences. Therefore, technological factors could be an affecting factor of students' expectancy confirmation of the online CFL learning, and further have an indirect influence on their decisions on engagement in learning activities.

DISCUSSION

Encouraged by increasing affordable digital devices and ubiquitous Internet connections, technologies are and will be

applied to CFL teaching and learning. To implement successful and attractive online learning, a need for identifying factors affecting international students' engagement in online learning activities and their stickiness is proposed. As a preliminary attempt, this empirical study investigated international students' online learning stickiness, as well as the relationships between each construct of an integrated theoretical model. The findings might contribute to current literature in the field.

Learning Stickiness, Expectancy Confirmation, and Social Integration

As **Figure 2** shows, the construct of learning stickiness signifies that expectancy confirmation and social integration had significant effects. Results indicated that international students' expectancy confirmation of the online CFL learning was a significant factor affecting their learning stickiness. The relationships between expectancy confirmation and learning stickiness highlighted the relevance of learning expectations to their learning engagement. Once the learning could fulfill students' learning expectations of language development and skill improvement, students would be satisfied with the outcomes and, for many of them, stay and continue their online learning with strong loyalty; that is, being sticky with online learning. This finding in a CFL context was consistent with those of some latest studies in other educational areas (Alshurideh et al., 2020).

In line with the findings from the questionnaire, students also confirmed the predicting influence of the expectancy confirmation factor on learning stickiness in the interviews. Students tended to have very high expectations of online language learning to achieve their goals, as it was usually described as an advanced tool for knowledge acquiring and skill development (Chung et al., 2020). A positive correlation could be seen between students' Chinese learning achievement and their learning stickiness. A student would get sticky with the online learning if he/she believed the approach could effectively improve his/her Chinese language abilities in various aspects, including language tests (Geng, Int. 1; Bai, Int. 3), in-class language performance (Jiang, Int. 5), personal career development (Chen, Int. 6), and communication with the local society (Zhang, Int. 8). When students' expectations of Chinese language learning were fulfilled, they would be largely encouraged and possibly decide to engage in the online courses more actively (Bai, Int. 3).

On contrary, a student might find the learning outcomes less satisfactory when he/she failed in confirmation of his/her preset learning expectations. Then this student would probably drop out and not return in the future. As noticed in this study, some students expected to "learn everything about the word of 打 within one class (45 min)" (Chen, Int. 6). In the Chinese language, 打 (dǎ and dá) has more than 30 meanings with different grammatical and syntactical functions and corresponding tones. It was impossible for a student to complete the task, even though abundant scaffolding materials, like pictures, videos, and audio clips, were provided in the online context. Soon these students found the learning failed their expectations and gave up engaging in learning, although the goal itself was not appropriate.

As witnessed by the present research, the story of learning 打 was not an isolated case. Students might drop out for being "disappointed" with the online learning as they might consider it "a waste of time" and thus "give up the learning" (Liu, Int. 7; Chen, Int. 6). Such thought was not fully correct but a reflection of the strong relationships between learning expectations and learning engagement. No matter what the real reasons for learning difficulties were, students might lose stickiness when their learning expectations were failed. These instances enhanced the findings from previous analysis that the learning expectancy confirmation was a key factor contributing to students' online learning stickiness. That was also seen in other studies in education (Mills et al., 2009; Openo, 2020).

With expectancy confirmation, social integration accounted for a large part of students' learning stickiness ($R^2 = 68\%$). Such results indicated that international students' online Chinese learning stickiness was critically affected by social integration in addition to learning expectancy confirmation. Social integration was a key feature of online learning. Compared with the traditional in-classroom learning in China, in which a teacher-centered lecture mode is widely applied (Chen and Yu, 2019), the social integration elements of the online approach provide students with more opportunities to employ what they have learned for practical uses (Wu et al., 2011). When the online approach could possibly facilitate their social interaction in "a time-saving" and "a cost-effective" way (Qiu, Int. 2; Liu, Int. 7), students would enjoy the convenience. It was noticed that many students preferred the online Chinese courses as they could have more practice with less time and location limits (Yang, Int. 4). Incorporated with strong social integration elements, the online learning, as insisted by some student participants, could effectively improve their language skills and knowledge. This is coherent with the conclusion made in Alexander (2002), which has asserted that social integration is crucial for language knowledge building. Besides, the integration of social elements in online learning could fulfill students' personal pursuits as well (Chen, Int. 4). From the perspective of the target language learning and personal learning expectations, students preferred the online approach and enjoyed their engagement in social interaction.

Interpersonal relationship in students' social integration was found as another significant factor contributing to their online learning stickiness. Delahunty et al. (2014) believed that building and maintaining good interpersonal relationships was one of the fundamental concerns a student participated in online learning. Such participation was signified by "strong feelings of community" (Rovai, 2002, p.199). Driven by these feelings for social purposes, students engaged in learning actively. They answered the teacher's questions, completed learning tasks, and submitted an assignment for "a sense of belonging" (Yang, Int. 4) – their peer students in the learning did the same. This sense of belonging, including trust between members, shared learning expectations and goals, imitations of friends, and concerns for each other, emerged as international students involved in the online community through interaction, cooperation, and negotiation with peers and teachers. For the purpose

of maintaining this sense, students insisted on learning, and stickiness was elevated.

Learning Stickiness, Academic Integration, and Social Integration

From academic integration to learning stickiness, no direct impact was found in the present study. The path was only mediated by the factor of expectancy confirmation: results from the analysis of the structural model indicated that it had a strong influence on expectancy confirmation in students' online CFL learning (**Figure 2**). That indicated that students were attracted by satisfactory learning content, while they might not persist in online learning only for its high quality. Academic integration was a major concern of many students in foreign language learning. In line with previous studies (Bhattacherjee, 2001; Wang et al., 2019), students were found to be attracted by courses and resources "with high quality" that could fulfill their learning needs (Geng, Int. 1).

It should be noted in this study that, however, no statistical significance was found between the construct of academic integration and learning stickiness. Although academic integration in online learning could meet students' expectations, and help with their language development, it did not necessarily lead to the decisions on engaging in learning or returning to learning in the future. As Garrett (2007) has concluded, "interest in online appears to be dominated by notions of convenience and is seen to imply a quality/experience tradeoff" (p. 52). Besides, for some students, academic integration attracted their engagement with learning content, instead of active participation in learning activities. As learning stickiness focuses more on the mutual relationship between learning and students, such one-side attraction is considered as "incomplete stickiness" (Robinson and Cook, 2018). This does not mean that academic integration was not important to learning stickiness, as it greatly affected expectancy confirmation, which was claimed as a strong affecting factor of learning stickiness in the current study. Academic integration had an indirect effect on learning stickiness through students' expectancy confirmation. In this respect, the present study assumed that academic performances and learning outcomes were not the only pursuit of CFL students in their online learning. They valued their learning emotional experiences as well.

Academic and social integration were two critical latent variables for students' expectancy confirmation. Together with technological factors, the significant influence was confirmed by sound evidence (R^2 = 74%). As an affecting factor, social integration could play a role in improving experiences in the online learning context, fulfilling students' learning expectations. The social factor in the online learning process also directly increased students' learning stickiness. Social integration was described as one of the most critical components of successful and pleasant online learning (Abrami et al., 2011). Being involved in interaction with peers, teachers and native speakers, students are to create a supportive environment with an anxiety-free climate (Gu et al., 2021). Harmonious interpersonal relationships have been recognized as a key factor that encourages students'

learning, and resources in and outside the classroom should be combined to facilitate their Chinese language learning (Gong et al., 2021a,b). It was also noticed in this study that some students emphasized that making friends was "one of the most important tasks" of their engagement in the online learning activities (Chen, Int. 6). The convenience of interaction in online learning enabled students to achieve their social goals of keeping good relationships with peers and teachers (Yang, Int. 4; Liu, Int. 7). Moreover, interaction, as found in the present study, stimulated the exchange of ideas, the expansion of horizons, and the construction of linguistic knowledge. In line with the findings from Johnston et al. (2005) that social interaction in this environment is the key to learning effectiveness, as well as a valid predictor of a learning experience, the current study noticed the affecting role social integration played on students' learning experiences and language knowledge construction (Qiu, Int. 2; Zhang, Int. 8). Once students believed that online learning could provide effective social integration contextualized in a relaxing environment, they would be more gratified with the approach, and the learning and practice of language knowledge. That would lead to their commitment to online learning in the future.

Learning Stickiness and Technological Factors

As shown in **Figure 2**, technological factors had a significant influence on students' online learning expectancy confirmation, which further led to their decisions on staying or withdrawing from learning activities, whereas the factor did not directly explain learning stickiness for it was not a major concern for most students (Bai, Int. 3). This finding is quite different from those of many previous ones on online learning and technology-enhanced education (e.g., Zhang et al., 2012; Chen, 2014).

Internet technology could provide students with ubiquitous access to multimedia CFL learning resources and teacher-student and student-student interaction to improve the effectiveness. Students would be satisfied with their online learning experiences when they had a stable connection to the Internet. When they had technological difficulties in engagement, however, they would find the learning fail their online learning expectations and ruined their learning experiences (Liu, Int. 7). With diverse socio-economic conditions and backgrounds, international students, particularly those who are currently learning from home, usually had different levels of access to the online community. The reliability of the Internet connection and digital devices was an essential factor affecting the effectiveness and experience of their language learning in the context. It is vital to deliver online learning in appropriate formats or means that are best suited to students' current hardware conditions (So and Brush, 2008). Otherwise, students would find themselves being "abandoned" (Jiang, Int. 5), lose interest in the online courses, and then, in some cases, students might be reluctant to engage in learning activities anymore.

Apart from the learning equipment and Internet connection, the present research also revealed that students' technical literacy was also an affecting factor in their online CFL learning. This finding is consistent with those in previous studies regardless of

the target languages (Wu and Wang, 2005; Wu et al., 2010a). To accept the implementation of the online approach, students were expected to have sufficient technical literacy and develop an ability to apply technologies for learning purposes. The study noticed some students spent a lot of the class time dealing with software glitches and did not listen to the lectures at all. This student found the online learning could hardly meet their expectation, nor could it fulfill their learning needs, as they acquired less from it. Indeed, there were a group of international students being a lack of necessary technical literacy (Qiu, Int. 2). These students had been accustomed to traditional in-classroom instruction methods. For them, online learning was considered to be a struggle, which was different from what they had expected – online learning is supposed to be an intelligent and automated approach with many benefits. A key concern for these students was how to effectively and efficiently employ these technologies to serve their language learning and practice purposes.

Investigation noticed that most participants of the present study (84%) had an above-average level of accessibility to the Internet connection and had the necessary equipment for online learning (see **Table 1**). For most current online learning platforms and services, although they present in various forms with different resources, the underlying logic of learner operation is similar, like basic clicking, double-clicking, dragging, and swiping (Hoffman and Paciga, 2014). Considering the majority of these international college students were characterized as the "Generation Z" and "digital natives," who were familiar with technologies and the operation of various kinds of devices and applications, they were supposed to be able to set an appropriate environment for the online learning with necessary assistance from teachers and computer engineers, as well as to use these online learning platforms successfully. Technological factors, both their technical literacy and the accessibility to the online community, were not a continuous concern of their engagement in the online learning. Technological factors were only found as a prerequisite of online learning. This study believes that once the technical problems are solved, factors of technological issues will not be obstacles for students' sustainable learning and future participation in learning activities.

IMPLICATIONS AND CONCLUSION

This study explored the factors affecting international students' online CFL learning stickiness in a Chinese university context. A developed theoretical model and the structural equation modeling analysis and individual interviews indicated that the stickiness was significantly impacted by students' expectancy confirmation, which was closely correlated with three key factors: academic integration, social integration, and technological factors. Moreover, social integration was found to be a direct contributor to learning stickiness, whereas no significant relationships were found between academic integration and learning stickiness, and between technological factors and learning stickiness. Theoretically, compared with some previous studies on learners in the context of general education

(e.g., Halilovic and Cicic, 2013), the theoretical model of this study was designed from both learner and non-learner perspectives. Being enlightened by SCT, three dimensions and four major constructs were taken into account when investigating learning stickiness. At the same time, based on a good explanation in this study, the proposed model can be considered as a theoretical perspective to accumulate the theoretical rationales from a wide range of factors, as well as presenting a systematic picture of students' online learning stickiness from different perspectives. In this regard, online language learning is a crucial means for learners to be integrated into an imagined community through their investment in the digital context (Stranger-Johannessen and Norton, 2017). Moreover, the above theoretical model could be used to explain CFL students' stickiness and perceptions on the new learning and teaching approach. The effective ways, rather than some single factor, need to be systematically considered to enhance students' engagement and persistence in learning activities. Findings from today's Internet era and its applications in instructions may hopefully contribute to advancing the understanding of international students' learning-related decisions and their engagement and dropout in online CFL learning in this regard.

Pedagogically, the empirical results proposed several practical implications for the purpose of providing a comprehensive insight into students' stickiness in online CFL learning. The first implication is that the quality of learning resources and the way to present them matter to online learners. The trend of supporting CFL teaching and learning by new information and computer technologies provided seamless access to learning resources in and outside the classroom (Gong et al., 2020c, 2021a). Developing qualified online learning content and delivering them in appropriate ways would effectively attract students to the online learning space, and encourage their persistence in future learning. The second implication concerns interaction in online learning. Due to time differences, technological factors, and communication obstacles, it was easy for online students to find themselves learning alone and thus drop out (Chen, 2021). Implementing some ways to encourage learning-related communicative and social interactions would be necessary as well. The interactive context could benefit language learning, as both teacher-student and peer interaction could be a way for language development, and for creating a supportive and relaxing atmosphere for language practice. The third implication is to provide technical support before and during the learning process. Through necessary technical support, students would achieve their expected outcomes with a pleasant learning experience with qualified resources, thereby facilitating their stickiness in the online learning environment.

Online language learning is not a new approach for today's university students. They have contacted and used various kinds of digital learning resources for different learning purposes. To meet their indispensable requirements of learning, the online approach has to be "intuitive, practical, and ubiquitous" (Chen, 2014). Therefore, online learning is supposed to take students' needs into consideration before deployment and to

embed factors discussed in this study within it. Otherwise, students may find the learning fail their expectations and then drop out. Efforts are expected from all participants in the learning activities, including researchers, administrators, teachers, courseware developers, and students, to comprehend the influencing factors regarding students' learning stickiness, and thereby to make online CFL teaching and learning benefit more international students worldwide, as well as serving their lifelong language learning purposes.

In spite of the findings from this empirical study, several limitations are also in need of attention. The findings are based upon an investigation of a limited number of international students from one university. Conclusions and implications might not be generalized in other educational contexts. Moreover, this study focused on students' perceptions of the online approach. This might narrow the scope of the investigation, and miss some critical issues in CFL teaching and learning, such as the latent influence of different language skill learning on students' stickiness. Future studies are recommended to provide more details.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material,

further inquiries can be directed to the corresponding author.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

AUTHOR CONTRIBUTIONS

CC conceived and designed the study, collected and analyzed the data, and wrote the manuscript.

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Error Types of and Strategies on Learning Chinese Connectives: A Study on Chinese as a Second Language Learners' Writing

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The correct use of connectives has great influence on language learners' writing proficiency, while errors of connectives are common in foreign learners' interlanguages. This study examines the types of errors that occur in native English-speaking learners' Chinese writing, the possible causes for the errors, and the learners' consequent learning strategies. The present research adopted corpora investigation, questionnaire survey, and focus-group interviews to examine the error types, causes of identified errors, and related learning strategies. Data analysis indicated that: (1) the main error types made by native English-speaking learners from high to low are misuse, overuse, mismatch, misplacement, and underuse of connectives; (2) causes related to intralingual transfer greatly contributes to the presence of errors; and (3) memory, social, and cognitive strategies were the most preferred, followed by metacognitive and compensation strategies, and then by effective strategies which were the least preferred. These findings showed that different strategies can be employed to cope with different errors in writing. The study further suggests that teachers and educators need to help native English-speaking learners find strategies that work best for them in terms of learning Chinese connectives.

Keywords: Chinese connectives, Chinese as a second language, error types, learning strategy, corpus analysis

INTRODUCTION

Connectives are one-word items or fixed word combinations that express the relationship between clauses, sentences, or utterances in the discourse (Pander and Sanders, 2006, p. 33). Specifically, connectives are recognized as conjunctions (Halliday and Hasan, 1976), cohesive devices (Schiffrin, 1987), discourse markers (Fraser, 1999), and discourse units (Celle and Huart, 2007). They play an important role in language expression fluency as well as argumentation reliability in both spoken and written language (Hu and Li, 2015; Uccelli et al., 2015; Crossley et al., 2016) and in writing and reading (Ferstl and von Cramon, 2001; Crosson and Lesaux, 2013). Previous studies have reported positive correlations between the presence of connectives and writing quality. For example, Lee (2002) made a classroom inquiry about ESL students and found that the teaching of connectives could enhance students' awareness of eligible writing. Mohammed (2015) argued that in the foreign language learners' writing, it is not the presence or the absence of cohesive items that makes a text well-organized, rather it is the appropriate use of these conjunctive markers. Other studies have shown that connectives are especially challenging for language learners since even experienced

writers have difficulties in using them correctly (Cheng and Tsang, 2021) and errors of connectives are common in foreign learners' interlanguages. According to a study conducted by Gaskell and Cobb (2004), the error rate of using connectives is high in both English and Chinese writing produced by L2 learners. Lu (2000) also found that the error rate of function words, especially connectives, was above 60% in L2 Chinese writing. Hence, additional research on connective errors in non-native speakers' writing is needed.

Chinese connectives refer to a collection of grammatical cohesive devices that are employed to convey the semantic relationships for the sake of discourse coherence (Lu, 2019). For instance, there are adversative relationships typically marked by connectives *danshi* "but," the causal-effective relationship typically marked by *yinwei* "because" and *suoyi* "so," the purposive relationship typically marked by *weile* "in order to," etc. (The classification and grammatical patterns will be illustrated in Section "Classification and Grammatical Patterns of Chinese Connectives"). Chinese and English connectives share some commonalities, such as being present in large quantities, having complex semantic types, and high frequency of use, but differences with regards to how they are used still exist. Specifically, connectives are required in English, which is a hypotaxis-prominent language that emphasizes uniformity and integrity in sentence structure, whereas connectives are optional in some contexts in Chinese, which is a parataxis-prominent language that emphasizes the relevance of function and meaning (Lian, 2010, p. 73–84). Such differences make it difficult for native English-speaking learners to learn and use Chinese connectives. Given the lingua franca status of English in language education, research on the issue of learning and using connectives has mainly focused on the context of English education (Ma et al., 2017; Gong et al., 2018, 2020b,c). In particular, and in contrast to a large number of studies on connective acquisition in L2 English (e.g., Tapper, 2005; Lai, 2008; Mohammed, 2015; Tian et al., 2021), a paucity of pertinent studies has been conducted in the field of L2 Chinese acquisition. Among the few studies that focus on L2 Chinese connective acquisition, Ke (2005) made extensive research into L2 Chinese learners' acquisitional patterns of 19 linguistic features and Zhang (2014) investigated the comprehension of 16 pairs of connectives by Chinese heritage and foreign language learners. However, previous studies mostly paid attention to acquisition patterns and error types but failed to explore the possible causes and learners' learning strategies. At the same time, the majority concentrate on learners from Asian countries (e.g., Korea: Zheng, 2009; Thailand: Yang, 2016; Vietnam; Pan, 2013; Indonesia: Li, 2010). That is, there is a lack of comprehensive research on Chinese connective acquisition, especially in foreign learners from English-speaking countries.

In this research, we will investigate error types that occur in native English-speaking learners' Chinese writing, examine possible causes for the errors, and inquire the learners' relevant learning strategies. Furthermore, based on these points of examination, the study will put forward suggestions that will help teachers and educators better assist native English-speaking learners in finding out the strategies that work best for them in learning Chinese connectives.

LITERATURE REVIEW

Previous Studies on L2 Chinese Connective Acquisition

Many previous studies on L2 Chinese connective acquisition have studied the acquisitional patterns and error types, and most of the studies focused on single type of Chinese connectives of foreign learners from Asian countries. For instance, Zheng's (2009) investigation of conditional connective errors made by Korean students revealed differences among errors in using conditional connectives. Pan (2013) investigated concessive connective errors made by Vietnamese learners. Zhang (2014) surveyed the comprehension of 16 pairs of connectives by Chinese heritage and foreign language learners and reported four categories of errors related to the usage of paired connectives: misplacement of connectives, mismatched pairs of connectives, absence of obligatory connectives, and order-reversed pairs of connectives. Yang (2013) examined the use of connectives by three Chinese as a second language learners in the United States and drew upon their written summaries on lesson contents presented in their textbooks.

The studies on L2 Chinese connective acquisition have mainly analyzed its typical error types, acquisition order, and acquisitional patterns of L2 Chinese learners. However, little attention has been paid to comprehensive investigation of typical errors in all kinds of connectives, the error cause, or learners' learning strategies.

Classification and Grammatical Patterns of Chinese Connectives

Chinese connectives are a type of conjunction. The function of which is to connect clauses and indicate logic-semantic relations between clauses and within complex sentences (Xing, 2016, p. 432). Given the important position of connectives in Chinese grammar, many different definitions and types of connectives have been presented by scholars (Xing, 2001; Huang and Liao, 2011; Yao, 2017). Among them, Xing's (2001) classification, which includes coordinative, chronological, progressive, alternative, causal-effective, inferential, hypothetical, conditional, purposive, adversative, concessive, and negative-adversative connectives, is one of the most influential frameworks of Chinese connectives and is adopted in this research.

In this part, we will start with five basic grammatical patterns of Chinese connectives (1) Usage of a single connective, (2) Use of two collocated connectives, (3) Repetition of a single connective, (4) Use of two types of connectives in one semantic level, and (5) Use of two or more different pairs of connectives in multiple semantic levels. These five grammatical patterns are the basis for error analysis in the present study and are exemplified below:

(1) Usage of a single connective: In this pattern, the use of a single connective to indicate the logic-semantic relation of clauses in a complex sentence is common, as shown in Example 1 below.

Example 1:
我需要与爸爸好好交流一下, 否则他会误解我。
Wo xuyao yu baba haohao jiaoliu yixia, fouze ta hui wujie wo.

I need with father well communicate one CL otherwise he will misunderstand me

"I need to talk with my father, otherwise he will misunderstand me."

In this example, there is only one connective *fouze* "otherwise" which is used as a negative-adversative marker.

(2) Use of two collocated connectives: In this pattern, two connectives are typically used as a fixed collocation, as shown in Example 2 below.

Example 2:

周明虽然有仁慈的心肠, 但是太偏颇了。

Zhou Ming suiran you renci de xinchang, danshi tai pianpo le.

Zhou Ming although have kind NOM heart but too biased PFV

"Although Zhou Ming is warm-hearted, he is too biased."

In this example, the connectives *suiran* "although" and *danshi* "but" are juxtaposed in separate clauses, indicating the concessive-adversative relation between the clauses.

(3) Repetition of a single connective: in this pattern, one connective can be used repeatedly in several parallel clauses, as shown in Example 3 below.

Example 3:

无论他走多远, 无论他怎么逃避, 他的内心始终放不下。

Wulun ta zou duo yuan, wulun ta zenme taobi, ta de neixin shizhong fang bu xia.

No matter 3SG walk how far no matter 3SG how escape 3SG POSS heart always let NEG down

"No matter how far he goes and in what way he escapes, he cannot let it go."

In the example above, *wulun* "no matter" is used twice in two clauses of one complex sentence, indicating a concessive relation.

(4) Use of two types of connectives in one semantic level: In this pattern, connectives with different semantic functions can be used together in one complex sentence to show two different logic relations of clauses at the same semantic level.

Example 4:

楼上是卧室, 平常即使没有人住, 可也都打扫的干干净净。

Loushang shi woshi, pingchang jishi meiyou ren zhu, ke ye dou dasao de ganganjingjing

Upstairs is bedroom usually even though no human live but also all clean NOM spotless

"Upstairs is a bedroom. It is swept clean everyday, even though nobody lives in."

In the example above, the concessive connectives *jishi* "even though" and *ye* "also" are used with the adversative connective *ke* "but" within the same complex sentence, explicating two relations at the same time.

(5) Use of two or more different pairs of connectives in multiple semantic levels: in this pattern, two or more pairs of connectives with different semantic functions co-occur to show the logic-semantic relations among clauses on multiple semantic levels.

Example 5:

虽然这样做可以先打死一部分敌人,   但是如果敌人进行反击, 那够呛。

Suiran zheyang zuo keyi xian dasi yi bufen diren, danshi ruguo diren jinxing fanji, na gouqiang

although this way do can first kill some enemy but if enemy take fight back then terrible

"We can kill some enemies in this way at first, but it will be terrible if they fight back."

In the example above, *suiran* "although" and *danshi* "but" are used in a pair, indicating the concessive-adversative relation of the first and the following two clauses, while *ruguo* "if" and *na* "then" are also used in a pair, indicating the hypothetical relation of the second and third clauses. This sentence consists of two pairs of connectives collocating with each other.

Error Analysis Theory

Error analysis (EA) is a method used to investigate errors, including the causes of errors and the learning rules of foreign language learners, which makes foreign language teaching more effective and targeted (Corder, 1967). It is an important tool in language teaching pedagogy as it "helps teachers identify the sources of errors and take pedagogical precautions" (Khanom, 2014, p. 39). The most significant contribution of EA lies in its success in elevating the status of errors from undesirability to that of a guide to the inner working of the language learning process (Corder, 1974). Corder (1974) proposed that the EA procedures include collection, identification, description, explanation, and evaluation, and classified the errors in terms of the difference between the learners' utterance and the reconstructed version into four categories: omission of some required elements; addition of some unnecessary or incorrect elements; selection of incorrect elements; and misordering of the elements. Further, Zhou (2007) described common grammatical errors in Chinese learning in detail, including addition, omission, misplacement, reference errors, and mixed errors.

Keshavas (1997) proposed that, the fields of EA can be divided into two branches, theoretical and applied. Theoretical EA is concerned with the process and strategies of language learning, which tries to investigate what is going on in the minds of language learners. While the applied branch is concerned with organizing remedial courses and devising appropriate materials and teaching strategies. It is worth noting that, the present study only concerns theoretical EA. To be precise, this study aims at investigating what is going on in the minds of language learners and what strategies language learners adopt in response to their errors.

Learning Strategies

Language learning strategies are defined as "conscious mental and behavioral procedures that individuals engage in to gain control over their learning process" (Ortega, 2009, p. 208); "deliberate goal-directed attempts to manage and control efforts to learn the L2" (Oxford, 2011, p. 12); "procedures that facilitate a learning task" (Brown, 2006); and "activities consciously chosen by learners to regulate their language learning" (Griffiths, 2008, p. 87). Oxford (1990) sees the aim of language learning strategies as being oriented toward the development of communicative competence. Given the important role learning strategies play in foreign language learning, there have been several investigations into these strategies (Oxford, 2011; Rafik-Galea and Wong, 2011; Szyszka, 2017). Among them, the specific strategies adopted

by students when learning L2 skills have been brought into focus (Oxford, 2011; Szyszka, 2017). Research has proved that appropriate learning strategies are important in helping students become more successful language learners, but still much remains to be investigated about what are applicable learning strategies that can be aimed at concrete language tasks. Oxford (1990) divides language learning strategies into two main classes, direct and indirect, which are further subdivided into six groups. Direct strategies include memory (strategies used for storage of information), cognitive (the mental strategies learners use to make sense of their learning), and compensation strategies (strategies that help learners overcome knowledge gaps and continue communication). Indirect strategies include metacognitive (strategies that help learners regulate their learning), affective (strategies concerned with the learner's emotional requirements such as confidence) and social (strategies that lead to increased interaction with the target language) strategies.

Based on the EA procedures and through focus-group interviews, this study poses three research questions:

RQ1: What are the types of Chinese connective errors in native English-speaking learners' writing?

RQ2: What are the possible causes for these errors?

RQ3: What strategic responses do English-speaking learners adopt in response to these connective errors?

METHODOLOGY

Participants

All participants of this study are Chinese as a second language (CSL) learners whose native language is English. To enhance the research generality, we selected the participants in line with the following criteria: (1) all participants are native English-speaking learners at intermediate and advanced levels, which can guarantee that they have Chinese connectives learning experiences; (2) they must study and live in mainland Chinese universities for at least 3 years so that they may employ all possible learning strategies; (3) there should be balance in the number of males and females to minimize the gender difference; and (4), the age of interviewees needs to be represented in the community of foreign learners. Therefore, a questionnaire survey was conducted amongst 86 native English-speaking learners to investigate the causes of errors. All these 86 native English-speaking learners were at the intermediate and advanced language level and from four mainland universities. To address the second research question, we selected and interviewed 10 of the 86 learners, four females and six males, to find out what strategies they use to address Chinese connective errors. According to Krueger (1994), the members in a focus-group interview should share similar characteristics so that they can feel comfortable with each other and engage in discussion. So, we chose 10 participants from the same university. Their ages range from 20 to 28 and all of them are at the intermediate and advanced language level. The participants have been assigned pseudonyms in order to protect their identity. Information such as gender, age, nationality, major, and language level can be seen in **Table 1**.

TABLE 1 | Participants' profiles.

	Name	Gender	Age	Nationality	Major	Language level
(1)	Jane	Female	23	United States	Chinese	Advanced
(2)	Frank	Male	23	United States	Chinese	Intermediate
(3)	Steve	Male	28	United Kingdom	Education	Advanced
(4)	Willy	Male	24	United States	History	Advanced
(5)	Anna	Female	21	Canada	Chinese	Intermediate
(6)	Marian	Female	20	Australia	Chinese	Intermediate
(7)	Sarah	Female	23	United States	Chinese	Advanced
(8)	Kenny	Male	20	United Kingdom	Chinese	Intermediate
(9)	Nelson	Male	28	Canada	News	Advanced
(10)	Louis	Male	23	United Kingdom	Education	Advanced

Corpora

All the data are taken from two corpora: native English-speaking learners' Chinese writing from the dynamic corpus of HSK composition and a self-compiled corpus constructed from the writing of 86 native English-speaking learners. The size of the HSK corpus is 300,321 Chinese characters and that of the self-compiled corpus is 203,247 Chinese characters, with the target connectives annotated.

HSK Dynamic Composition Corpus is a corpus of examination compositions written by intermediate and advanced Chinese language learners from different countries from 1992 to 2005. Its size can meet the requirements of the present study. The self-compiled corpus included the compositions written by native English-speaking learners from four mainland universities in the past 3 years.

Data Collection

In this study, the error analysis was conducted in accordance with the procedure proposed by Corder (1974). First, Chinese written works composed by native English speakers from the above-mentioned corpora were collected. The collection process involved determining the learners' native language backgrounds which was done by checking the language background of the participants to make sure that all of them were native English speakers. Second, we analyzed the texts with a focus on identifying all connectives used, and consequently identified 1321 sentences with connective errors. Third, we described the error types by comparing the incorrect usage of the Chinese connectives with the correct usage. This involved classifying the errors and assigning a grammatical description of each error. Then, the errors were explained by attempting to identify the causes of the errors. Finally, the errors were evaluated in detail by assessing them with a focus on finding out the participants' learning strategies.

A questionnaire survey was conducted among 86 native English-speaking learners to get a full picture of what the possible causes for the errors were. The questionnaire was designed by referring to Richards' (1974) identification of various strategies associated with developmental errors, which includes (1) overgeneralization, a device used when the items do not carry any obvious contrast for the learner; (2) ignorance of rule restrictions occurs when rules are used in context where in target

language usage they do not apply; (3) incomplete application of rules involves a failure to learn the more complex types of structure; (4) false concepts hypothesized refers to errors derived from faulty understanding of target language distinctions. Apart from the given options, we also allowed space for the participants to add their possible causes (see **Appendix 1**). According to scale development standard proposed by Shi et al. (2012), 10 experts were invited to assess the content validity from tow perspectives of item-level content validity index (I-CVI) and scale-level content validity index based on the average (S-CVI/Ave). The results showed that I-CVI > 0.8 and S-CVI/Ave = 0.94, the content validity was satisfying. All the data were collected and analyzed before the focus-group interviews.

After collecting and analyzing the error causes from the questionnaire survey, we conducted focus-group interviews with 10 of the 86 native English-speaking learners in an informal group discussion. A focus-group interview is reliable for "exploring what individuals believe or feel as well as why they behave in the way they do" (Rabiee, 2004, p. 655). It was used because the naturalistic conversational situation it creates helps to obtain authentic and rich data (Abednia et al., 2013; Gong et al., 2020a), and its focus on "ideas and feelings that individuals have about certain issues" (Rabiee, 2004, p. 656) was in line with our research objectives. The focus-group interview lasted for 4 h. During the interview, four interviewers had a free but purposive discussion with the participants to elicit the research issues, then all questions were discussed by all participants. We assume that the result is credible because "the type and range of data generated through the social interaction of the group are often deeper and richer than those obtained from one-on-one interviews" (Thomas et al., 1995, p. 207) and "focus groups could provide information about a range of ideas and feelings that individuals have about certain issues, as well as illuminate the differences in perspective between groups of individuals" (Rabiee, 2004, p. 656). The interview questions mainly included: (1) Which of the five types of connective errors are you most likely to make? (2) What is your biggest challenge in learning Chinese connectives? (3) What strategic responses do you adopt in response to these connective errors? And (4) What strategies have worked for you? The interviewers were proficient in both Chinese and English. When the participants had difficulties expressing themselves in Chinese, they were allowed to speak English, which ensures that they could fully express their views. All the interviews were audio recorded, and transcribed verbatim in Chinese by interviewers (not including the authors). After the interviewers completed the transcription, the participants were asked to review and verify the transcriptions in order to guarantee accuracy of the transcribed data.

RESULTS

After checking all 1,321 sentences with connective errors, five typical error types were identified: (1) mismatch of connectives, (2) misuse of connectives, (3) underuse of connectives, (4) overuse of connectives, and (5) misplacement of connectives. The results of the 86 native English-speaking learners' questionnaires

revealed the most likely causes for the typical error types and the focus-group interview manifested what learning strategies were preferred by the participants.

Typical Errors in Connective Usage

Following the error types classified by Corder (1974) and Zhou (2007), and in combination with the data from our results, five types of errors were identified. All examples in this paper are from the above-mentioned HSK dynamic composition corpus and the self-compiled corpus unless otherwise specified. The five typical errors are exemplified as follows:

(1) E1: mismatch of connectives – refers to the use of connectives in pairs that do not match.

Example 1:

他不仅要保护自己, 而是要保护所有人。

*Ta bujin yao baohu ziji, ershi yao baohu suoyou ren

He not only protect himself but protect everyone.

He had to protect not only himself but everyone.

In this sentence, the progressive connective *bujin* (not only) cannot be used with the adversative connective *ershi* (but) in a pair; *ershi* (but) should be replaced with *erqie*(also) which would make a complete pair.

(2) E2: misuse of connectives – refers to the use of inappropriate connectives to indicate the logic-semantic relation of a complex sentence.

Example 2:

他受伤了, 于是明天可能不会来。

*Ta shoushang le, yushi mingtian keneng buhui lai

He hurt so he tomorrow won't come.

He is hurt and may not come tomorrow.

This is a typical causal-effective complex sentence. Both *yushi* and *suoyi* are effective markers, but *yushi* can only be used for past events, not for a future event (Zhao, 2003), which makes it inappropriate. The second clause "he may not come" is a future event, so *yushi* should be replaced by the effective marker *suoyi* or *yinci*.

(3) E3: underuse of connectives – refers to the omission of connectives in a place where they should be used.

Example 3:

他不但外表出众, 人品很好。

*Ta budan waibiao chuzhong, renpin hen hao

He not only appearance outstanding character good.

He is not only outstanding in appearance, but also good in character.

In Chinese, *budan* (not only) is commonly matched with *erqie/ye/hai* (but also/even) to form a fixed collocation (Lü, 2005, p. 94). In such patterns, *budan* is optional but the latter is not.

(4) E4: overuse of connectives – this error is caused by using connectives where they should not be used.

Example 4:

重要的原因是因为这些孩子是在幼儿园学的。

*Zhongyao de yuanyin shi yinwei zhexie haizi shi zai youeryuan xue de

Important reason is because these children in kindergarten learn.

The important reason is that the education of these children was received in kindergarten.

In this sentence, the semantic function of *zhongyaodeyuanyin* (the important reason) and that of *yinwei* (because) overlap. This means that *yinwei* should be omitted.

(5) E5: misplacement of connectives – refers to the use of the connectives in improper positions in a complex sentence.

Example 5:

王明不但取得了好成绩，而且他的队友都取得了好成绩。

*Wang Ming budan qude le hao chengji, erqie ta de duiyou dou qude le hao chengji

Wang Ming not only get good results but also his teammates all get good results.

Not only did Wang Ming get good results, but all of his teammates also got good results.

In this example, "Wang Ming" is the subject of the first clause but not the whole sentence, so the progressive connective *budan* should be placed before the first clause (Lü, 2005, p. 94).

The proportion of each error type is shown below in **Figure 1**.

As seen in **Figure 1**, the proportion of E2 is highest at more than 65.6%. E4 is in second place at 16.3%. E1 and E5 are at the third and fourth place with the rate of 8.2 and 5.6%, respectively, and E3 is the least at only 4.4%.

Causes of Typical Errors

In view of the identified errors, we created a questionnaire survey that was administered to 86 native English-speaking learners to find out the likely causes behind these connective errors. This is the fourth step of EA previously outlined in Section "Data Collection" which sets the foundation for the following focus-group interviews. The results indicate the causes in two domains raised by Erdogan (2005), namely interlingual transfer and intralingual transfer. Khanom (2014) listed the specific causes in these two domains as (1) L1 interference in interlingual transfer, (2) overgeneralization, (3) ignorance of rule restrictions, (4) incomplete application of rules, and (5) false concepts hypothesized in intralingual transfer. These causes and

domains are outlined in **Table 2** below. The first column lists the error code, with the first error cause marked as C1, the next as C2, and so on. The second column contains error causes listed in the questionnaire, the third column lists the domains of error causes, and the last column lists the proportion of each error cause.

Compared with the findings of Cao (2013) and Yang (2013), who claimed that L1 transfer was the primary driving force of connective errors, it is noteworthy that intralingual transfer plays a big part in the error causes in this study. Therefore, we emphasized the strategies adopted by learners to address intralingual errors and investigated these applicable strategies that were used to reduce intralingual errors.

Strategic Responses to Connective Errors

The findings of the focus-group interview showed that the participants adopted memory, cognitive, social, metacognitive, compensation, and affective learning strategies in response to their connective errors. As "the results of focus-group interviews can be presented in uncomplicated ways using lay terminology supported by quotations from the participants" (Rabiee, 2004, p. 656), we will illustrate how the participates employ learning strategies in response to connective errors in the following sections by using quotes from their interviews.

FIGURE 1 | The proportion of error types. E1, mismatch of connectives; E2, misuse of connectives; E3, underuse of connectives; E4, overuse of connectives; E5, misplacement of connectives.

TABLE 2 | Causes of typical errors.

Code	Error causes in the questionnaire	Domains	Proportion (%)
C1	The meanings of some connectives are too close to distinguish their differences.	Intralingual transfer	55.9
C2	Lack of practice in using some connectives.	Intralingual transfer	53.5
C3	I apply the wrong Chinese grammar rules.	Intralingual transfer	48.8
C4	Trying to avoid using such complex connectives for fear of making mistakes.	Intralingual transfer	46.5
C5	I don't understand the whole sentence.	Intralingual transfer	44.1
C6	There is no equivalent usage in the mother tongue.	Interlingual transfer	41.7
C7	Drawing a false equivalence between an English connective and a Chinese one that shares a similar meaning.	Interlingual transfer	41.7
C8	The wrong judgment was made by applying the grammar rules of the mother tongue.	Interlingual transfer	29.1
C9	Different ways of thinking result in different views on the relationship between clauses.	Interlingual transfer	25.2
C10	The wrong usage is often used by native Chinese speakers.	Intralingual transfer	21.3
C11	I am not willing to learn some connectives because they are useless.	Intralingual transfer	17.3
C12	Such usage has appeared in a certain book.	Intralingual transfer	9.4
C13	The teacher's explanation of such connectives is not clear enough to be understood.	Intralingual transfer	9.4
C14	Such usage has been seen in films, television works, and online media.	Intralingual transfer	7.9
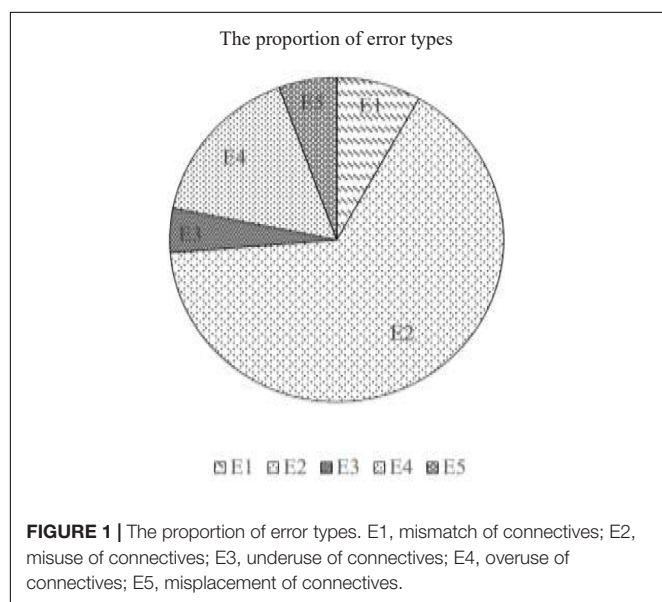
Direct Strategies

Language learning strategies that are directly involved in language learning are called direct strategies. Oxford (1990, P. 17) identified memory, cognitive, and compensation strategies as direct strategies.

Memory Strategies

Memory strategies help students store and retrieve new information; cognitive strategies help them understand and produce new language by many different means, and compensation strategies allow them to use the language despite gaps in knowledge. The most commonly used strategy by the 10 participants was the memory strategy, which is thought to be the most direct and effective strategy for the learning of connectives. Based on the analysis of the interview results, we found that all interviewees (10/10) adopted methods like memorizing typical example sentences, associative memory, and network media assisted memory to deal with errors such as the mismatching of connectives (E1), selection of incorrect connectives (E2), and omission of connectives (E3). Jane, who often mismatched connectives in the early stages of learning, did so due to being unfamiliar with fixed collocations. In the Excerpt (1) below, she shares her experience:

[1]

Well, at first, I was not really familiar with Chinese connectives and the only method I adopted was trying to use and memorize them again and again. Fortunately, our teachers usually analyze the sentences in our books and teach us more typical sentences, so I would try to recite these sentences. And, you know, in this way, I try to understand and memorize the connectives in them. Then, gradually, I memorized some fixed collocations and came to know how to use these connectives.

Willy was another participant who also adopted the method of memory strategy. However, based on the existing connectives in the sentences, he would associate related or similar connectives and memorize them together. In Willy's view, this associative memory method helped him memorize connectives faster and more firmly. A few students (3/10) thought that rote learning was very boring and inefficient, so they turned to the method of network media associated memory. Louis is one of them. Louis shared that he sometimes proactively searched for some example sentences with certain connectives on Chinese websites like Baidu and copied the typical sentences for reading and reciting.

Cognitive Strategies

Eight students adopted the cognitive strategy in this interview. The cognitive strategy refers to the "manipulation or transformation of the target language by the learner" (Oxford, 1990, p. 43) or general mental processing (Schmitt, 2000). Specifically, cognitive strategies include various methods such as strengthening practice, inferential reasoning analysis regarding the meaning of connectives and sentences, and paradigm shifting, which mainly help foreign students overcome errors of misuse (E2), overuse (E4), and misplacement (E5). Some students (8/10) thought that practice was a useful method, which can be summarized as "practice makes perfect." For example, Frank mentioned that:

[2]

I prefer doing exercises to learn Chinese grammar. You know, I always do a lot of grammar practices after class, including the exercises given by our teachers, and other sentence-making practices I find from other reference books. For example, I learned a connective in our class today, and I will use it to make sentences after class. Then, I'll ask my teachers or my Chinese friends whether they're correct. Well, I think this is a good way for me to learn how to use Chinese connectives.

The description of connective error types mentioned in **Figure 1** indicates that the misuse of connectives largely existed in foreign students' writing (accounting for 65.6%). From the causes in **Table 2** (see Section "Causes of Typical Errors" above), we can infer that the main reason for connective errors is that learners could not distinguish the meaning and usage of similar connectives, nor could they understand the logical relationship between clauses. For instance, once in a test, Steve misused *suoyi* ('so') as *yushi* ('then') (see e.g., 2 in Section "Typical Errors in Connective Usage"), and he felt very confused about the distinction between the two connectives. Later, with the teacher's help, he carefully analyzed the complex sentences containing these two connectives and came to understand the logical relationship between the clauses. In the end, he gained insight into the differences between them. In addition, given the impact of the negative transfer of the native language (English), Jane believed that a shift in thinking, that is, learning Chinese sentences in a Chinese way is essential.

Compensation Strategies

Some interviewees (3/10) mentioned compensation strategies during their interviews. Compensation strategies belong to the group of direct strategies and involve using the new language for comprehension or production (Oxford, 1990) and are intended to "help learners with limited or complete absence of vocabulary knowledge and grammar" (Letchumanan et al., 2016, p. 175). The interview results indicated that the three students hope to deal with errors such as mismatch (E1), misuse (E2), and overuse (E4) by using the dictionary and guessing the meaning of connectives. Nelson is one of these students who, when faced with two similar connectives, finds it hard to make a choice and then looks up the connectives in the dictionary. He expressed that consulting dictionaries can help him deal with some errors. The following is his opinion:

[3]

You know, er. . . the difference between some connectives you know, are. . .are very small. Even with the dictionary, sometimes, I still can't distinguish them. Well, this really er. . . this makes me feel confused.

In addition, a student named Anna also mentioned the method of guessing. When feeling confused about which connectives to choose, she would first judge which categories of connectives were needed, then guess the specific ones. Although compensation strategies were also adopted by these students to address connective errors, this class of strategies was not their initially preferred choice amongst all the available strategies.

Results from the interview show that, in terms of direct strategies, the ten participants tended to adopt the memory

strategy followed by the cognitive strategy, and then the compensation strategy, despite the effect of the compensation strategy being limited.

Indirect Strategies

According to Oxford (1990, p. 135), indirect strategies consist of metacognitive, affective, and social strategies. All these strategies are indirect because they support language learning without involving the target language directly.

Social Strategies

Social strategy, which involves interaction with other people to improve vocabulary learning (Oxford, 1990; Schmitt, 2000), is one of the most frequently used strategies. Nine out of ten participants said they have adopted this strategy. Through exchanges with their classmates and Chinese friends, the participants obtained a communicative and interactive environment for learning and using Chinese connectives. Marian and Anna were classmates and good friends. When learning Chinese, Marian encountered serious challenges in using some connectives. She often discussed her problems with Anna after class and then practiced the usage of some connectives, sometimes even communicating in Chinese. In the excerpt (4) below, Marian shares her experience:

[4]

For me, the most difficult things in Chinese learning are the connectives and complex sentences. I was once very upset. Fortunately, my friend Anna always encouraged me. By discussing and practicing with her, I made good progress in learning Chinese. She really helped me a lot, and she is my good friend as well as my good teacher.

During the interview, five students said that they hoped to make friends with Chinese people because communicating with native speakers could provide them with real-life Chinese context. Kenny, for example, said that even though he could understand the usage of connectives taught in class, he could hardly use them properly in daily conversation. Therefore, he and his Chinese friends met twice a week to chat or dine together, during which he endeavored to communicate in Chinese and also paid special attention to how his friends used connectives.

Metacognitive Strategies

Another indirect strategy is the metacognitive strategy. Metacognitive strategy includes the methods used to oversee, regulate or self-direct language learning (Hismanoglu, 2000). Five participants made it clear that they had used this strategy. In the process of learning connectives, these students do not only make study plans for themselves but also evaluate their learning results by sorting out the wrong sentences they had made so as to improve their study plans in real time. Frank studied very hard and made a detailed plan for himself in order to master Chinese connectives better. In the interview, he showed us a list of study plans which included detailed steps such as studies, practices, reviews, and applications. In the excerpt (5) below, Sarah shares that she has the habit of sorting out wrong sentences, holding the view that by analyzing the incorrect sentences she had made, she could not only find her weak points but also evaluate her own

learning results. This allows her to adjust her learning focuses and strategies in real time.

[5]

Because I often use connectives incorrectly, I have made a plan for myself to review connectives. And also, . . . I will extract the mistakes related to connectives in previous exercises to see which kinds of connectives I am more likely to misuse. So, . . . in the future, I will practice these connectives more.

Affective Strategies

In addition to social strategies and metacognitive strategies, four international students also mentioned affective strategies. Affective strategies are concerned with the learner's emotional requirements. For example, as Marian mentioned above in the excerpt (4), she felt depressed when she met some setbacks in her study. With the encouragement of her good friend Anna, Marian regained her confidence, gained the motivation to study, and gradually overcame some difficulties in learning connectives.

From these interviews, it can be concluded that among indirect strategies, students prefer social strategies, followed by metacognitive strategies and affective strategies.

DISCUSSION

This study investigated the types of errors that native English-speaking learners make when using Chinese connectives, the possible causes, and the strategic responses they adopted in response to the errors. Most previous studies published in English have investigated the use of connectives in ESL and EFL learners' writing (Tapper, 2005; Lai, 2008; Mohammed, 2015; Tian et al., 2021), the results of which have shown that the underuse, overuse, and misuse of English connectives are common. In view of the peculiarity of Chinese connectives, and based on the corpus investigation, in addition to the above-mentioned misuse (E2), underuse (E3), and overuse (E4) of connectives, we identified two more error types: mismatch (E1) and misplacement (E5) of Chinese connectives. Despite the low proportion (see **Figure 1** in Section "Typical Errors in Connective Usage"), E1 and E5 still deserve our special attention because "one of the unique features of Chinese connectives is that they often seem to occur in pairs and in an orderly fashion as correlatives" (Lu, 2019, p. 559) and the distribution of Chinese connectives may be a function of their syntactic position in a sentence (Cao, 2013). Such uniqueness does not exist in English and this makes these two types of errors unavoidable in native English-speaking learners' writing. Thus, it is necessary for teachers or educators to find appropriate learning strategies to help native English-speaking learners overcome these two special error types. According to our survey, the proportion of each error type from high to low is: E2, E4, E1, E5, and E3. The proportion of E2 is highest at more than 65.6%, which reveals that selecting correct Chinese connectives while writing is the biggest challenge for native English-speaking learners. This result is consistent with the conclusion of Altunay (2009) who found that misuses of some connectives were common. E4 is in the second most common error accounting for 16.3%, showing that native English-speakers tend to add connectives in sentences where they should not be

used. The overuse of connectives was also found in other studies. For instance, Tapper (2005) found that advanced Swedish EFL learners tended to overuse adverbial connectives when compared to American university students. Lai (2008) also suggested that unskilled learners used connectives more frequently than the skilled ones through investigating the use of discourse connectors in the writing of EFL undergraduate writers from Chinese Taiwan. Although the result of this study is largely consistent with previous studies on English connective acquisition, what we attempt to stress in this study is having a thorough understanding of what strategies are adopted by native English-speaking learners and helping them to find the corresponding strategies best suited for learning Chinese as a second language, especially in terms of connectives (Gong et al., 2021).

After identifying and describing the errors, we explored the possible causes behind them through a questionnaire survey before investigating the learning strategies. The results offered fresh insights into Chinese connective learning. Negative cross-linguistic influence has been unanimously recognized by researchers as an important cause of errors (Lu, 2019); however, this study shows that intralingual transfer plays a big part in the cause of errors. This gives a hint that in the teaching of Chinese connectives, we should no longer overstress the L1 transfer as we used to but put certain emphasis on intralingual transfer.

As this study concerns theoretical EA, rather than simply listing the typical error types and causes, we went further to identify what learning strategies are employed by the participants in response to connective errors. In direct strategies, memory strategies were directed at error cause of C1 and C3 (see **Table 2** in Section "Causes of Typical Errors") and adopted by all participants (10/10) in response to error types E1, E2, and E3. Cognitive strategies could be used to solve the problems caused by C2. Since cognitive strategies "involve the element of practice, and practice promotes internalization of vocabulary items" (Letchumanan et al., 2016) and were applied by participants (8/10) to cope with all five types of errors, especially E2, E4, and E5. From some participants' (3/10) viewpoints, compensation strategies could be risky and not effective, but consulting dictionaries helped them understand the meanings and usages of connectives, thereby reducing errors caused by C1, C6, C12, and C13. This is similar to what has been reported by Schmitt (1997), who conducted a study on the multiple uses of vocabulary learning strategies and concluded that, "the use of bilingual dictionary was the most used strategy among Japanese students and this was followed by guessing meaning in context." Indirect strategies are useful in virtually all language learning situations and are applicable to all language skills (Oxford, 1990, p. 135). The most common indirect strategies employed by participants (9/10) are social strategies, which relate to causes of C10 and C14 and are effective in generally reducing connective errors. Half of the participants (5/10) showed their tendency to use metacognitive strategies. As one of the indirect strategies, metacognitive strategies cannot be used to reduce one or more concrete kinds of errors but can help language learners improve their connective acquisition overall. As Hismanoglu (2000, p. 35) notes, "all language learners use language learning strategies either consciously or unconsciously when processing new information and performing tasks." Affective strategies, which could be useful to reduce the errors caused by C4 and C11, were unconsciously adopted by the participants (4/10). The findings reveal that participants may adopt one or more strategies in response to the same type of error, and one strategy may be employed in response to one or more types of errors. This falls in line with the findings in Rafik-Galea and Wong (2011), which reveals that the learners used multiple strategies to learn vocabulary. In addition, Rafik-Galea and Wong (2011) surveyed adult foreign language learners' preferences for vocabulary learning strategies. They found that the five categories of vocabulary learning were cognitive, compensation, metacognitive, memory, and social categories. Among them, cognitive strategies were highly preferred by the learners and metacognitive were the least preferred. The reason why this result is different from ours is that we are focusing on connective learning strategies and not the overall vocabulary.

In terms of the findings, this study further suggests that teachers and educators need to assist learners in taking advantage of their preferred strategies to cope with the targeted errors. For instance, the findings show that intralingual transfer plays a big part in error causes and that the top two strategies are memory and social strategies. The results suggest that we need to adopt proper methods of memory strategies to solve errors caused by intralingual transfer. For example, the method of lexical chunk teaching, which emphasizes recitation of phrases, fixed phrases and other lexical chunks, can be introduced in connective teaching. Furthermore, the lexical chunks themselves are prefabricated and the whole block can be extracted so that learners can directly extract lexical chunks of relevant connectives in their writing (Zhang, 2017). This is useful in reducing connective errors, especially E1, E2, and E3 which are caused by intralingual transfer. In addition, when teaching connectives, teachers traditionally emphasize the meanings and different usages of connectives. However, the findings of this study revealed that using connectives in daily life is an effective way to improve Chinese connective learning. Thus, contextualization is required to help learners distinguish the pragmatic functions of Chinese connectives. We suggest that teachers adopt social strategies, such as assigning some tasks for learners to accomplish in collaboration with native speakers, to encourage them to communicate more with Chinese people and create conditions in which learners can learn and practice connectives by exposing themselves to the native language environment. Learning connectives from native speakers in the real world is undoubtedly an efficient way to decrease connective errors, especially the unique E1 and E5 errors in Chinese connective acquisition.

CONCLUSION

The purpose of the current study was to investigate the Chinese connective error types in native English-speaking learners' writing and the strategic responses they adopted in response to these connective errors. The results of this investigation showed that the main error types made by native English-speaking

learners from high to low were misuse, overuse, mismatch, misplacement, and underuse of connectives. This study also found that the causes related to intralingual transfer greatly contributed to the presence of errors, and the participants employed both direct and indirect strategies to cope with connective errors. The direct strategies had a higher degree of pertinence and could be used to reduce some concrete types of errors caused by intralingual transfer while indirect strategies were more suitable for improving overall connective acquisition. The most preferred strategies employed by English-speaking learners were memory, social, and cognitive strategies, followed by metacognitive and compensation strategies, and affective strategies were the least preferred ones. These findings suggested that different strategies can be employed to cope with different errors in writing, and teachers and educators need to help native English-speaking learners find the strategies that work best for them in learning Chinese connectives.

A limitation of this study is that the investigation was only conducted with native English-speaking learners, and any generalizations of the findings to all CFL and CSL learners should be undertaken with caution. This study was based on corpus analysis and focus-group interviews. The results would be helpful to provide some general information about the Chinese connective acquisition of foreign learners. Although the data were collected by rigorously abiding by the error analysis procedure (Corder, 1974) and focus-group interview analysis (Rabiee, 2004), which are widely-accepted procedures in the academic field to enhance the trustworthiness of the research results, what was reported might be different from what was enacted in the actual context. Beyond that, we used in-depth group interviews in which participants are selected because they are purposive, but they are not necessarily representative and thus results may not be generalized to all foreign learners.

The main contribution of this study is that the results reveal typical Chinese connective errors, their possible causes, the learning strategies adopted by native English-speaking learners in response and their internal connections, which provide insights for teachers and educators to make better teaching

procedures, and therefore has significant theoretical and practical value. Further studies can be conducted to explore grammatical errors in foreign learners writing with different native language backgrounds and explore the learners' learning strategies from different perspectives (Tsung and Gong, 2021).

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

ETHICS STATEMENT

Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this manuscript.

AUTHOR CONTRIBUTIONS

LZ was responsible for providing the overall idea. SS was responsible for data analysis. SY was responsible for experimental design. All authors contributed to the article and approved the submitted version.

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APPENDIX 1: QUESTIONNAIRE

Questionnaire for Error Causes

Part 1

    Gender:

    Age:

    Nationality:

    Length of Chinese learning:

Part 2

Tick your error causes

    () (1) There is no equivalent usage in the mother tongue;

    () (2) Drawing a false equivalence between an English connective and a Chinese one that share the similar meaning;

    () (3) Wrong judgment made by applying the grammar rules of the mother tongue;

    () (4) The meanings of a group of Chinese connectives are too close to distinguish their differences;

    () (5) Apart from the connectives, the whole sentence is difficult to understand;

    () (6) The wrong usage has appeared in a certain book;

    () (7) The teachers' explanation of these connectives was not clear enough to be understood;

    () (8) Different ways of thinking result in different views about the relationship between the Chinese clauses;

    () (9) Lack of practice;

    () (10) Trying to avoid using connectives with complex meanings for fear of making mistakes.

Part 3

Please write down other possible causes:

The Development of Formulaic Knowledge in Super-Advanced Chinese Language Learners: Evidence From Processing Accuracy, Speed, and Strategies

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The study examined the development of Chinese as a second language learners' formulaic knowledge through comparing the processing of Chinese idioms versus non-idiomatic formulaic sequences (FSs) by advanced-level learners (ALs), super-advanced learners (SLs), and native speakers (NSs). Using two phrase acceptability judgment tasks with and without think-aloud protocols, we collected data on participants' processing accuracy, processing speed, and processing strategies of reading the two types of FSs. Four processing patterns emerged from the analyses of the datasets. First, learners' processing accuracy and speed increased along with their proficiency. Second, learners' idiom processing ability was generally lower than that of non-idiom processing ability, but they demonstrated an improving trend as their proficiency level increased. Third, learners' use of processing strategies did not change much as proficiency rose and demonstrated a categorical difference from NSs. Fourth, all three groups exhibited poorer productive idiom knowledge than productive non-idiom knowledge. The overall findings denote that second language learners' formulaic knowledge can evolve beyond the lexical plateau as learners move from the advanced to a higher proficiency level, but the productive idiom knowledge can be a long-term problem. The findings provide implications for measuring and teaching Chinese formulaic knowledge at the higher-than-advanced stage.

Keywords: language proficiency, formulaic sequence, processing strategy, think-aloud, CSL (Chinese as a second language)

INTRODUCTION

In second language acquisition (SLA), the two primary goals are to identify the nature of learners' linguistic knowledge and to provide accounts for how this knowledge transforms over time (Ellis, 2005; Bowles, 2011). Specifically for research on Chinese as a second or foreign language (CSL/CFL), Gong et al. (2020b) pointed out that it is important to measure students' learning outcomes and to gauge the underlying mechanisms that impact the development of students' language proficiency.

In the last two decades, mounting evidence has suggested that overall second language (L2) proficiency can be improved by acquiring formulaic sequences (FSs), which are multiword expressions that frequently recur as a whole in language use (Biber and Conrad, 1999; Wray, 2000; Cortes, 2015; Wood, 2019). This claim has been supported by corpus linguistic, psycholinguistic, and functional linguistic research (Schmitt, 2010; Myles and Cordier, 2017). Corpus linguistic research indicates that a small class of FSs covers a fairly large portion of spoken and written texts; this ubiquity underscores the importance of FSs in the use of language (e.g., Oppenheim, 2000; Bestgen, 2017). The psycholinguistic research shows that native speakers (NSs) process FSs more efficiently than they process rule-generated phrases (e.g., Jiang and Nekrasova, 2007; Siyanova-Chanturia et al., 2011), suggesting that FSs are likely to be prestored and retrieved as whole units directly from long-term memory. Functional linguistic research indicates that FSs are semantically integral, which allows for the relatively complex meaning and function to be compacted into somewhat simple sequences. Hence, learning FSs can make communication more sophisticated and efficient (Schmitt and Carter, 2004; Tang and Taguchi, 2021). These findings led to the assumption that learning FSs can facilitate language comprehension and production (Boers et al., 2006; Lindstromberg and Boers, 2008; Taguchi et al., 2013; Yan, 2020; Saito and Liu, 2021). As such, mastering FSs can lead to the development of overall language proficiency (Weinert, 1995; Wray, 2000).

Despite the general acknowledgment of the importance of learning formulaic knowledge, little is known about how formulaic knowledge develops as learners' proficiency increases. Some corpus-based studies (e.g., Qi and Ding, 2011; Staples et al., 2013) focused on portraying the change of FS use by learners at different proficiency levels, but did not tap into learners' cognitive processes that may regulate such change. This study set out to fill the gap by comparing how advanced learners (ALs), super-advanced learners (SLs), and NSs process two types of Chinese FSs. Based on the patterns of processing accuracy, processing speed, and processing strategies, we attempted to investigate the development of L2 learners' formulaic knowledge as well as the underlying mechanisms that may impact the development.

LITERATURE REVIEW

In the FS literature, there is a severe lack of studies gauging the development of L2 formulaic knowledge. This scarcity of research may have to do with certain characteristics of FSs. We review these characteristics and the related empirical findings in the following sections.

Formulaic Sequence Types
Formulaic sequences lack homogeneity. Different types of FSs vary greatly in their linguistic dimensions, such as idiomaticity, form fixedness, function, and linguistic register (Wray and Perkins, 2000). For example, idioms (e.g., "kick the bucket"), lexical collocations (e.g., "kick the ball"), and lexical bundles (e.g., "one of the most") are all formulaic expressions. However, the

three kinds of FSs are quite different in the degree of semantic transparency. Idioms have low degree of semantic transparency; their conventional meanings are often different from their literal interpretations. Thus, idioms often cause problems to language comprehension because their meanings might not be derived from analyzing the constituent words and their grammatical relations (Cacciari and Tabossi, 1988). In contrast, lexical collocations and lexical bundles are highly transparent; their meanings are unlikely to "cause trouble for L2 learners from a comprehension perspective" (Wolter and Yamashita, 2018, p. 396). In this sense, lexical collocations and lexical bundles are similar to non-formulaic novel phrases; one thing that sets them apart is that lexical collocations and lexical bundles are recurrent in language use, enjoying significantly higher frequency than novel phrases do (Jiang and Nekrasova, 2007).

In NSs' FS processing, although researchers generally agree that FSs have a processing advantage over non-formulaic novel phrases, Carrol and Conklin (2020) found that the factors contributing to the processing advantage of different types of FSs were fundamentally different, suggesting that the processing of FSs is type-sensitive.

In L2 learners' FS processing, studies focusing on different kinds of FSs have often reported different processing patterns. For example, by examining idiomatic FSs, Conklin and Schmitt (2008) employed a self-paced reading paradigm to compare the processing of idioms' literal interpretation ("take the bull by the horns" interpreted as "wrestle with an animal") to their figurative interpretation ("take the bull by the horns" interpreted as "to attack a problem"). They found a processing advantage of idioms' figurative reading among both NSs and learners. However, when Siyanova-Chanturia et al. (2011) harnessed eye tracking to test NSs' and learners' idiom processing in literal versus figurative contexts, they did not detect any idiom processing advantage among learners due to their prolonged processing time spent on the idioms' figurative reading before reaching the idiom key, where an idiom can be recognized as an idiom. When targeting non-idiomatic FSs, Jiang and Nekrasova's (2007) grammaticality judgment tasks showed that both NSs and learners processed non-idiomatic FSs ("to tell the truth") significantly faster than their matched novel sequences ("to tell the price") with fewer errors. However, in series studies exploring another type of non-idiomatic FS— lexical collocations using eye-tracking paradigms (Vilkaitė, 2016; Vilkaitė and Schmitt, 2019)—the authors found that NSs and learners both processed adjacent collocations ("provided information") significantly faster than their free combination controls, while only NSs processed non-adjacent collocations ("provide some of the information") faster than free combinations. However, while scrutinizing lexical collocations in grammaticality judgment tasks, Gyllstad and Wolter (2016) reported a contrary processing pattern where both NSs and learners processed lexical collocations significantly more slowly than they processed free word combinations.

Due to conflicting findings, researchers have recently begun to call attention to the necessity of empirically comparing different types of FSs in SLA-oriented studies to discern the sources of learners' processing difficulties, and to better integrate findings about FS processing into FS acquisition (Myles and Cordier, 2017;

Carrol and Conklin, 2020). The most successful attempts can be found in a series of studies that aimed to identify L1 to L2 transfer occurring in the idiom domain (see Carrol et al., 2016 for a review) and the non-idiomatic collocation domain (see Wolter and Yamashita, 2018 for a review). By comparing the processing of L1-L2 congruent and incongruent FSs, these studies indicated that incongruency (an expression existing in the L1 but not in the L2, or vice versa) is a major source of FS processing difficulty, which to different degrees interacts with how frequently learners may encounter the FSs in the input (objective frequency) and how familiar they are with the FSs (subjective frequency); in turn, this affects their processing accuracy and processing speed. The pedagogical implication of these findings is that L2 learners may acquire different types of FSs through diverse sources and at different stages of learning (Wood, 2019). Hence, it is unlikely to draw a reliable conclusion about how L2 learners' formulaic knowledge develops when FS is used as an "umbrella term" (Myles and Cordier, 2017).

Chinese Formulaic Sequences

Chinese FSs share the universal characteristics that have been observed in FSs of other languages. They also lack homogeneity, and studies on the processing of different types of Chinese FSs by CSL learners have also reported conflicting results. For example, Zheng et al. (2016) used a grammaticality judgment task and a self-paced reading task to compare Chinese NSs' and learners' processing of a mixed class of FSs presented in isolation versus embedded in context. When FSs were presented in isolation, both NSs and L2 learners demonstrated significant FS processing advantages over the control novel phrases. However, when FSs were embedded in sentences, the processing advantage disappeared from the non-native speaker group. The authors concluded that the nature of L2 learners' and NSs' FS knowledge may be fundamentally different due to the different FS learning contexts. In contrast, using eye-tracking paradigms, Yi et al. (2017) explored the effects of whole-phrase frequency and constituent words' co-occurrence probability in the online processing of Chinese adverbial FSs embedded in sentences. They found that both NSs and L2 learners were sensitive to phrasal frequency and co-occurrence probability. Based on this processing pattern, the authors concluded that NSs and adult L2 learners may share the same statistical learning mechanism despite the different FS learning contexts.

Among all types of FSs, Chinese idioms, such as 成语 Cheng-yu set-language (e.g., "杯弓蛇影" cup-bow-snake-shadow "to mistake the shadow of a bow projected in one's cup as the shadow of a snake, indicating a false alarm or self-created suspicion") and 惯用语 Guan-yong-yu habitual-use-language (e.g., "翘辫子" rise-braid-SUFFIX "to be dead"), may be the thorniest type for L2 learners. Chinese idioms are often "composed in Classical Chinese and thus typically have a different grammatical structure from that of Modern Chinese" (Jiao et al., 2013, p. vi). Moreover, Chinese idioms often have highly compact meanings because of the limited length of three or four characters. Due to their classical origin and compact meaning, the acquisition of Chinese idioms can be particular difficult, and the proper use of Chinese idioms are often considered an "important

indicator of one's overall language proficiency" (Li and Tat, 2014, p. 338). For CSL/CFL teachers, idioms are categorized as a "luxury" component for Chinese learners (Guo, 2017; Yang, 2020). The empirical research has also found that L2 learners' idiom knowledge is often incomplete. Zheng et al. (2022) found that some idioms can only be correctly recognized but cannot be correctly understood or used. Duff and Li (2004) found that the speech quality of advanced Chinese learners who already have very good speaking and listening skills is highly constrained due to the improper use idioms. In other words, Chinese idioms represent very advanced knowledge that is particularly difficult to grasp, but they cannot be circumvented if near-native proficiency is to be achieved. In fact, idioms in other languages are also considered the steppingstone to achieve higher-than-advanced proficiency (Kim, 2016). Unfortunately, this proficiency can be attained by only a very small portion of learners (Webb, 2018).

Proficiency Levels and Formulaic Sequence Processing by L2 Learners
Proficiency Levels

In SLA contexts, proficiency levels can be operationalized by more practical or theoretical approaches. In educational settings, more practical approaches are often adopted. College-level foreign language programs tend to use the seat time to determine the proficiency status. By this criterion, the advanced proficiency often requires three to four semesters in the language program (Byrnes, 2012, p. 510), and the higher-than-advanced proficiency would need additional time. The discipline programs often specify proficiency levels through standardized test scores, such as the Oral Proficiency Interview (OPI), derived from the American Council on the Teaching of Foreign Languages Proficiency Guidelines-Speaking (American Council on the Teaching of Foreign Languages [ACTFL], 2012), and the Test of English as a Second Language (TOEFL). Based on performance descriptors for the TOEFL iBT, advanced learners would score 24–30 in the reading section, 22–30 in the listening section, 25–30 in the speaking section, and 24–30 in the writing section (Educational Testing Service [ETS], 2021). The ACTFL guidelines distinguish the advanced and superior levels of oral proficiency. The major difference between advanced-high level and superior level is that advanced-high speakers "cannot sustain performance at that level across a variety of topics" (American Council on the Teaching of Foreign Languages [ACTFL], 2012, p. 5). As an instrument for evaluating the functional language ability, the ACTFL proficiency guidelines share the same theoretical framework with the systemic functional linguistic approach, basing L2 proficiency on learners' abilities to use the target language in various genres (Ryshina-Pankova, 2018). From the psycholinguistic perspective, L2 proficiency is determined by the extent to which the late L2 learners (beyond the critical period) can process the target language in a native-like manner (Roberts, 2018). Because NSs command a wide range of formulaic language and advanced learners do not (Pawley and Syder, 1983), formulaic language was often used in psycholinguistic studies to address the proficiency effect (Bui et al., 2018).

The Proficiency Effect on L2 Learners' Formulaic Sequence Processing

Due to the difficulty in recruiting highly proficient L2 learners who have a sufficiently large FS repertoire to gauge the formulaic development, only a few studies on L2 FS processing have addressed the proficiency effect. Nekrasova (2009) compared intermediate and advanced English learners' and English NSs' knowledge status of two FS types: discourse-organizing bundles (e.g., "what do you think") and referential bundles (e.g., "one of the most"). The purpose was to determine whether these FSs are perceived as holistic units. To achieve that goal, Nekrasova conducted a gap-filling task to measure speakers' precise knowledge of the constituent words in FSs, and a dictation task to gauge the participants' knowledge of the holistic forms of the FSs. On the gap-filling task, intermediate learners scored significantly lower than the other two groups, while there was no significant difference between advanced learners and NSs. Based on this finding, the author concluded that learners who are capable of accurately producing FSs develop their skill as their proficiency increases. However, on the dictation task, advanced learners outperformed both intermediate learners and NSs in the amount and accuracy of the FSs that they recalled. The author speculated that lower-proficiency learners may have insufficient FS knowledge, while NSs may have an FS repertoire that is too large, which probably led to both groups' poor performance in recalling the exact forms of the dictated FSs. In addition, the comparisons of the two FS types revealed that all three groups acquired discourse organizers better than referential bundles on both tasks; this implied that the speakers' knowledge of FSs was affected by linguistic register and discourse function. Given the complicated outcomes, the author cautioned that more than one measurement should be used to determine the psychological validity of a particular FS type. In a more recent study, Wolter and Yamashita (2018) compared how intermediate English learners, advanced English learners, and English NSs processed L1 (Japanese)-L2 (English) congruent and L1-L2 incongruent collocations, and whether their processing speed was impacted by constituent word frequency and collocational frequency. In a phrase acceptability judgment task, the learners read four types of adjective-noun collocations under congruency conditions: (1) congruent; (2) English-only incongruent; (3) Japanese-only incongruent; and (4) non-collocational free phrases. Wolter and Yamashita analyzed the reading times of the items that were correctly responded to. In contrast to NSs, they found that L2 learners processed congruent collocations significantly faster than they processed English-only collocations. The authors attributed the congruency effect to the age of acquisition. For the proficiency effect, although all three groups exhibited sensitivity to both word-level and whole-form-level frequency, as learners' proficiency increased, they experienced a shift from greater sensitivity to word frequency to greater sensitivity to collocational frequency, representing a development toward nativeness. Based on this developmental pattern, the authors rebutted previous claims that there is a fundamental difference between NSs and L2 learners' processing of FSs, arguing that FS processing behavior evolves as speakers' language proficiency increases.

From the methodological perspective, both studies showed that the development pattern could not be observed without the fine-grained manipulation of FS materials.

Also, concerning the research methods, although both studies addressed the proficiency effect in L2 learners' FS processing, Nekrasova (2009) used controlled production tasks, while Wolter and Yamashita (2018) employed online perception tasks. Controlled production tasks tap into productive knowledge, and online perception tasks tap into receptive knowledge. However, previous research has pointed out that the development of learners' receptive knowledge and that of their productive knowledge are often unbalanced (Laufer, 1998; Daller et al., 2013). Therefore, to gain a more comprehensive view of how L2 learners' formulaic knowledge develops, both types of knowledge need to be investigated.

The current study went a step further, triangulating online perception data and unstructured production data by using a speedy phrase acceptability judgment task and a phrase acceptability judgment task with think-aloud protocols. The speedy task collects participants' yes-or-no judgments and response time, through which we can generalize FS processing patterns (Jiang, 2013). The think-aloud task gathers participants' thought processes, through which we can infer what processing strategies the participants use (Leow et al., 2014; Kim and Bowles, 2019). The overall processing patterns and detailed processing strategies can complement each other and provide a fuller picture of how the status of FS knowledge may evolve as proficiency level increases. The three research questions (RQs) that guided the study are as follows:

(1) Do ALs, SLs, and NSs demonstrate different patterns in FS processing accuracy?
(2) Do ALs, SLs, and NSs demonstrate different patterns in FS processing speed?
(3) Do ALs, SLs, and NSs demonstrate different patterns in their FS processing strategies?

MATERIALS AND METHODS

Participants
Recruitment

The participants included 13 ALs, 13 SLs, and 13 NSs. Although a larger sample size is always desirable for lexical research to iron out individual variances, Schmitt (2010) pointed out that "for psycholinguistic tasks with very precise measurement, this may require only 10 or 20 subjects" (p. 150). In the initial recruitment stage, 30 non-heritage CSL degree pursuers who had passed the highest level (Level 6) of the standardized Chinese language proficiency test (**HSK:** *Hangyu Shuiping Kaoshi*) volunteered to participate. Before the main test, the participants took an online character quiz designed and distributed by the APP Wenjuanxing questionnaire. On the quiz, the participants were asked to associate each character with its correct meaning on a multiple-choice task. The characters included (but were not limited to) all the characters that would appear in the testing materials. All

characters were within the required vocabulary range of the HSK 6 guidelines, so presumably the participants would already know all the characters. Knowing all target characters is important because it can confirm that any observed processing problems are NOT due to the presence of unknown words in the FSs. Finally, we included 26 learners (mean age = 26) who achieved a score of 100% on the quiz on the main test. Another 13 NS participants were undergraduate and graduate students recruited from two universities in Beijing (mean age = 27). None of them were Chinese language or literature majors.

Proficiency Levels of the L2 Participants

The 26 L2 participants came from four Chinese universities and were enrolled in three types of programs: (1) language degree programs designed for foreign students to learn Chinese for general and specific purposes; (2) discipline programs (including psychology, biology, economics, Chinese language and literature, and foreign language and literature) that mostly enroll Chinese undergraduate students and some very advanced foreign students who are able to use Chinese in academic settings; and (3) preparatory programs designed to prepare advanced foreigners to enter into discipline-focused programs. The background information about the L2 participants is presented in **Table 1**.

We further divided the 26 learners into two proficiency groups. Because the HSK test does not have official guidelines to differentiate advanced and higher-than-advanced levels of proficiency, we used learners' HSK scores as the primary criterion to distinguish their proficiency levels. We grouped the 13 highest scorers together (mean score = 247.77) and the 13 lowest scorers together (mean score = 206.54). Independent t-tests confirmed that the two groups' HSK scores were significantly different ($df = 24$, $t = -7.31$, $p < 0.000$). Other than HSK scores, we also considered years of learning the language and current enrollment programs. Shohamy (2006) proposed that the "advancedness" of language proficiency can be assessed by the extent to which language serves as a means for content knowledge learning, or if language itself is the goal of instruction. Based on this criterion, the top 13 scorers who were primarily learners in discipline-focused programs (n of learners in a discipline-focused program = 8, n of preparatory program learners = 4, n of language program learners = 1) would be considered more advanced than the bottom 13 scorers, who were mostly learners in language programs (n of learners in a language program = 10, n of learners in a preparatory program = 3). Moreover, Byrnes et al. (2010) argued that an undisputed characteristic of advanced language capacity is the long-term cumulative nature. Given the number of years it takes to learn Chinese, the top 13 scores (mean years of learning = 7.62) were more advanced than the bottom 13 scores (mean years of learning = 4.77). Hence, we identified the top 13 scorers as super-advanced learners and the bottom 13 scorers as advanced learners.

Test Materials

The two types of FSs used in this study were Chinese idioms and non-idiomatic FSs. Because we differentiated FSs by the domain of idiomaticity, we treated subtypes of non-idiomatic FSs (i.e.,

lexical collocation and lexical bundles) as one category. For both idioms and non-idioms, we also manipulated the sequence length by using three-character (3-C) sequences and four-character (4-C) sequences with matched whole-form frequency. The rationale is that because 4-C items are one character longer than 3-C items, if 3-C items are processed significantly faster than 4-C items of the same FS type, then it is very likely that the FSs will be visually recognized in a word-by-word fashion. If the length does not play a significant role in processing speed, then it is more likely that the FSs will *not* be read in a verbatim fashion.

We chose the target idioms based on the following steps. First, we manually extracted all 3-C and 4-C idioms listed in *The Contemporary Chinese Dictionary* (6th edition). We tried to be as exhaustive as possible. This procedure yielded a total of 2,098 4-C idioms and 3,783 3-C idioms. The 4-C idioms are all 成语 Cheng-yu; the 3-C idioms include both 惯用语 Guan-yong-yu and semantically non-transparent, verb-complement structures (e.g., 看上去 look-up go "*it seems like*"). Second, we ran the two types of idioms in the Google 1-gram database. Given the raw token frequency, we further extracted the top-ranked 300 items in each type. Then, by consulting with two experienced Chinese language teachers, we selected 38 3-C and 38 4-C idioms that are more likely to be familiar to advanced learners and have comparable whole-form frequencies for the idiom pool. Finally, using a 5-point scale, 33 Chinese language teachers rated these idioms based on the likelihood that an advanced Chinese learner would know them. Finally, we included 24 3-C idioms and 24 4-C idioms that received an average score of 4 or higher (see **Supplementary Materials Table A** for the ratings). The Cronbach's alpha coefficient (0.748) suggests that the raters' internal consistency was acceptable.

Because we aimed to compare the processing of idioms and non-idiomatic FSs, we matched each idiom with non-idiomatic FSs through the following steps. We first changed one constituent word of the target idiom and waited to see if the new expression would be grammatical, and if the whole-form frequency and total stroke number were matched with the target idiom (e.g., 大吃一惊 big-eat-one-surprise "be astounded at" vs. 大吃一顿 big-eat-one-meal "eat a big meal"). If changing one character failed, we continued to change two characters (e.g., 心中有数 heart-middle-have-number "have a clear ideal about" vs. 心里有事 heart-in-have-thing "have something in mind"). If changing two characters also failed, we used the fuzzy search function provided in the BCC corpus and looked for a potentially non-idiomatic expression that shared at least one content character with the target idiom (e.g., 前所未有 before-place-not-have "unprecedented" vs. 不可能有 not-can-able-have "cannot have"). After several rounds of matching, we found that some of the chosen non-idioms were absent from the existing Chinese frequency corpora. To solve this problem, we adopted Libben and Titone's (2008) method using the most popular Chinese website search engine[1] as the database, and we

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[1] www.baidu.com

TABLE 1 | Background information of L2 participants.

Ranking	Subject	Age	HSK score	Years of learning	Nationality	Program
Top 13 scorers	1	23	273	10	Korea	Discipline
	2	24	270	10	Korea	Discipline
	3	29	264	4	Korea	Discipline
	4	22	260	10	Korea	Preparatory
	5	19	250	7	Korea	Discipline
	6	26	248	3	Vietnam	Discipline
	7	22	247	9	Korea	Discipline
	8	24	246	9	Korea	Preparatory
	9	24	240	7	Korea	Preparatory
	10	30	232	8	Thai	Discipline
	11	21	232	10	Mongolia	Language
	12	31	230	5	Korea	Preparatory
	13	33	229	7	Thai	Discipline
Bottom 13 scorers	14	28	220	3	Korea	Language
	15	23	220	5	Kazakhstan	Preparatory
	16	27	220	6	Egypt	Language
	17	31	219	7	Korea	Language
	18	32	218	5	Russia	Preparatory
	19	23	212	2	Korea	Language
	20	27	210	4	Japan	Language
	21	30	207	6	Kazakhstan	Language
	22	27	204	6	Egypt	Language
	23	24	194	6	Kazakhstan	Preparatory
	24	23	188	6	Japan	Language
	25	25	187	4	Japan	Language
	26	29	186	2	Korea	Language

employed the log-transformed page count to represent the whole-form frequency. The selected non-idioms fulfilled the following criteria: (1) they are grammatical phrases commonly used in modern Chinese; (2) they have equal numbers of characters and similar constructions to the matched idioms; (3) they share at least one identical content character with the matched idioms; and (4) they have comparable total stroke numbers and whole-form frequency to the matched idioms. Independent samples t-tests ($a = 0.0125$) showed no significant differences in the 3-C idiom and 3-C non-idiom frequencies ($t = -0.57$, $df = 46$, $p = 0.57$) or stroke numbers ($t = 0.36$, $df = 46$, $p = 0.72$). The 4-C idiom and 4-C non-idiom frequencies were also not significantly different ($t = 0.09$, $df = 46$, $p = 0.93$), nor were their stroke numbers ($t = 0.08$, $df = 46$, $p = 0.94$). The Independent samples t-tests also confirmed that the 24 3-C idioms and 24 4-C idioms were matched in whole-form frequency ($t = -1.49$, $df = 46$, $p = 0.14$), as were the 24 3-C non-idioms and 24 4-C non-idioms ($t = 1.69$, $df = 46$, $p = 0.72$).

In sum, the test stimuli (in **Supplementary Materials Table A**) consisted of four categories of FSs: (1) 3-C idioms ($n = 24$) and (2) matched 3-C non-idioms ($n = 24$) and (3) 4-C idioms ($n = 24$) and (4) matched 4-C non-idioms ($n = 24$). Another 96 ungrammatical phrases were made up as fillers. We divided the test stimuli into two counterbalanced blocks so that the

participants would not read an idiom and its matched non-idiom in the same block.

Instruments

The Speedy Phrase Acceptability Judgment Task

We programmed the speedy acceptability judgment task using Paradigm software to collect judgment accuracy data and response time data. Acceptability judgment task paradigms have been widely used in the SLA field to measure learners' L2 competence (e.g., Ellis, 1991; Han and Ellis, 1998; Loewen and Erlam, 2006). Because the time pressure imposed by speedy/timed tasks reduces the chance of accessing metalinguistic knowledge, speedy acceptability judgment tasks are often considered a measure of implicit knowledge (Ellis, 2005; Bowles, 2011) and the amount of cognitive effort spent (Jiang, 2013). For some linguistic phenomena (i.e., FS) that are not easily elicited in free production tasks, the acceptability judgment task is also more practical because it can test a large number of target forms and can therefore gather more representative data. For this task, the participants were informed that they would see some Chinese phrases and that they needed to indicate whether a phrase is likely to be read or heard in Chinese. A phrase was presented on a computer screen after an 800-millisecond (ms) presentation of a fixation cross; the participants were asked to press the "A" key if the phrase seemed acceptable in Chinese or the "L" key if the

phrase seemed unacceptable, as quickly as they could. The phrase remained on the screen until a response key was pressed. The participants then took a 5-min break and returned to complete the second block.

The Think-Aloud Phrase Acceptability Judgment Task

We conducted the think-aloud phrase acceptability judgment task 1 week after each participant finished the speedy acceptability judgment task. This task allowed us to examine participants' thought processes when they judged the phrases. The purpose was to infer what processing strategies were used by different groups of participants and for different types of FSs. As a versatile data collection tool, the think-aloud method has been broadly employed in L2 studies to gather data about learners' thought processes to measure processing strategies (Cooper, 1999), depth of processing (Kim and Bowles, 2019), or linguistic awareness (Leow and Morgan-Short, 2004). In mixed-methods research, think-aloud protocols are harnessed to complement other concurrent data collection procedures to obtain nuanced information that quantitative methods might not be able to capture (Leow et al., 2014).

In previous SLA research, think-aloud protocols can be classified into two types—metalinguistic and non-metalinguistic—each tapping into different kinds of knowledge and having different techniques. The metalinguistic think-aloud protocols—which are carried out by asking participants to provide justifications for their performance—tap into metalinguistic knowledge. The non-metalinguistic think-aloud protocols—which are conducted by simply asking the participants to verbalize whatever is on their minds while performing a task—tap into general cognitive processes (see Bowles, 2010, Chapter 2 for a thorough review). Since it is impossible for participants to vocalize all of their thoughts, neither of the two approaches can verify whether the non-metalinguistic think-alouds represent a more accurate reflection of learners' thought processes, because the non-metalinguistic instruction does not ask participants to explain their performance, and thus does not intentionally induce participants to access any particular type of knowledge (Ellis and Loewen, 2007). The disadvantage of non-metalinguistic think-alouds is that think-aloud data provide enough details, but not all of them are directly related to the research questions.

For this study, we generally used a non-metalinguistic approach, asking participants to report whatever came to their mind when making a yes-or-no judgment. However, instead of emphasizing "don't explain your thoughts" (Sanz et al., 2009, p. 53), the participants were asked to answer, "How do you know that the phrase is acceptable or not?" without requiring a specific type of information. We conducted two rounds of pre-tests and found that this instruction did not especially induce the participants to provide metalinguistic information. For example, on the pre-test, some participants simply reported that "我就感觉是对的 *I just feel it's correct*" or "我听过这个 *I've heard of this.*" On the test, we used the same set of test stimuli and a different set of filler stimuli. The test stimuli were presented one by one on a computer screen controlled by a research assistant.

Because L2 learners were also asked to verbalize in Chinese, they were informed that they need not worry about language errors, because the purpose of the task was to understand their thought process, rather than testing verbal proficiency (Kim and Bowles, 2019). Adapted from Sanz et al. (2009, p. 53), the instructions were as follows:

"我听过这个请判断这个短语在汉语里能不能说，请说出您是怎么知道的。就把您思考时在脑子里对自己说的话大声说出来，就好像您独自坐在一个房间里跟自己说话一样。不用在意说的句子语法对不对，完整不完整，因为我们只是了解您在做判断时的想法。(*Please judge whether or not this phase is acceptable in Chinese, and state how you know that. Just say out aloud everything that you would say to yourself silently while you think. Just act as if you were sitting alone in the room speaking to yourself. Don't worry about whether your sentence is grammatical or complete because we only want to know about your thought process while making the judgment.*)"

We used five grammatical FSs and five ungrammatical phrases in the practice session to ensure that the participants were able to think aloud appropriately. On the main test, to ensure that participants' thinking aloud was constant throughout the experiment, they were reminded to keep talking when they fell silent. We audio-recorded the entire think-aloud session using Audacity and manually transcribed the data.

Coding

We coded the participants' think-aloud reports for processing strategies. In this study, "processing strategy" refers to what type of information a participant relied on to make a judgment. A participant could use his/her intuition and say, "*I just feel it is correct,*" or think of an example sentence, such as "看热闹，对的，两个人打架我去看热闹 (*'Kan-re-nao,' correct. Two men are fighting and I go to watch the fun*)". When developing the coding book, we consulted one grammaticality judgment study and one idiom processing study. In Rebuschat and Williams' (2012) study, participants were asked to report what source of knowledge they used to make grammaticality judgments, and the verbal reports were coded into five categories: guess, intuition, pre-existing knowledge, rules, and memory. In Cooper's (1999) study, L2 learners were asked to verbalize what they were thinking while reading a passage that included idioms. Learners' idiom processing strategies were coded into eight categories: repeating or paraphrasing; analyzing the context; requesting information; guessing the meaning; using the literal meaning of the idiom; using background knowledge; referring to one's L1; and other strategies. Referring to the above two coding schemes and our preliminary observations of the think-aloud data, we created five categories for processing strategies: (1) using intuition (abbr. intuition); (2) thinking of examples (abbr. example); (3) making an interpretation (abbr. interpretation); (4) associating pre-existing knowledge (abbr. association); and (5) performing metalinguistic analysis (abbr. metalinguistics). **Table 2** presents the think-aloud evidence for each processing strategy.

Two trained research assistants coded approximately 20% of the think-aloud data ($n = 750$) independently. The intercoder reliability reached 95.3% (Cohen's Kappa = 0.829). The

TABLE 2 | Processing strategies, specific presentations, and TA evidence.

Strategy	TA evidence
Intuition	
Feeling	我听起来就不对.
	It doesn't sound right to me.
Confession	我见过这个，可是意思忘了.
	I have seen this one, but forgot its meaning.
Cliché	这就是我常说的/这就是一个成语.
	This is just what I often say/This is just an idiom.
"A just means A"	我很高兴就是我很高兴.
	wŏ-hĕn-gāo-xìng [I am very happy] just means *wŏ-hĕn-gāo-xìng* [I am very happy]."
Example	
Give an example	他通过了考试，真是'出人意料'.
	He passed the exam; it is truly *chū-rén-yì-liào* [beyond all expectations].
Interpretation	
Interpret the meaning	'一见钟情'就是第一次见面就爱上了彼此.
	yī-jiàn-zhōng-qíng [fall in love at first sight] means falling in love with each other during the first meeting.
Interpret the context of usage	'不敢当'就是别人夸你的时候你说，谦虚的.
	bù-gan-dăng [I truly don't deserve this] is what you say when people praise you in order to be modest.
Association	
Associate a synonym/antonym	'等不及'就是'不耐烦'.
	dĕng-bù-jí [can't wait] is just *bu-nai-fan* [impatient]
Associate another FS	没听过'好意思'，只听过'不好意思'.
	Haven't heard of *hăo-yì-si* [have the nerve], only heard of *bù-hăo-yì-si* [be ashamed of].
Associate L1	对，韩语里也有这样的说法.
	Correct. Koreans also have this saying.
Metalinguistics	
Syntactic analysis	对，是动词加补语的结构.
	Correct. It is a verb plus a complement structure.
Semantic analysis	应该是表达和自己的情绪有关系，因为有哭和笑两个字.
	It should be related to one's emotions, because there is a *kū* [cry] and *xiào* [smile] in it.
Pattern analysis	'谈天说地'，对的，中文里说'天'就一定要说'地'.
	tán-tiān-shuō-dì [talk of everything under the sun], correct. In Chinese, when *tán* [sky] is mentioned, *dì* [earth] must also be mentioned.

agreement was considered high enough for one assistant to code the remaining data alone.

Preliminary Data Processing

To analyze processing accuracy, we included all judgment data. Because the selected testing materials were highly familiar to NS participants and most non-native participants, the dichotomous judgment data (processing accuracy) were supposed to be positively skewed (Kurtosis-3 = 7.65, p < 0.000; with an expected kurtosis value of 3). To analyze processing speed, we transformed the raw response time data by log10 to reduce skewness (Kurtosis-3 = 0.11, p = 0.182). We excluded incorrect responses to target items, which led us to remove 1.9% of the

NS data, 5.7% of the SL data, and 16.3% of the AL data. We further trimmed the extreme data by setting the cutoffs at three standard deviations from each participant's mean response time. This procedure removed an additional 1.1% of the NS data, 0.7% of the SL data, and 0.6% of the AL data. To analyze processing strategies, we included all think-aloud data (Kurtosis-3 = 0.06, p = 0.417).

Processing accuracy was analyzed using a generalized linear mixed-effects model, and processing speed using a linear mixed-effects model in R via the lmerTest package. When we fitted the models, we included the variables of group, type of FSs, length of FSs, and their interactions as fixed effects. The participants and items were added as random effects beginning with a maximal structure encompassing random intercepts for participants and items, and random slopes for all fixed effects. The maximal random-effects structure was reduced when the model failed to converge. Regarding the above analyses, we report the model structure, the Wald chi-square statistics for processing accuracy, F statistics for processing speed, degrees of freedom, and the significance of the fixed effects. The full model outputs, including all results of pairwise contrasts, are available in the **Supplementary Materials** (Tables B and C). The processing strategy was cross-tabulated by group and type of FS to explore the frequency distribution. We also performed qualitative analysis of each strategy used by each group.

RESULTS

RQ1: Processing Accuracy

RQ1: *Do ALs, SLs, and NSs demonstrate different patterns in FS processing accuracy*? To answer this question, we examined the yes-or-no judgments made by the three groups of participants on the speedy acceptability judgment task. First, we cross-tabulated the accuracy percentages by the three groups on different type and length conditions. The results (in **Table 3**) show that the judgment accuracy on all FS conditions increased as proficiency level increased. NSs' judgments of idioms were either as accurate as, or more accurate than, their judgments of non-idioms. In contrast, SLs' and ALs' judgments of idioms were either as accurate as, or less accurate than, those of non-idioms.

The dichotomous judgment data were then analyzed via a generalized linear mixed-effects model in R using the lmerTest package. When fitting the models, we entered the variables of

TABLE 3 | Mean judgment accuracy ratios by group and FS type and length.

		NS		SL		AL	
		Mean	SD	Mean	SD	Mean	SD
Type	*Length*						
Idiom	3-Character	0.98	0.13	0.93	0.26	0.79	0.41
	4-Character	1.00	0.00	0.94	0.25	0.84	0.37
Non-idiom	3-Character	0.98	0.14	0.97	0.18	0.88	0.33
	4-Character	0.96	0.18	0.94	0.24	0.85	0.36
Total		0.98	0.11	0.94	0.23	0.84	0.37

group, length, and type as fixed effects. We added the participants and items as random effects, including the random intercepts of participants and items and the random slopes for all fixed effects. When dealing with the multicollinearity issue, we excluded the three-way interaction of group × type × length from the model because the two-way interactions and the planned *post hoc* contrasts for the two-way interactions were informative enough about the source of the effect of type and length on different group conditions. The analysis returned a significant effect for group ($\chi^2 = 49.16$, $df = 2$, $p < 0.000$) and the interaction of group × type ($\chi^2 = 10.13$, $df = 2$, $p = 0.006$) and type × length ($\chi^2 = 9.54$, $df = 1$, $p = 0.002$). The effect of type was marginally significant ($\chi^2 = 2.91$, $df = 1$, $p = 0.088$), while the effect of length ($\chi^2 = 1.66$, $df = 1$, $p = 0.198$) and the group × length interaction ($\chi^2 = 1.42$, $df = 2$, $p = 0.493$) were both non-significant.

We then conducted the planned pairwise comparisons. The analyses for the effect of group show that the judgment accuracy was significantly different between NSs and ALs ($p < 0.000$), NSs and SLs ($p < 0.000$), and ALs and SLs ($p < 0.001$). NSs' judgments were more accurate than those of the two groups of learners, and SLs' judgments were more accurate than those of the ALs. The analyses for the effect of type × group indicate that idioms were judged significantly more accurately than non-idioms by NSs ($p = 0.012$), while idioms were judged significantly less accurately than non-idioms by ALs ($p = 0.024$). SLs' judgments of idioms and non-idioms were only marginally different ($p = 0.061$). This finding suggests that NSs' recognition of idioms was more successful than their recognition of non-idioms, implying that idioms were more deeply entrenched in the NSs' lexicons and therefore unlikely to be recognized incorrectly. For CSL learners with a relatively low proficiency level, the results hint that they were better at judging semantically transparent or syntactically regular sequences than the irregular formulae. For learners with a higher proficiency level, their judgment ability of the irregular formulae developed and approached their judgment ability of the regular formulae. The analyses for the effect of length × group demonstrated no significant results for NSs ($p = 0.623$), SLs ($p = 0.297$), or ALs ($p = 0.747$), thereby suggesting that longer FSs were recognized as successfully as shorter FSs by all three groups of participants.

RQ2: Processing Speed

RQ2: *Do ALs, SLs, and NSs demonstrate different patterns in FS processing speed?* We used the eligible response time data to answer this question. We first examined the raw response times descriptively (results in **Table 4**). As expected, the mean response time under all FS conditions decreased as proficiency level rose. For the NS group, 3-C and 4-C idioms were both processed more quickly than their non-idiom counterparts. We noted a similar trend in the SL group. In contrast, for the AL group, 3-C and 4-C non-idioms were processed more quickly than their idiomatic counterparts. The fastest FS category was 4-C idioms for NSs (1000 ms), 3-C idioms for SLs (1516 ms), and 3-C non-idioms for ALs (2,345 ms).

The log10-transformed response time data were then sent into a linear mixed-effects model with group, type of FSs, and length of FSs included as fixed effects. We added the participants and items as random effects, beginning with a maximal random effects structure encompassing random intercepts for participants and items, and random slopes for all fixed effects. The outcomes showed a clear effect for group ($F = 51.45$, $df = 2$, $p < 0.000$), length ($F = 8.90$, $df = 1$, $p = 0.003$), the interaction for group × type ($F = 7.62$, $df = 2$, $p < 0.001$), group × length ($F = 14.42$, $df = 2$, $p < 0.000$), and group × type × length ($F = 5.35$, $df = 2$, $p = 0.005$). The effect of type ($F = 0.96$, $df = 1$, $p = 0.327$) and the interaction for type × length ($F = 1.37$, $df = 1$, $p = 0.242$) were non-significant.

To explore the differences between the levels of each variable, we performed planned pairwise comparisons. The analyses for the effect of group showed that processing speed was significantly different between NSs and ALs ($p < 0.000$), NSs and SLs ($p = 0.017$), and ALs and SLs ($p < 0.000$). Further, NSs outperformed the two learner groups, and the SLs outperformed the ALs. The analyses for the effect of group × type revealed that idioms and non-idioms were processed at a significantly different speed by NSs ($p = 0.002$), with idioms being processed faster than non-idioms, and by ALs ($p = 0.019$), with idioms being processed more slowly than non-idioms, but the difference was non-significant for SLs ($p = 0.268$). This pattern indicates that learners with lower proficiency might spend more cognitive effort processing semantically or syntactically irregular formulae than regular ones. As proficiency approached the near-native level, the cognitive efforts spent on irregular forms decreased, thereby generating comparable processing speed for idioms and non-idioms. For NSs, the processing pattern was reversed, as idioms were processed more effortlessly than non-idioms, suggesting that idioms might be pre-listed in NSs' mental lexicons. The analyses for the effect of group × length showed that the processing speed of 3-C versus 4-C FSs was significantly different

TABLE 4 | Raw RT (ms) by group, type of FSs, and length of FSs.

		NS			SL			AL		
		Mean	N	SD	Mean	N	SD	Mean	N	SD
Type	*Length*									
Idiom	3-Character	1199	303	825	1516	286	945	2415	243	1713
	4-Character	1000	311	369	1769	290	1360	2872	259	1781
Non-idiom	3-Character	1216	302	687	1652	299	1210	2345	272	1408
	4-Character	1205	296	833	1853	292	1674	2403	262	1379
Average across types and lengths		*1155*	*303*	*679*	*1698*	*292*	*1297*	*2509*	*259*	*1570*

for the NS group ($p = 0.002$), with 4-C FSs being processed faster than 3-C FSs. A significant length effect was also found for the SL group ($p = 0.002$) and the AL group ($p = 0.002$). However, both with 3-C FSs were processed more quickly than 4-C FSs. The findings of the length effect for SLs and ALs were explainable, as the longer sequences required a longer time to read. Notwithstanding, the finding for NSs was counterintuitive. We computed the planned pairwise comparison for length × type for the NS group. The length effect existed only in the processing of idioms, with 4-C idioms responding significantly faster than 3-C idioms ($p = 0.011$), but the difference between 3-C non-idioms and 4-C non-idioms was non-significant ($p = 1.00$).

RQ3: Processing Strategies

RQ3: Do ALs, SLs, and NSs demonstrate different patterns in their FS processing strategies? We first addressed this question by cross tabulating the frequency distributions of the five strategies (intuition, example, interpretation, association, and metalinguistics) by group. The results are presented in **Figure 1**. There is a clear group difference in strategy use. The most frequent strategy in the NS group was the example strategy, but the most frequent strategy in the AL and SL groups was the interpretation strategy. The intuition strategy was also more frequently used by NSs than it was by the two groups of learners. The association strategy was seldom used by all three groups. The metalinguistics strategy was almost exclusively used by ALs. To further explore whether there was a difference between each group's strategy use for idiomatic versus non-idiomatic FSs, we cross-tabulated strategy use by type and group (see **Table 5**) and performed a qualitative analysis for each strategy.

Intuition

Intuition was used more frequently by NSs; 38.8% of idioms and 35.9% of non-idioms were processed with intuition by NSs. SLs used intuition for 22.3% of idioms and 28% of non-idioms. ALs used intuition for 25% of idioms and 19.4% of non-idioms. When using intuition with idioms, NSs often immediately identified the idioms, saying, "*It is just an idiom.*" Learners either relied on their feelings or confessed that "*I have learned this but forgotten its meaning.*" When using intuition with non-idioms, all three groups of participants provided a cliché type of answer, such as "*A just means A*" or "*It is just what I often say*" without further elaboration. That NSs could quickly recognize idioms suggests that idioms are a very salient FS type in NSs' mental lexicons. In contrast, learners' feelings and confessions imply that idioms might not have been fully acquired. The cliché reports hint that both NSs and learners' non-idiomatic FS knowledge had become proceduralized.

Example

The example strategy was more frequently used for non-idioms than idioms by all three groups. NSs provided examples for 53.4% of non-idioms, SLs for 45.7% of non-idioms, and ALs for 40.5% of non-idioms. For idioms, an example strategy was used 31.4% of the time by NSs, 19.9% of the time by SLs, and 17.9% of the time by ALs. In using the example strategy, the participants either described a typical situation in which an FS

often occurs or directly used the target FS to make a sentence. Being able to use an FS in a real situation is evidence of the possession of proceduralized knowledge (DeKeyser, 2003). The prevailing use of the example strategy for non-idioms indicates that non-idiomatic FS knowledge has been fully acquired as communicative and productive knowledge. When the example strategy was used for idioms by learners (and occasionally by NSs), the examples often contained errors, denoting that their productive idiom knowledge was limited. Below are two incorrect examples for the same idiom.

Target idiom: 脱口而出 cast-mouth-and-out "*blurt out*"
    An NS's report: "我脱口而出吐了一口痰. (*I 'tuo-kou-er-chu' and spit sputum.*)"
    An AL's report: "嗯，这个，看起来是对的。比如说，嗯，我、我、我好久都没有跟你说什么，终于 脱口而出. (*Er, this one, seems correct. For example, I, I, I haven't said anything to you for a long time, and finally 'tuo-kou-er-chu').*"

Interpretation

The interpretation strategy was the most frequent approach for both the AL and SL groups. SLs used interpretation for 53.5% of idioms and 23.7% of non-idioms, and ALs used interpretation for 36.1% of idioms and 23.6% of non-idioms. For NSs, 26.4% of idioms and 8.3% of non-idioms were interpreted. Interpretations include two types: one is to provide a correct interpretation for a familiar FS (which is the case for all NSs' interpretations); the other is to propose an interpretation for an unfamiliar FS (which is the case for some learners' interpretations).

In the latter case, learners are often based on the constituent word's meaning and their logical thinking to make sense of the unknown FS, sometimes resulting in an erroneous interpretation. An example is shown below.

Target idiom: 千方百计 thousand-method-hundred-plan "*to make every possible effort to*"
    An AL's report: "是对的，应该......我觉得解释应该是有很多计划. (*Correct. Should...I think that the meaning should be 'having many plans?')*"

Association

This strategy was barely used by all three groups (all <7%). When employing this strategy, both NSs and the two groups of learners would associate synonyms or antonyms, but only learners confused the target FS with another Chinese FS with a similar form, but not exactly the same meaning (e.g., 一路顺风 one-road-smooth-wind "*wish you a happy voyage*" vs. 一帆风顺 one-sail-wind-smooth "*wish everything go smoothly*"). Learners also associated a similar expression in their L1. The association strategy suggests that learners store their FS knowledge in a network fashion (Fitzgerald et al., 2020). Thus, by activating one item, other related items are also activated. However, the learners' think-aloud evidence suggests that such association may facilitate FS recognition but not necessarily FS comprehension or production.

Metalinguistics

The metalinguistics strategy was almost exclusively used by ALs in the processing of both idioms (14.6%) and non-idioms
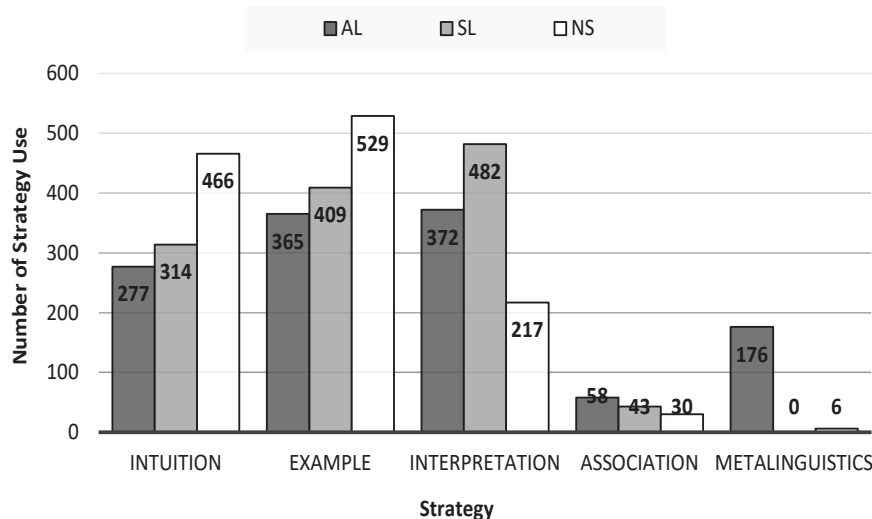
FIGURE 1 | Frequencies of strategy use by group.

TABLE 5 | Crosstabulation of strategy by group and type.

	NS		SL		AL	
	Idiom	**Non-idiom**	**Idiom**	**Non-idiom**	**Idiom**	**Non-idiom**
	n (%)	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**
Intuition	242 (38.8)	224 (35.9)	139 (22.3)	175 (28.0)	156 (25.0)	121 (19.4)
Example	196 (31.4)	333 (53.4)	124 (19.9)	285 (45.7)	112 (17.9)	253 (40.5)
Interpretation	165 (26.4)	52 (8.3)	334 (53.5)	148 (23.7)	225 (36.1)	147 (23.6)
Association	20 (3.2)	10 (1.6)	27 (4.3)	16 (2.6)	40 (6.4)	18 (2.9)
Metalinguistics	1 (0.2)	5 (0.8)	0 (0.00)	0 (0.00)	91 (14.6)	85 (13.6)
Total	624 (1.00)	624 (1.00)	624 (1.00)	624 (1.00)	624 (1.00)	624 (1.00)

(13.6%). NSs employed metalinguistic strategies less than 1% of the time, and SLs used zero metalinguistic strategies. By scrutinizing the think-aloud reports, we found that NSs' metalinguistic cases often involved questioning whether a lexical bundle (e.g., 不可能有 not-may-possible-have "it is impossible to have") was legitimate to be used in isolation. Metalinguistic analysis is often considered evidence of accessing explicit knowledge (Ellis and Loewen, 2007). In this study, ALs' metalinguistic analysis often occurred to unfamiliar FSs, suggesting that when FSs had not been acquired, learners would reply on their rule-based semantic and syntactic knowledge to make the judgments. The correct yes-or-no judgment indicates that the rule-based knowledge is useful to some extent, but the incorrect inference of the meaning suggests that the acquisition of FSs cannot depend on the learning of rules. The following examples display the incorrect metalinguistic analyses.

Target idiom: 谈天说地 *talk-sky-say-earth* "*talk of everything under the sun*"
    An AL's report: "应该是对的, 因为谈和说有关的, 天和地有关的, 但是怎么用……不知道. *(Should be correct, because 'tan [talk]' is related to 'shuo [say]'; 'tian [sky]' is related to 'di [earth],' but how to use it……I don't know.)*"

Target non-idiom: 打死了 *beat-die-ASPECT* "*beat to death*"
    An AL's report: "对的程度很深的时候用死了, 就是很厉害地打. *(Correct. 'si-le [dead]' is to indicate a deep degree,' just meaning to beat severely.)*"

DISCUSSION

Findings

This study examined the processing of Chinese idiomatic and non-idiomatic FSs among three groups of participants with different levels of proficiency. Due to the relatively small sample size, the findings should be considered to be tentative answers to our three research questions.

RQ 1

This question aimed to compare AL, SL, and NS processing patterns through dichotomous judgment data. The analysis of the dichotomous judgments returned significantly different processing patterns among the three groups. NSs judged idioms more successfully than they judged non-idioms. ALs judged non-idioms more successfully than they judged idioms. SLs judged non-idioms slightly more accurately than they judged idioms,

but the difference was marginal. The length effect was absent in all three groups. These patterns suggest that idioms are more deeply entrenched in NSs' long-term memory than non-idioms and are thus unlikely to be recognized as wrong. For ALs, both types of FSs might not have been fully acquired, but since non-idioms are semantically and syntactically transparent forms, their correctness is easier to judge than idioms. SLs were almost equally successful with idioms and non-idioms, indicating that in the super-advanced stage, learners' idiomatic knowledge improved compared to that in the advanced stage.

RQ 2

This question aimed to compare AL, SL, and NS processing patterns through reaction time data. For NSs, idioms were processed significantly faster than non-idioms, regardless of the length of the FSs. In the AL group, we observed a reversed pattern; non-idioms were processed significantly faster than idioms were. Longer FSs took a significantly longer time to process than shorter ones did. For SLs, idioms were processed as fast as non-idioms, but longer FSs still required significantly longer processing times than shorter FSs. The presence of a length effect in the AL and SL groups suggests that learners were likely to read both idioms and non-idioms in a word-by-word fashion. For ALs whose idiom knowledge was quite limited, judging the correctness of an idiom may have largely relied on the online computation of the constituent words. Because idioms are semantically non-transparent forms, computing and making sense of an idiom would require more time than computing and making sense of a transparent non-idiom. However, SLs who possess better idiom knowledge still need to read an idiom word-by-word in the initial stages, but after they have reached the idiom key—the constituent word that determines when an idiom form can be recognized as an idiom (Cacciari and Tabossi, 1988)—they are able to judge the correctness without having to compute the rest of the sequence, hence saving processing time, resulting in a comparable processing speed for idioms and non-idioms. Overall, the SL performance exhibited a transition-stage pattern, gradually departing from the ALs and approaching NSs.

RQ 3

This question aimed to compare AL, SL, and NS processing patterns through think-aloud data. We coded think-aloud statements for five levels of processing strategies. The frequency analysis showed that the two learner groups used different processing strategies from the NS group. NSs preferred to use the example strategy, while learners preferred to use the interpretation strategy. This pattern suggests that the nature of NSs and learners' formulaic knowledge may be fundamentally different. Being able to provide examples indicates that NSs' formulaic knowledge has become proceduralized. Providing interpretations implies that learners' formulaic knowledge might still be descriptive (Basturkmen et al., 2002; DeKeyser, 2007). In addition, all three groups employed more example strategies with non-idioms than idioms, denoting that both NSs' and learners' productive idiom knowledge is limited to different extents.

In sum, the following processing patterns emerged from the analyses of processing accuracy, speed, and strategy. First, the participants' processing accuracy and global processing speed increased along with their proficiency. Second, CSL learners' idiom processing ability was generally lower than that of non-idiom processing ability, but they demonstrated an improving trend as their proficiency level increased. Third, CSL learners' use of processing strategies did not change much as proficiency rose and demonstrated a categorical difference from NSs. Fourth, all three groups exhibited poorer productive idiom knowledge than productive non-idiom knowledge.

Implications
Moving Beyond the Lexical Plateau

In the analyses of processing accuracy and processing speed, we found that SLs' processing patterns were significantly different from those of ALs. From the advanced to the super-advanced levels, the learners changed from being more successful at non-idiom processing to being equally successful at non-idiom and idiom processing, marking a transition toward NS performance (being more successful at idiom processing). This finding suggests that formulaic knowledge can grow substantially as learners move from an advanced to a higher proficiency level.

In the SLA literature, higher-than-advanced learners have long been overlooked. A major reason for this is that the number of achievers is very small, especially for learners of a non-English language such as Chinese. Another reason may have to do with the general assumption of the lexical plateau (see Daller et al., 2013 for an overview). Motivated by general learning curve models, L2 researchers have found that the development of lexical knowledge follows the general learning curve with slow growth at the beginning, followed by an accelerating phase and then flattening out to a plateau. This finding has led educators to assume that in the advanced stage, lexical knowledge probably ceases to grow because learners have already accumulated a large vocabulary inventory and sufficient L2 experience that allows them to successfully handle most target language scenarios. However, our findings imply that some lexical aspects maintain a fast-growing pace after learners have surpassed the advanced stage.

From a methodological angle, our findings hint that the lexical plateau phenomenon may be the outcome of the testing method used. That is, the instruments employed to test higher-than-advanced learners' lexical knowledge might not be sufficient to reveal domain-specific progress. In recent years, as Chinese language education has received substantially more attention within and outside China (Gong et al., 2020a), the number of advanced learners has shown an incremental trend. In 2021, the newly published *Chinese Proficiency Grading Standards for International Chinese Language Education* (National Language Commission, 2021) changed the 6-level standard to a 9-level standard to accommodate Chinese learners' increased overall proficiency (Ministry of Education of the People's Republic of China, 2021). In contrast to this development, there is a profoundly inadequate understanding of higher-than-advanced Chinese learners and a severe dearth of teaching and testing materials. The findings about formulaic knowledge may inform researchers and teachers of where to direct their efforts to help advanced learners move beyond the lexical plateau.

Enhancing Idiomaticity in the Classroom

Another observation gained from the think-aloud data was that both NSs' and learners' ability to use idioms was limited to different extents. This was shown by the fact that all three groups used far fewer example strategies (ranging from 22% to 36%) with idioms than with non-idioms. Poor idiom competence was also reported by Lewis et al. (1998) and Yang and Xie (2013), who found that making mistakes in using idioms is a pronounced phenomenon in both native and non-native Chinese speakers.

As for why using idioms is problematic, there are multiple reasons for learning difficulties. The primary one is the semantic opaqueness of idioms. Because of semantic and syntactic idiosyncrasies, learning idioms largely depends on rote memorization (Long et al., 2018), which causes cognitive burdens for learners. Second, most idiomatic expressions are domain- or genre-specific (Xu and Qin, 2021), which means that language users may have passively encountered them multiple times, but have not had sufficient opportunities to actively use them (Ellis, 2012). As a result, there is a great gap between learners' receptive and productive idiom knowledge. Laufer (1998) pointed out that the development of passive lexical knowledge does not imply the development of active lexical knowledge. Usage-based approaches also predict that true learning only occurs when a language form can be employed interactively (Abbot-Smith and Tomasello, 2006). The question then becomes: How can we increase the frequency of the interactive use of idioms? Since idioms are not frequently used in everyday communicative settings, we argue that L2 learners' idiomaticity could be enhanced by integrating interactive activities into the classroom. Yang and Xie (2013) proposed a self-generated learning approach for Chinese idioms, the essential parts of which are that students work in pairs and make idiom-carrying sentences/stories, and then read and provide peer feedback on other groups' productions. Through these ongoing input–output cycles, learners' productive idiom knowledge becomes entrenched. The authors also stressed that teachers' interventions, such as idioms solitaire, are needed throughout the process to maximize the learning-on-error effect.

Improving Formulaic Competence Outside the Classroom

Another finding we would like to consider is the processing strategy used by the three groups of participants. Although the processing accuracy and speed data demonstrate a trend whereby L2 learners' FS knowledge increased as they moved from the advanced to the super-advanced levels, the learners' processing strategy pattern basically remained unchanged. While NSs used the example strategy the most, both ALs and SLs employed the interpretation strategy the most. The use of examples indicates that NSs can interact with FSs in a communicative manner, which represents a high degree of knowledge mastery. In contrast, the interpretation strategy involves describing or inferring FSs' meaning; both cases suggest that CSL learners' formulaic knowledge is descriptive and static (Ellis, 2005; Bowles, 2011). The question we must ask then is: How can descriptive FS knowledge become communicative knowledge?

Dörnyei et al. (2004, p. 87) proposed that the acquisition of formulaic competence is a "socially loaded process" because formulaic expressions are so closely linked to the sociocultural reality of the target language. Thus, to incorporate descriptive formulaic knowledge into learners' own language repertoires, learners must immerse themselves in host cultures through active participation in L2 communities. Taguchi et al. (2013) found that even when studying abroad, learners' perceived encounters with formulae could not directly lead to gains in formulaic production, especially in the case of proficient learners. Moreover, learners' contextually inappropriate use of formulae may occur due to a lack of socio-pragmatic knowledge. Gong et al. (2021) also suggested integrating opportunities and resources both in and outside the classroom to promote CSL/CFL learners' Chinese proficiency. Based on previous literature and our observations, we assert that a more effective pedagogical means for cultivating formulaic competence—especially in the advanced stage—is to encourage students to step outside the classroom and to engage in everyday interactions with NSs. For teaching in CSL contexts, Gong et al. (2020b) recommended that language teachers adopt new pedagogical approaches that can provide sociocultural and psychological support to international students so that they become more willing to communicate with local Chinese people. For teaching in CFL contexts, Luo and Yang (2018, 2022) suggested that teachers create virtual exchange opportunities between foreign and Chinese students through telecollaboration, which is a mutually beneficial approach to promoting cultural learning and establishing the target language community.

LIMITATIONS AND FUTURE RESEARCH

Although the experimental design enabled a controlled comparison of two types of formulae among three groups of Chinese speakers with different proficiency levels, a fact which had not been fully examined in the FS literature, we must acknowledge some limitations. First, the sample size of our study was relatively small; thus, the answers are more tentative than conclusive. Although higher-than-advanced learners are very scarce, endeavors could be made to conduct a larger-scale study.

Another issue is the homogeneity of the FSs. In this study, we could subdivide both idioms and non-idioms. For example, non-idiomatic FSs included lexical collocations and lexical bundles. According to Carrol and Conklin (2020), NSs' processing of these two subtypes of FSs is regulated by different linguistic features. Thus, to more accurately depict the developmental path of L2 learners' formulaic knowledge and to pinpoint the regulatory factors, finer-grained manipulation of FSs is needed.

Regarding the methodology of think-aloud protocols, there may be the issue of reactivity; i.e., the possibility that thinking aloud may alter participants' cognitive processes (Bowles, 2010). Although substantial findings have confirmed that think-aloud protocols do not significantly influence speakers' cognitive processes during relatively simple reading tasks (e.g., Bowles and Leow, 2005; Adrada-Rafael and Filgueras-Gómez, 2019), research using a counterbalanced think-aloud (versus silent) task order could eliminate potential suspects.

Another methodological issue concerns the use of NSs as the baseline group. According to our findings, NSs do not necessarily possess full idiom knowledge, especially productive idiom knowledge. Thus, future studies involving idiom production should carry out a preliminary test to confirm that the chosen NSs are eligible to serve as indexing norms.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/**Supplementary Material**, further inquiries can be directed to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by University of Illinois at Urbana-Champaign. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

HZ designed the study, performed the experiments, analyzed the data, and wrote and edited the manuscript. BH analyzed the data, reviewed, and revised and edited the manuscript. JX supervised the research, analyzed the data, and reviewed the manuscript. All authors contributed to the article and approved the submitted version.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2022.796784/full#supplementary-material

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Research on Anxiety of Learning Chinese as a Second or Foreign Language in and Outside Mainland China: A Systematic Review of the Literature 1999–2020

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This paper reviews research on anxiety of learning Chinese as a second or foreign language (CSL/CFL) in and outside mainland China. This review involves 52 Chinese language articles identified in leading journals from the Chinese National Knowledge Infrastructure (CNKI) database (中国知网) and 42 English language articles from the Web of Science and ERIC database published during the period of 1999 to 2020. By adopting bibliometric analysis and content analysis, this study compares the topical issues and methodological approaches of research on CSL/CFL learning anxiety published in leading Chinese and international journals. The review found that, compared with mainland Chinese scholars, international researchers examined a broader range of topical issues from multidimensional perspectives. While most Chinese empirical studies are dominated by the quantitative approach, qualitative methods such as classroom observations and in-depth interviews were also widely adopted by international researchers. The analysis also revealed that although Chinese scholars had drawn on well-established theories and concepts originating from foreign language anxiety (FLA) research, their role in CSL/CFL anxiety research is limited and peripheral. Consequently, we conclude this review with recommendations that encourage mainland Chinese researchers to be well informed by the updated theoretical perspective and methodological approaches such as the utilization of social network analysis and the integration of Information Communications Technology in language education.

Keywords: learning anxiety, Chinese as a second or foreign language, mainland Chinese journals, international journals, bibliometric analysis

INTRODUCTION

A great variety of emotions experienced by language learners have attracted scholarly attention from various linguistic, educational, and sociocultural contexts (Jain and Sidhu, 2013; Dewaele, 2018; Miyahara, 2019). Among them, a situation-specific anxiety, that is, Foreign Language Anxiety (FLA) proposed by Horwitz et al. (1986), is responsible for students' negative affective reactions to foreign language learning. This complicated psychological phenomenon related to foreign language

learning is defined as "a distinct complex of self-perceptions, beliefs, feelings, and behaviors related to classroom language learning arising from the uniqueness of the language learning process" (Horwitz et al., 1986, p. 128). In order to accurately measure learners' anxiety of learning a foreign language, a standard instrument, the Foreign Language Classroom Anxiety Scale (FLCAS), was designed and developed, and which has been widely adopted in a range of empirical studies (e.g., Saito et al., 1999; Kitano, 2001; Park, 2014; Weng, 2020). These studies on FLA are conducted in different language education contexts, such as Japanese (Aida, 1994; Djafri and Wimbarti, 2018), Korean (Kim, 2000; Lee, 2021), Spanish (Noels, 2001; Cordeiro, 2019), French (Rodríguez and Abreu, 2003; Bosmans and Hurd, 2016), and Chinese (Le, 2004; Zhao, 2013) providing cross-linguistic and cross-cultural evidence for the pervasive existence of anxiety in foreign language learning. Since Chinese is distinctly different from alphabetic languages such as English due to its unique tone system and logographic writing system (Shen and Xu, 2015, p. 82), it posts enormous challenge for Chinese as a second or foreign language (CSL/CFL) learners, especially native-English learners, which reflects partly on the high drop-out rate of CSL/CFL classes (Luo, 2011). Previous studies have revealed that the withdrawal rate is remarkably higher among learners with higher levels of FLA (Bailey et al., 2003; Xiao and Wong, 2014). Therefore, there is plausible reason to believe that anxiety is a highly relevant issue among CSL/CFL learners. However, in contrast to the abundant research on English language anxiety (ELA) with a long history, research on anxiety of learning CSL/CFL is not only scarce but only a recent concern. During the preceding two decades, most studies involving CSL/CFL education have focused on language pedagogy (e.g., Mao, 2010; Tao, 2012), Chinese character, phonetic, lexical, and grammatical learning (e.g., Wu et al., 2006; Wen, 2010; Fan, 2013; Luan, 2013), language testing (Wang, 2008), and teacher development (Guo, 2012), while affective factors such as attitudes, motivation, beliefs, and anxiety have not received adequate attention (Yu, 2010). In particular, language researchers started to steer their attention to the anxiety level of CSL/CFL learners in the late-1990s (Qian, 1999; Jiang and Ramsay, 2005). Since then, an increasing number of studies on anxiety of CSL/CFL learners have been published in and outside mainland China. Therefore, to depict a whole picture of the current literature on anxiety level specific to CSL/CFL learners, a systematic review on this issue is urgently needed.

However, we notice that the academic exchanges and communication between scholars who publish papers in mainland China and those who publish in international journals[1] are insufficient (Gong et al., 2018). One piece of evidence is that few articles published in mainland China concerning CSL/CFL learners' anxiety were cited in related articles published in international journals. It seems that the two groups of researchers may not be fully appreciating what their counterparts have achieved in this field due to inadequate bilingual competence and differences in academic practices (Gong et al., 2018, 2020a,c).

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[1] The term "international journals" used in this article refers to journals issued outside mainland China and the term "international articles" refers to articles published in international journals.

Moreover, although two reviews of studies on anxiety of learning CSL/CFL were retrieved (e.g., Chen, 2018; Xu, 2018), they were published in non-CSSCI journals in mainland China with limited impact. Despite the fact that the existing two reviews did provide some insights into this field, they only addressed the studies published in mainland China with a limited time span. Therefore, it is a pressing need to provide a systematic review of research on anxiety of CSL/CFL learners conducted both in and outside mainland China to reflect the topic issues and methodological approaches so that informative mutual exchanges can be facilitated. Moreover, given that the number of students learning CSL/CFL outside mainland China is significant and is still steadily increasing (Ministry of Education of the People's Republic of China, 2019) as well as the anxiety of learning CSL/CFL being prevalent among non-Chinese learners abroad (Luo, 2011), it was presumed that mainland Chinese researchers working on anxiety of CSL/CFL learners could learn much from relevant studies published in international journals. To verify this assumption, it is vital to find out to what extend have mainland Chinese researchers referred to studies on anxiety of learning CSL/CFL conducted in the international context. To achieve these ends, this review attempts to address the following two research questions:

RQ1: What topical issues and methodological approaches can be identified in studies on anxiety of learning CSL/CFL published in mainland Chinese journals and international journals?

RQ2: How have mainland Chinese scholars drawn on research on the anxiety of learning CSL/CFL conducted outside mainland China?

METHODOLOGY

Database Selection

In view of the sociocultural and historical differences between diverse learning contexts in the greater China region, this review was confined to journals published in mainland China, excluding publications from Chinese Taiwan, Hong Kong SAR, and Macau SAR (Gong et al., 2018). Moreover, because of our concern for both comprehensive coverage and potential impact of the relevant literature in this scope, we selected three databases, that is, the China National Knowledge Infrastructure (CNKI, 中国知网), the Web of Science (WoS), and the Education Resources Information Center (ERIC). CNKI was chosen due to the fact that it is the largest academic journal database in mainland China, covering comprehensive integrated knowledge resources of all disciplines. WoS was selected as another primary database because it offers subscription-based access to many different databases that provide comprehensive citation data for multiple academic disciplines (Steinhardt et al., 2017). In addition, we also chose ERIC, a comprehensive full-text database specialized in educational research, as a complement to the two preceding databases. Generally, these three databases provide

researchers with a wealth of data to understand the latest progress and trending research issues of diverse disciplines (Kuang et al., 2016).

Article Selection

After preliminary searching string-based selection, we found that the first Chinese language publication concerning anxiety of learning CSL/CFL dates back to 1999 (cf., Qian, 1999) while the first English language article in this field was published in 2005 (cf., Jiang and Ramsay, 2005). Also, as we could not guarantee that all related papers published in 2021 could be collected, we limited this review to research published during the years 1999–2020 to ensure the accuracy and validity of the findings. Our first step was to use search strings to search and select articles regarding anxiety in Chinese language learning published in mainland China. Specifically, the search strings [topics = (汉语"Chinese language" + 留学生"overseas students" + 来华"study abroad in China") *焦虑"anxiety"] were adopted in the CNKI database, which resulted in 401 articles being found. Secondly, to identify relevant English language

publications, the search strings [topic = (Chinese language AND anxiety)] were used in WoS and ERIC, which yielded 421 and 116 articles respectively. Next, these two collections of articles from the two databases, i.e., WoS and ERIC, were compared in case of data duplication and 16 articles were found to be overlapping and consequently excluded from one of the collections.

As a result, a total of 401 Chinese publications from CNKI database and 521 English publications from WoS database and ERIC database were found. Moreover, considering the quality and potential impact of the relevant studies, we further limited our review to core journals listed in the China Social Sciences Citation Index (CSSCI): an interdisciplinary citation database that covers "the top journals with high academic quality from thousands of journals in China" (Ge, 2019, p. 48). Hence, a total of 61 articles were found. To further identify the relevant studies related to anxiety of CSL/CFL learners, the titles and abstracts of the resulting 582 articles were then examined and evaluated by all three members of the team. After the thorough evaluation, 94 articles were identified as relevant, including 52 Chinese language articles (see **Figure 1**) published in mainland


FIGURE 1 | Chinese language articles' selection process.
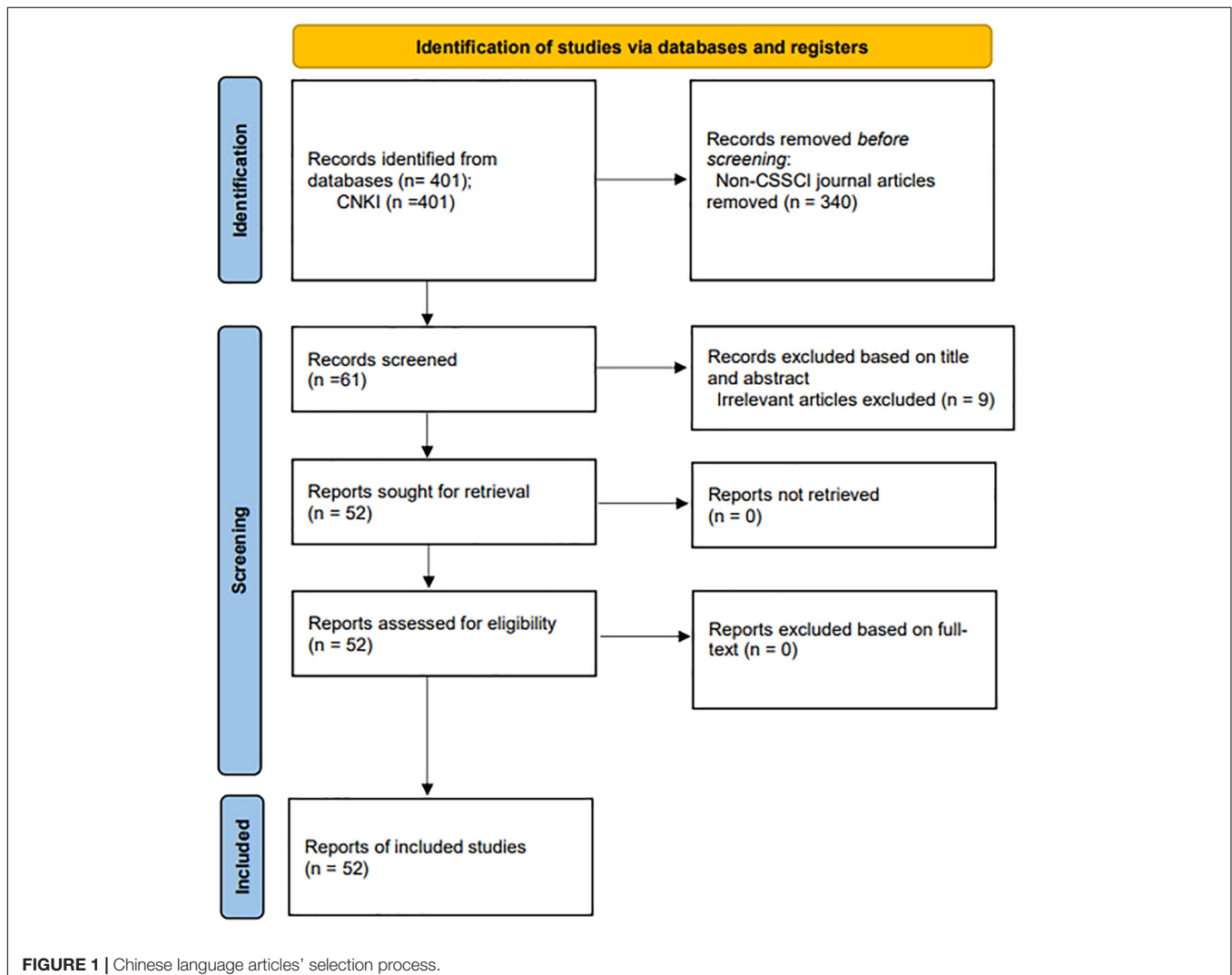
China and 42 English language articles (see **Figure 2**) published in international journals. The PRISMA flow diagrams presented in **Figures 1**, **2** follow the guidance from PRISMA statement (Page et al., 2021).

Analysis and Tools

To identify the topical issues of research on anxiety of learning CSL/CFL, we conducted the bibliometric analysis and content analysis. To be specific, this review inspected the bibliometric indicators of the selected publications, which included the publication year and keyword. Keyword co-occurrence analysis as well as keyword frequency analysis were carried out, aiming at detecting the primary content and emerging trends of a body of scientific knowledge (Callon et al., 1983; Chen, 2004, 2006). Keyword co-occurrence means the common occurrence and sharing of the same keywords across different papers,

revealing core research domains and cognitive structures (Su and Lee, 2010). The embedded bibliometric analysis tool in the CNKI database and the WoS database, as well as Vosviewer, a software that can build and visualize bibliometric networks structure, were used to detect and visualize the findings (Van Eck and Waltman, 2010). Meanwhile, content analysis was adopted to examine the topics addressed in each of these selected articles. To be precise, the titles, abstracts, and conclusions of the reviewed publications were studied by three members of the team to determine the addressed topical issues. Whenever necessary, we also read the full text to ascertain their topics. This categorization of the topical issues was based on an existing classification of themes in FLA research (e.g., Luo, 2013), which provided us basic criteria for theme classification in CSL/CFL anxiety research. During the review process, new themes were appended or subcategories within each existing

FIGURE 2 | English language articles' selection process.
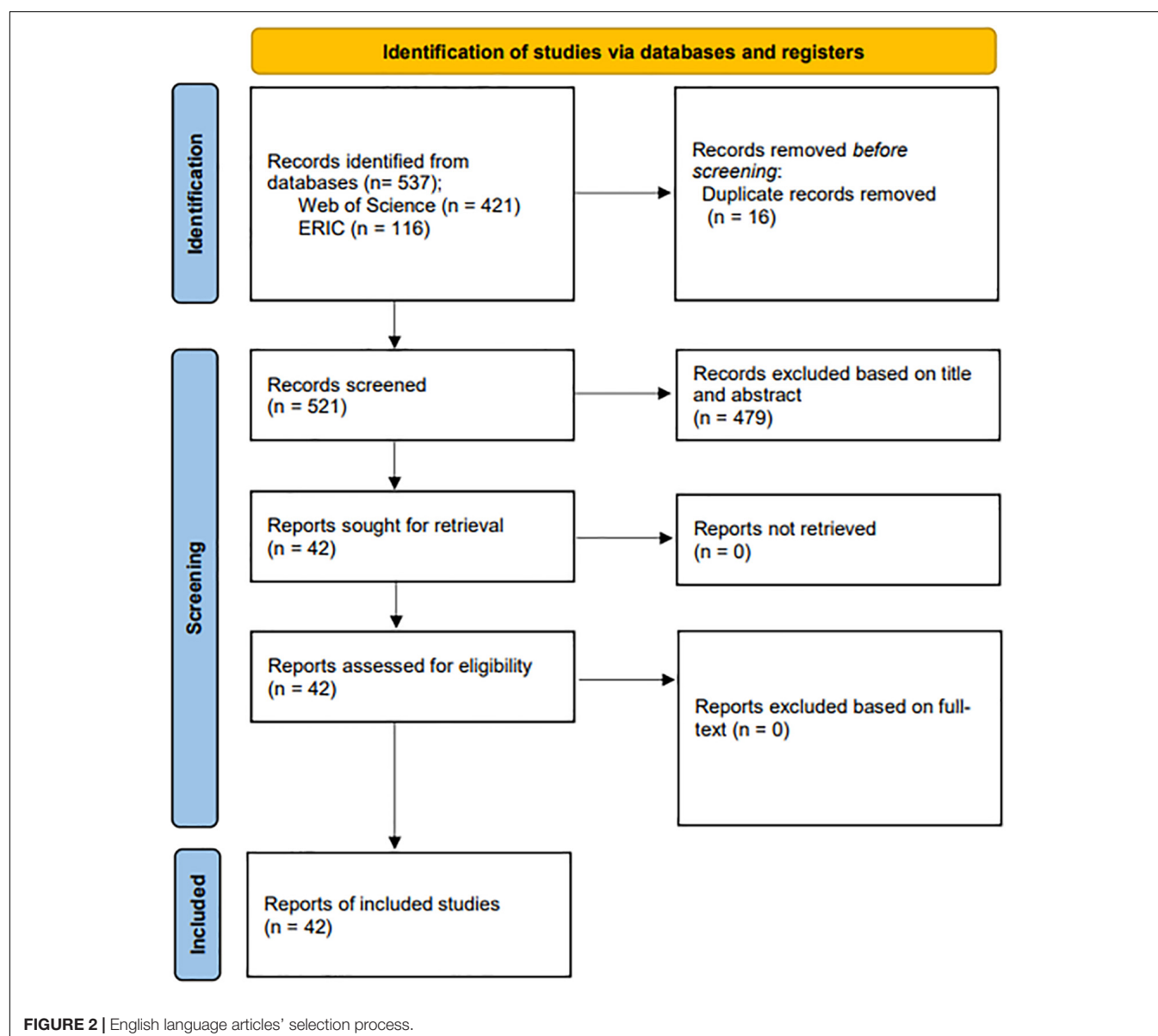
theme were refined and revised to capture what was revealed. Through the categorization process conducted by two members individually, we have identified four categories, namely, measure of CSL/CFL anxiety, factors associated with CSL/CFL anxiety, effects of CSL/CFL anxiety, and classroom practices to reduce CSL/CFL anxiety. As "the most widely used measure of interjudge reliability" (Perreault and Leigh, 1989, p. 137), Cohen's (1960) kappa was used to assess the intercoder reliability for each categorized articles. And kappa here was 0.871, indicating a high level of reliability. The content analysis enables us to precisely identify the topic as well as the detailed relevant content of individual article for in-depth analysis while the bibliometric analysis visualize a holistic network map of the topical issues in mainland Chinese and international journals for global comparison. To identify the methodological approaches on anxiety of learning CSL/CFL, methodological sections or relevant descriptions were examined to identify which methodological paradigm had been adopted.

To address the second research question, the citation lists of the 52 selected Chinese language articles were analyzed to understand how these studies had drawn upon previous research on the anxiety of learning CSL/CFL published outside mainland China. Citations have been interpreted as a reference to some previously published source of information that is relevant to the argument the author wants to make (Baird and Oppenheim, 1994). They are seen as an index of how an article builds on a previous body of research. Therefore, an analysis of the type and number of citations can help to shed light on the second research question. In total, 318 citations were identified from the 52 selected publications. In an attempt to detect how these Chinese language articles had drawn upon their English counterparts, two members of our team first classified all the citations into Chinese language publications and English language publications. And while examining the topical issues of these citations through reading their titles and abstracts, we noted that a portion of articles in both Chinese and English addressing issues of second language acquisition (SLA) are not associated with FLA. Thus they were classified as separate groups. Consequently, the 318 citations were categorized into eight types: (1) Chinese language publications on CSL/CFL anxiety research; (2) Chinese language publications on English or other language anxiety research; (3) Chinese language publications on SLA[2]; (4) Chinese language publications unrelated to FLA or SLA; (5) English language publications on CSL/CFL anxiety research; (6) English language publications on English or other language anxiety research; (7) English language publications on SLA; and (8) English language publications unrelated to FLA or SLA. Two members of our team conducted the citation analysis based on these eight categories individually. And to measure the intercode agreement, Cohen's (1960) kappa was also used to assess the intercoder reliability for each category. And kappa here was 0.846, showing a high level of reliability.

[2]The group 3 refers to publications concerning issues of second language acquisition that are not associated with foreign language anxiety. As the full explanation would be too long, we use "Chinese language publications on second language acquisition" to name this group. This also applies to group 7.

RESULTS

Topical Issues

General Observations on Topical Distributions of the Studies

The thematic analysis indicated that the 94 selected articles (52 Chinese language articles and 42 English language articles) could be categorized into four groups: measure of CSL/CFL anxiety, factors associated with CSL/CFL anxiety, effects of CSL/CFL anxiety, and classroom practices to reduce CSL/CFL anxiety. The number of articles and its corresponding proportion within each category is specified in **Table 1**. To further detect whether there is any difference between the topical concerns in mainland Chinese articles and international English articles, we conducted the Chi-Square Test, the results of which are presented in **Table 2** below. The result shows that $p = 0.038$ ($p < 0.05$), revealing clear differences between the topical issues addressing in articles published in mainland Chinese and international journals. The detailed comparisons and analysis are presented in the following part in this section.

The measurement of anxiety level of Chinese language learners is a main topic explored by both mainland Chinese scholars and international scholars in this field. FLCAS, the most widely used tool for measuring FLA designed by Horwitz et al. (1986), was adopted in most of these studies. Apart from using FLCAS to examine learners' listening, speaking, reading, and writing anxieties in Chinese learning (Zhang, 2002; Wu and Liu, 2019), FLCAS was also applied to test the correlation between learners' levels of anxiety with other factors such as learners' willingness to communicate (Liu, 2017). However, while many

TABLE 1 | The number and proportion of selected articles on each theme.

Theme	Mainland Chinese articles	International English articles
Measures of CSL/CFL anxiety	9 (17.31%)	11 (26.19%)
Factors associated with CSL/CFL anxiety	20 (38.46%)	10 (23.81%)
Effects of CSL/CFL anxiety	16 (30.77%)	7 (16.67%)
Classroom practices to reduce CSL/CFL anxiety	7 (13.46%)	14 (33.33%)
Total	52 (100%)	42 (100%)

TABLE 2 | The chi-square test result of topical issues in mainland Chinese and international articles.

Themes	Languages (%)		Total	χ^2	p
	Chinese	English			
Measures of CSL/CFL anxiety	9(17.31)	11(26.19)	23(24.47)	8.42	0.038*
Factors associated with CSL/CFL anxiety	20(38.46)	10(23.81)	30(31.91)		
Effects of CSL/CFL anxiety	16(30.77)	7(16.67)	20(21.28)		
Classroom practices to reduce CSL/CFL anxiety	7(13.46)	14(33.33)	21(22.34)		
Total	52	42	94		

*$p < 0.05$.

studies verified their research assumptions by using FLACS, Luo (2014) questioned the general reliability and validity of this anxiety scale, arguing whether the proposed FLACS could comprehensively examine students' anxiety in Chinese language learning as it does not address the unique characteristics of the target language. In response, she developed an anxiety scale specific to the measure of CSL/CFL learners' anxiety levels (cf., Luo, 2014).

Apart from efforts to measure CSL/CFL learners' anxiety level, over one third of Chinese language articles and approximately one fourth of English language articles examined multiple factors associated with anxiety in CSL/CFL learning. These diverse factors can be generally categorized into two types, i.e., background variables and quantitative learner variables. Frequently inspected background variables involve learners' gender, age of acquisition, target language proficiency, heritage-learning status, ethnic background, and the length of residence in the country where the target language is spoken. For example, Fan's (2009) study revealed different levels of anxiety among American, Japanese, and Korean students with the same level of Chinese language proficiency when reading Chinese. This study gave further evidence that learners' Sinosphere background, or the so-called Chinese-character cultural circle, is a significant factor that may affect language anxiety in learning Chinese. This finding is in accordance with Wen's (2011) study published outside mainland China that compared with other ethnic groups, non-Chinese Asian groups, i.e., Asian but not Chinese American, demonstrated the most positive learning experience. In another study, Yu and Watkins (2008) found that learners' language anxiety was significantly and negatively correlated with their Chinese language proficiency. This means that the poorer the target language proficiency, the more language anxiety they may experience. Quantitative learner variables are the second type of factors associated with anxiety of learning CSL/CFL, which include learners' age, learning motivation, foreign language aptitude, self-perceived foreign language learning ability, language achievement, self-perceived achievement, and the difficulty level of the target language. For instance, learners' FLA when speaking Chinese was found to be closely related to their self-perceived Chinese language proficiency in a native Chinese-speaking environment (Liu, 2017). Zhang and Wang (2002) investigated 42 international students' FLA in learning Chinese as well as their performance in HSK (*Hanyu Shuiping Kaoshi*, standardized test of Standard Chinese language proficiency of China for non-native speakers). The analysis indicated a negative correlation between learners' language anxiety and their Chinese language achievements, especially in listening and speaking sections. Some studies also discussed how the difficulty level of Chinese language, as an influential factor, can have an effect on learners' anxiety. Luo's (2015) study examined CSL/CFL anxiety and its associated factors among Chinese heritage learners. The correlation and multiple regression results indicated that perceived difficulty level of Chinese was a significant predictor of language anxiety. Overall, both mainland Chinese scholars and international scholars have made substantial contributions to exploring the various factors and their interrelationship with CSL/CFL learners' anxiety levels.

The third main topical concern is how CSL/CFL learners' anxiety has an impact on their language performance and achievements. As illustrated in **Table 1**, compared with their international counterparts, Chinese mainland researchers were more interested in this branch of research as they published almost twice as many as articles on this topic. Although findings concerning anxiety and achievement in second language learning have been relatively uniform, suggesting a consistent negative correlation between anxiety and achievement (typically test scores) (Horwitz, 2001), researchers working on anxiety of learning CSL/CFL, especially mainland Chinese scholars, have contributed to the exploration of how anxiety affects learners' performance in specific language skills or aspects. As an example, via accurate measure of 15 international students' voice speed, unnatural pauses during topic-oriented narration as well as levels of anxiety in learning CSL/CFL, Zhang (2001) measure the effect of anxiety on learners' fluency of spoken Chinese. Liang and Quan (2016) examined the effect of CSL/CFL anxiety on the writing performance of ASEAN learners, i.e., students from South-East Asian Nations such as Malaysia, Thailand, and Vietnam, studying in China during different academic stages. To capture the true effects of anxiety, an English language article (Liu, 2017) assessed the effect of language anxiety together with other cultural and linguistic variables on CSL adult learners' willingness to communicate in Chinese.

Mainland Chinese and international scholars showed different foci in the last topical concern. Although only 7 (13.46% in total) Chinese language publications explored how classroom practices could reduce CSL/CFL students' anxiety, all of them addressed this issue from teachers' perspectives (e.g., Deng, 2008; Guan, 2012; Tao, 2013; Liu, 2019). For example, Deng (2008) investigated overseas students' affective reactions to teachers' different questioning modes in CFL classrooms and concluded with suggestions for teachers to adapt their questions based on learners' language and cognitive competence in order to bolster learners' confidence. As another example, Tao (2013) pointed out that teachers' inappropriate ways to correct students' errors in oral tasks may directly lead to CFL learners' high level of anxiety and a sense of frustration. In response, he suggested teachers decrease the frequency of correcting learners' errors and offer them ample time to formulate their utterances. However, in these two studies mentioned above, both researchers did not further conduct comparative research to find out whether learners' perceived anxious experience had really changed. On the contrary, among the 14 English language publications concerning this topic, most of them (10 out of 14, 71.43%) attempted to eliminate learners' perceived anxious experience by creating learner-centered learning environment. For instance, many studies probed into the integration of VR tools (Xie et al., 2019a,b), computer-mediated communication (CMC) activities (Jiang and Ramsay, 2005; Wang et al., 2017) and on-line games (Hwang et al., 2013; Hong et al., 2019) that provide opportunities for CSL/CFL learners to immerse in the target culture and enhance their communicative competence

in relaxed leaning environment. It seems that the coping strategies proposed by mainland Chinese scholars to reduce learners' anxiety are mainly from teachers' perspective while international scholars[3] in this field tend to address this issue by designing learner-oriented activities or incorporating new technologies or tools to eliminate learners' perceived anxious experience.

Similarities and Differences in Topical Issues

The bibliometric analysis of keywords in Chinese and English papers are presented in **Figures 3**, **5**, respectively. In these two maps (the Chinese map and the English map), a node represents a keyword and the size of the node denotes the activity of the keyword. We set the minimum number of keyword occurrence as 1; then the threshold of the Chinese map is 250 and that of the English map is 176. In total, there are 79 items in the Chinese map and 167 items in the English map meeting the requirement. From the keyword co-occurrence network of Chinese articles shown in **Figure 3**, it can be seen that three keywords, i.e., "焦虑" (anxiety[4]), "对外汉语教学" (teaching CSL/CFL), and "留学生" (overseas students) play a central role and are linked to various other keywords. Closer inspection of **Figure 3** reveals 14 different thematic clusters connected with each other, among which Chinese reading cluster, correlation analysis cluster, and

teaching strategy cluster are the three largest clusters. It is also worth noting that the "汉语学习" (learning CSL/CFL) and "对外汉语教师" (CSL/CFL teachers) are frequently mentioned topics in Chinese language publications. Compared with the network of Chinese publications, a more complex and multi-dimensional social network structure of the English language papers is depicted in **Figure 5**. "Anxiety" is the biggest cluster with the highest occurrence as it was used as the search string. Although there is no definitely prominent cluster (e.g., learners/attitude/foreign language/motivation/2nd language), these 13 thematic clusters are evenly distributed, and each cluster has multiple links to each other. A comparison of **Figures 3**, **5** shows that "Reading" and "Speaking" are two keywords in both network structures, suggesting that issues related to speaking and reading anxieties were fully examined in Mainland Chinese and international articles. Furthermore, three keywords co-occur in these two networks of publications: "Emotion," "Motivation," and "Achievement," which indicates that researchers in and outside mainland China have carried out extensive research on factors associated with learners' anxiety in learning Chinese. This finding is consistent with our analysis in section "General observations on topical distributions of the studies."

Considering the topical distributions and the keywords co-occurrence in mainland Chinese and international journals, some differences can be identified between the research of CSL/CFL anxiety in and outside mainland China. Firstly, the comparison of the two keyword co-occurrence maps illustrates that, compared with mainland Chinese scholars,

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[3] As English is now the most powerful global language (Ma et al., 2017) and the main medium of academic publication (Gong et al., 2020a), the term "international scholars/researchers" is used in this article to refer to scholars/researchers who tend to publish their articles written in English outside mainland China.

[4] The English translation of each Chinese keyword can be found in **Figure 4**.

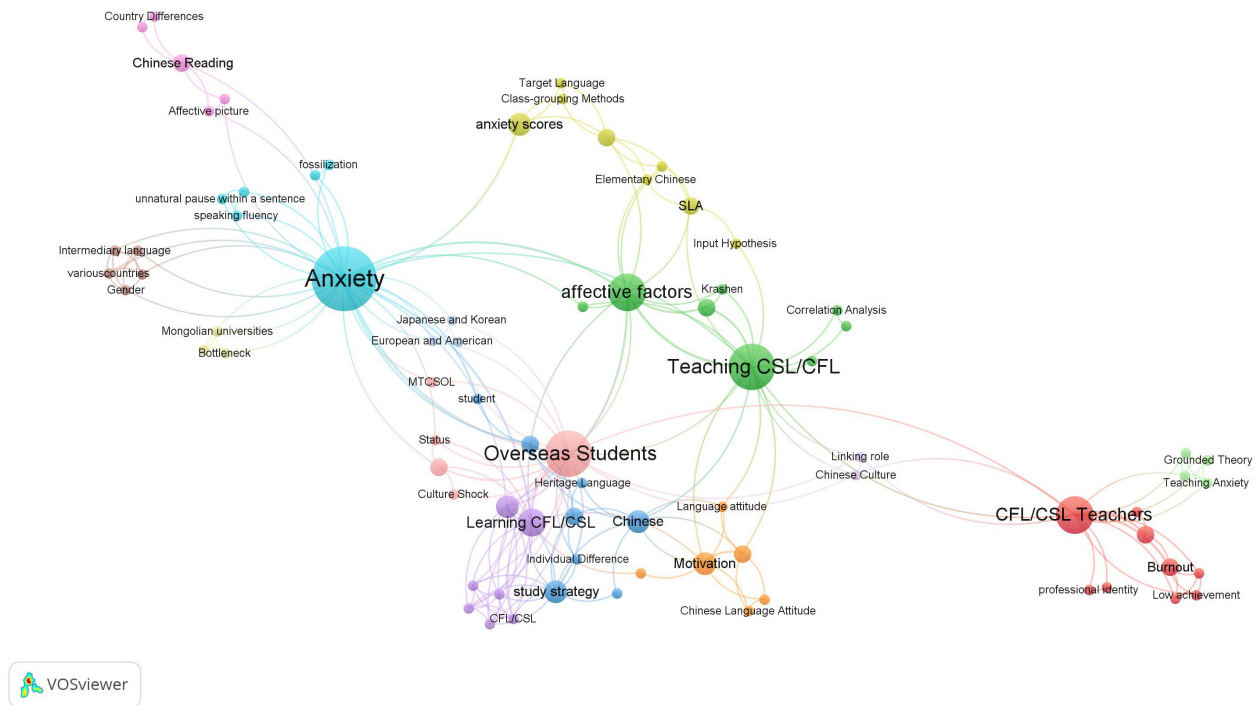**FIGURE 3** | Keywords co-occurrence in Chinese language articles.
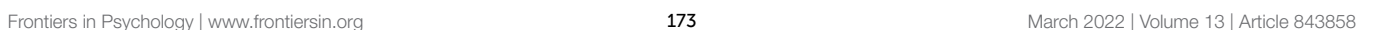
FIGURE 4 | English translation of keywords co-occurrence in Chinese language articles.
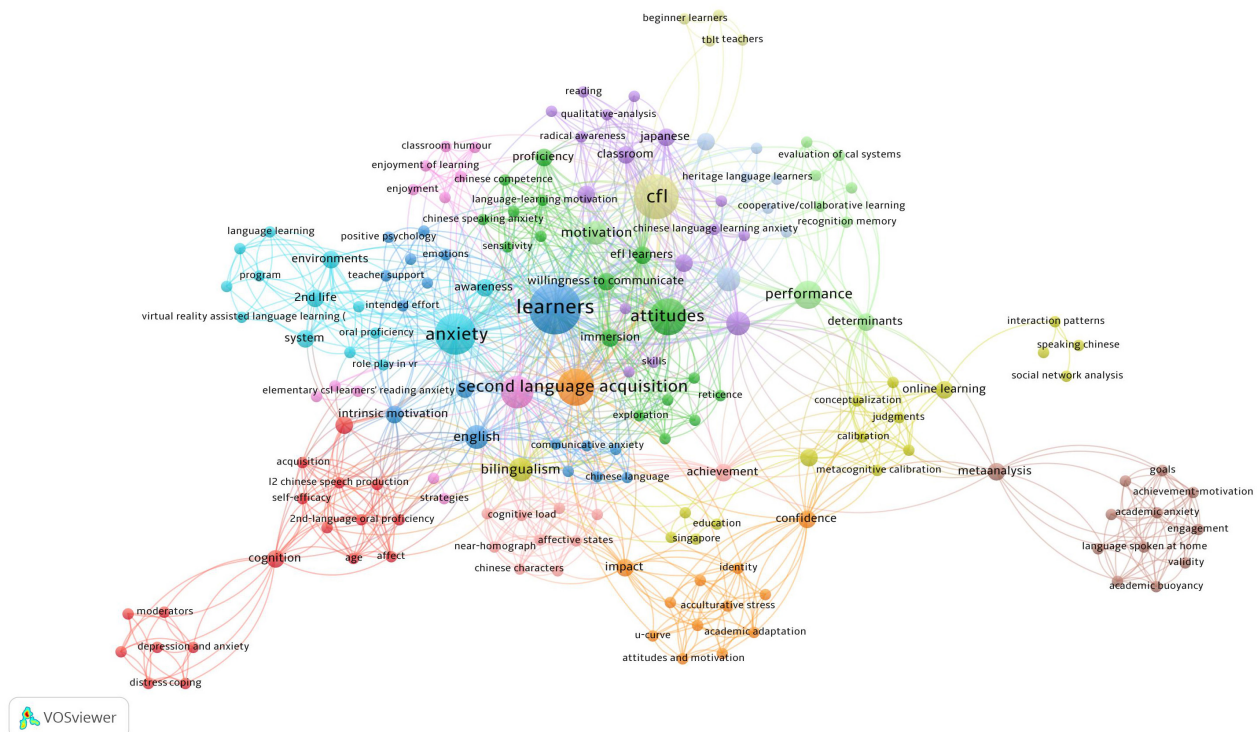

FIGURE 5 | Keywords co-occurrence in English language articles.

researchers overseas addressed a broader range of topical issues. In particular, some keywords such as "bilingualism," "virtual reality assisted language learning," "online learning" and "social network analysis" that occurred in English articles were not mentioned in their Chinese counterparts. Indeed, international researchers were aware of the importance to discuss CSL/CFL learners' language anxiety in multilingual contexts in an attempt to explore its uniqueness in the field of SLA. As an example, McEown and Sugita-McEown (2020) assessed the effects of positive and negative psychology on students' anxiety in learning foreign languages other than English (LOTE), i.e., Chinese, German, French, and Spanish. Their study proposed that CSL/CFL learners may experience lower levels of anxiety when compared with learners of other three LOTE in the same study environment as CSL/CFL learners generally receive more support from their parents and teachers due to the fact that Chinese (Mandarin) is the second most powerful language in the world. McEown and Sugita-McEown's (2020) study is among a number of English language studies aimed at comparing the differences between anxiety of learning CSL/CFL and anxiety of learning other foreign languages (e.g., English) (Liu, 2016; Collie et al., 2017; Sun and Zhang, 2020), which is a new research perspective that has not been explored in Chinese language articles.

Secondly, it is noteworthy that there have been several contributions published in leading international journals addressing how the employment of information and communication technology (ICT) affect students' anxiety in learning CSL/CFL (Wang et al., 2017; Shi and Stickler, 2018; Hong et al., 2019; Xie et al., 2019a). Wang et al. (2017), for example, found that CMC activities were an effective foreign language learning facilitator that could reduce learners' FLA. This empirical study also indicates that CSL/CFL learners are more anxious when chatting with native speakers than chatting with non-native speakers. Shi and Stickler (2018) explored the most suitable interaction patterns between the CSL/CFL beginners and teachers of Chinese in an online language teaching environment to support online speaking practice and reduce learners' levels of anxiety. Drawing on data obtained from the utilization of computer-assisted language learning (CALL) in CSL, Jiang and Ramsay (2005) examined whether this medium can be used to foster learner–teacher rapport beyond the realms of face-to-face interaction of the classroom. This exploratory study suggested that CALL can enhance learning, motivate learners, and reduce learner anxiety. Similarly, Xie et al. (2019b) investigated university students' use of interactive virtual reality tools (VR tools) for learning CFL. The study indicates that the integration of VR tools in CSL/CFL classrooms not only creates an authentic language environment but also alleviates participants' anxiety when presenting in Chinese.

In sum, by examining the commonalities and individuality of the topical issue of research on anxiety of learning CSL/CFL conducted in and outside mainland China, we can see that scholars have reached a general consensus that language anxiety is a negative emotional reaction that may interfere with CSL/CFL learning and cannot be ignored. The application of various

anxiety scales, especially FLCAS in empirical studies, has greatly contributed to our understanding of levels of anxiety among a growing number of CSL/CFL learners globally. Compared with researchers in mainland China, international scholars addressed a broader range of research issues with innovative perspectives. In particular, they set research on anxiety of CSL/CFL learning in a multilingual context and make the best use of ICT in an attempt to provide coping strategies specific to CSL/CFL learners, which are rarely adopted by mainland Chinese researchers in relevant research.

Methodological Approaches

Through examining the relevant methodological sections or descriptions in each selected article, we identified a total of 81 empirical studies and 13 non-empirical studies during the period 1999–2020 (see **Table 3**). The analysis illustrated that while international journals are inclined to empirical studies (100% in total), a quarter of articles published in mainland Chinese journals are non-empirical. These non-empirical studies addressed the issue of learners' anxiety in Chinese language classrooms based on personal views without a purposed research plan, reliable data, or detailed analytical procedures (e.g., Tao, 2013; Zhao, 2013). A closer inspection of the methodological approaches adopted in the 39 Chinese empirical studies revealed that the majority of empirical studies involved quantitative research (28 out of 39, 71.79%) with only a small number of qualitative (7 out of 39, 17.94%) and mixed-method studies (4 out of 39, 10.26%). On the contrary, although quantitative research (45.24% in total) accounts for the largest proportion of English empirical studies, a large number of mixed-method studies (30.95% in total) and qualitative studies (23.81%) are also involved. It can be seemed that quantitative paradigm involving qualification of data and objective testing appealed to most mainland Chinese researchers, whereas qualitative paradigm involving naturalistic and interactive data as well as an integration of quantitative and qualitative approaches were also adopted by international researchers.

A detailed examination of methods revealed that, as the most widely adopted measure for FLA, FLCAS was used in most quantitative studies published in and outside mainland China to examine language anxiety of CSL/CFL learners worldwide. In the late 1900s, Qian (1999) published the first article on anxiety of learning CSL/CFL in mainland China, using quantitative statistical methods, that is, FLCAS to measure the anxiety levels of CSL/CFL learners in target language countries. It is the first

TABLE 3 | Methodological approaches.

		Mainland Chinese articles	International English articles
Empirical studies	Quantitative studies	28 (53.85%)	19 (45.24%)
	Qualitative studies	7 (13.46%)	10 (23.81%)
	Mixed-method studies	4 (7.69%)	13 (30.95%)
Non-empirical studies		13 (25.00%)	0 (0.00%)
Total		52 (100%)	42 (100%)

time that the concept of CSL/CFL anxiety was introduced into the research field of teaching Chinese as a foreign language (TCFL), and also the first time that the FLCAS was applied in studies of CSL/CFL anxiety. Since then, most of the relevant articles published in mainland Chinese journals used FLCAS for precise and in-depth measurement (e.g., Zhang, 2001, 2002, 2008; Zhang and Wang, 2002; Liang and Quan, 2016; Cao and Tian, 2017). A small number of studies made some adaptation to this scale for accurate measure of CSL/CFL learners' levels of anxiety (e.g., Fan, 2009; Zhou, 2015) while most of the rest apply it directly in their studies. We speculate that this practice may result in the large proportion of quantitative studies published in mainland Chinese journals. FLCAS was also largely adopted in quantitative studies published outside mainland China. But we also notice that in order to enhance the reliability and validity of their studies, other scales were integrated with FLCAS to appropriately measure learners' anxiety in learning Chinese as well as its correlation with other factors (e.g., Liu, 2016).

However, inspired by a number of English language studies claiming that the uniqueness of target language may have an impact on learners' FLA (Aida, 1994; Saito et al., 1999; Le, 2004), study Luo's (2014) published outside mainland China criticized that FLCAS, as a generic instrument, does not take the characteristics of the specific target language into consideration. In response to this lack of consideration for the target language, Luo constructed the Chinese Language Learning Anxiety Scale (CLLAS) as a reliable and valid measure for the anxiety level of CSL/CFL learning. Luo (2014) also proposed that qualitative analysis is also needed for a more comprehensive understanding of major causes of language anxiety. Consequently, qualitative techniques such as classroom discourse analysis (Lambert and Zhang, 2019), classroom observations (Xie et al., 2019b; Tong and Tsung, 2020), reflective journals (Sun and Luo, 2018), and personal interviews (Xie et al., 2019a) were used extensively in English language publications. For example, empirical work triangulating qualitative analysis of learners' L2 discourse with multiple quantitative sources of data was conducted in order to gain deep insight into the cognitive, affective, and linguistic processes that take place on a range of pedagogical tasks in second language classrooms (Lambert and Zhang, 2019). In another study, three qualitative data collection tools, i.e., in-class observations, learners' reflections, and semi-structured individual interviews, were carried out and aimed at probing into learners' perceived advantages and difficulties of utilizing VR tools to learn Chinese language as well as culture (Xie et al., 2019b). Moreover, while a few Chinese language research articles (4 out of 39, 10.26%) chose a combination of the quantitative paradigm such as questionnaire surveys and anxiety scales and the qualitative paradigm including in-depth interviews and classroom observations (e.g., Deng, 2008; Cao and Tian, 2017), approximately one third of English language articles (13 out of 42, 30.95%) adopted the mixed methods approach. For instance, in a study aimed at exploring CSL learners' anxiety when speaking Chinese and its association with self-rated proficiency in Chinese, both questionnaire surveys and semi-structured interviews were adopted (Liu, 2016). The questionnaire was designed to identify learners' self-rated proficiency in Chinese

while the interview was conducted to explore the participants' real inner thoughts and attitudes toward learning CSL. In another study, Lambert and Zhang (2019) investigate CSL learners' levels of anxiety in a range of pedagogical tasks by triangulating multiple sources of data including anxiety questionnaire, video-recorded classroom observation, and in-depth interviews to gain insight into learners' cognitive and affective responses to different types of classroom tasks.

In general, while all the English language articles are empirical studies with rigorous data collection and analytical procedures, still one fourth of the Chinese language articles are non-empirical and largely based on personal experiences and reflections. In addition, most of the Chinese empirical studies report the use of statistical analysis or measurement of learners' anxiety level. In contrast, qualitative research methods including classroom observations and personal interviews are also widely adopted in the English language articles. Moreover, mixed-method approach that entails a combination of the qualitative and quantitative paradigm with the aim of generating a more adequate and thorough understanding of CSL/CFL learners' anxiety has been adopted largely by international researchers. This finding suggests that Chinese language research in this field has been dominated by a positivist paradigm that perceives anxiety as an objective 'reality' that can be scientifically studied and measured (Gao et al., 2001; Gong et al., 2018). Meanwhile, international researchers in their studies of CSL/CFL learning anxiety invested a great deal of effort in integrating theory and practice in "inquiry." A fundamental characteristic of their research is that they are emic-oriented. That is, they attempt to interpret the complex psychological phenomenon of language anxiety from a learner's perspective rather than from an etic or researcher's perspective. From this perspective, qualitative research methods such as observation of authentic classroom interactions and in-depth interviews with individual participants are also essential for fully revealing the subjective and multi-faceted nature of CSL/CFL learning anxiety. Therefore, we encourage mainland Chinese scholars to be better equipped with diverse research techniques for implementing high-quality, inquiry-driven, quantitative and qualitative research. After all, methodological knowledge means not only mastery of skills, "but also informed choices and decisions" (Gao et al., 2001).

Mainland Chinese Research's Dependency on Previous English Language Research

To address our second research question, citation analysis was carried out for each selected Chinese language article by two members of the team to shed light on how these publications had drawn on relevant research published outside mainland China. In total, 318 citations were identified from the 52 Chinese language articles, including 67 Chinese language publications on CSL/CFL anxiety research, 35 Chinese language publications on English or other language anxiety research, 97 Chinese language publications on SLA, 63 Chinese language publications unrelated to FLA or SLA, 25 English language publications on English or other language anxiety research, 22 English language publications
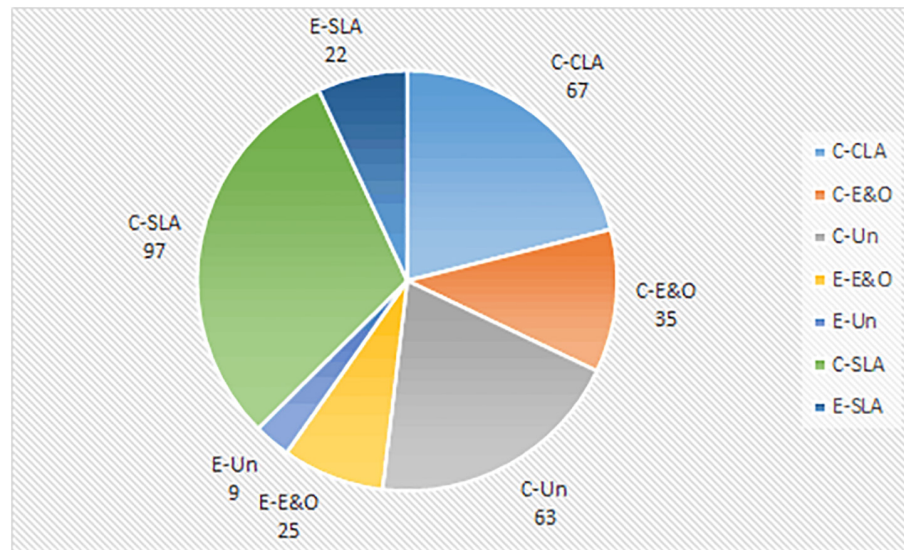
FIGURE 6 | Citation trends (1999–2020). C-CLA, Chinese language publications on CSL/CFL anxiety research; C-E&O, Chinese language publications on English or other language anxiety research; C-SLA, Chinese language publications on SLA; C-Un, Chinese language publications unrelated to FLA or SLA; E-CLA, English language publications on CSL/CFL anxiety research; E-E&O, English language publications on English or other language anxiety research; E-SLA, English language publications on SLA; E-Un, English language publications unrelated to FLA or SLA.

on SLA, and 9 English language publications unrelated to FLA or SLA (see **Figure 6**).

Overall, far more Chinese language publications (175 in total) were cited than English ones (40 in total). In addition, the analysis reveals that Chinese language articles on CSL/CFL anxiety research were cited the most (74 out of 318, 23.27% in total). This suggests that Chinese researchers draw heavily on their Chinese colleagues' publications, especially relevant articles on CSL/CFL anxiety research. It is pretty noteworthy that no English language article on CSL/CFL anxiety research, which should belong to the most relevant and valuable intellectual base for researchers working in this field, was cited. It seems that mainland Chinese researchers do not know what their counterparts have achieved in this domain or what emerging thematic trends or new topics are being explored. This may be due to researchers' inadequate bilingual competence (e.g., Chinese and English) and limited exchanges among researchers and institutions in China and abroad (Gong et al., 2018). Moreover, a closer examination of the 25 cited English language articles on English or other language anxiety research demonstrates that most of these articles are publications that introduced well-established research theories or concepts (e.g., Horwitz et al., 1986; Weiner, 1986; Saito et al., 1999) and very few of them are case studies that focus on a particular group of learners in specific learning contexts (e.g., Park and French, 2013). To be specific, 13 studies introduced and applied FLCAS developed by Horwitz et al. (1986) to measure CSL/CFL learners' general level of anxiety. Furthermore, the classical "attribution theory of motivation and emotion" proposed by Weiner (1986) was introduced in Zhang (2008) and was used to verify its appropriateness to explain the causes of anxieties among foreign students learning Chinese in mainland China. Although there are a few Chinese language

studies attempted to supplement and revise theories or concepts generated by international scholars, their contributions were limited to some minor revision to FLCAS in order to be used in the CSL/CFL learning context (e.g., Zhong and Gao, 2014; Wei, 2016). It seems that Chinese language scholars tend to draw on well-established and widely adopted theories generated elsewhere while failing to keep track of the latest trends in CSL/CFL anxiety research fronts.

The content analysis of the 36 cited Chinese language articles on FLA research reveals that most of these cited papers concern the identification of anxieties associated with specific skills such as reading, writing, and speaking (Chen, 1997; Kang, 2011) as well as the analysis of correlation between anxiety and affective factors (Wang and Wan, 2001; Zhou and Wang, 2008), which is in accordance with our finding of topical issues elaborated in section "Topical issues." However, in the last decades, FLA research in mainland China, especially English language anxiety research, has witnessed an increasing number of publications adopting new theoretical perspectives and methodological approaches such as flipped teaching mode, Computer-Assisted Instruction, and online synchronous tutorials (He and Wang, 2020) which cannot be found in research on anxiety of learning CSL/CFL conducted in mainland China. A possible explanation for this finding is that most Chinese language articles on CSL/CFL anxiety are published by teachers or researchers working in CSL/CFL-related disciplines, which are sub-categories of Chines language and literature (Liu, 1997). Thereby, these researchers' engagement with research in international contexts is not as strong as their colleagues in English-related disciplines. This can be changed if more researchers working in the field of CSL/CFL anxiety research could enhance their bilingual competence and expand their theoretical perspectives.

DISCUSSION

The present systematic review covers both Chinese language articles and English language articles published in flagship journals during the period from 1999 to 2020 in and outside mainland China in an attempt to depict a whole picture of the topical issues and methodological approaches and shed light on how mainland Chinese scholars have drawn on research on the anxiety of learning CSL/CFL conducted by international scholars.

Firstly, the content analysis and citation analysis of the selected Chinese publications reveal that Mainland Chinese scholars are not fully informed about the emerging theoretical trends and research fronts in terms of CSL/CFL anxiety scholarship. This is evidenced by three aspects of observations. To start with, although 42 English language publications on CSL/CFL anxiety research were identified from leading international journals, none of them was cited by their Chinese counterparts. Besides, among the 25 cited English language articles concerning English or other language anxiety, most of them are publications that introduce well-established theories or concepts published more than 20 years ago (e.g., Horwitz et al., 1986; Weiner, 1986; Saito et al., 1999). And few latest English language studies that tackle FLA from new perspectives were cited by Chinese language publications. Furthermore, a number of English language articles published in recent years that reported the incorporation of ICT into language learning in an attempt to reduce learners' anxious and discomfort experience in classroom learning environment (Wang et al., 2017; Hong et al., 2019; Xie et al., 2019b) cannot be found in Chinese language articles in this field. The effort to apply new theoretical perspectives and methodological approach embodies international researchers' initiative to draw on achievements of scholars from diverse disciplines to gain insight into the multi-faceted and multi-dimensional nature of FLA. Unfortunately, Chinese language researchers' engagement with the latest research theories and concepts is relatively limited. Although Chinese scholars have drawn on relevant theories and concepts in this field, the results show that most of their research are influenced by Horwitz et al. (1986)'s FLA theory and their contributions to FLA research are rather peripheral. This failing to keep track of the emerging theoretical trends may be a result of the inadequate multilingual competence, a lack of interdisciplinary awareness, as well as the insufficient collaboration and conversations between scholars from diverse disciplines in mainland China and abroad (Gong et al., 2018).

Secondly, the content analysis reveals that research on anxiety of learning CSL/CFL conducted by mainland Chinese scholars tend to be teacher-oriented while international scholars mainly address CSL/CFL anxiety issue from learners' perspective. Firstly, as discussed earlier in section "General observations on topical distributions of the studies," the coping strategies formulated by mainland Chinese scholars to reduce CSL/CFL learners' anxiety are mainly from teachers' perspective. To be precise, mainland Chinese researchers attempted to "tell" teachers what to do, such as providing suggestions on how to group CSL/CFL learners with different nationalities (Wei, 2016), proffering advice for teachers to modify their error correction modes (Tao, 2013) or questioning modes (Deng, 2008), thereby potentially ignoring

the learners' perceived affective experience in classrooms. On the contrary, researchers outside mainland China mostly focus on learners' language acquisition process and emotional experience during a dynamic learning process. Accordingly, they attempted to alleviate CSL/CFL learners' perceived anxious experience by creating learner-centered learning environment, such as integrating VR tools to create authentic real-life settings for the students to feel relaxed in pedagogical practices (Xie et al., 2019b) or encouraging CSL/CFL learners to pursue and sustain interaction with faculty members, classmates as well as the host country people to better adapt to the L2 community and feel more confident and motivated in CSL/CFL learning (Yu, 2010). Secondly, the importance attached on CSL/CFL learners' feelings and experience by international scholars can also be reflected from the methodological approaches adopted in their research. Compared with mainland Chinese articles that are largely dominated by the quantitative paradigm (28 out of 39, 71.79%), qualitative methods such as video-recorded classroom observations (Xie et al., 2019b; Tong and Tsung, 2020), semi-structured individual interviews (Xie et al., 2019a), and learners' reflective journals (Sun and Luo, 2018) were also widely adopted in English language articles to probe into learners' perceived anxious experience in long-term learning process. This observation is consistent with Ma et al.'s (2017) and Gong et al.'s (2018) study that Mainland Chinese researchers tend to place greater emphasis on Chinese language teachers' beliefs, concepts, practices, and teaching pedagogy rather than learners' values, experience, and competence. One primary reason for that may be the different educational concepts in mainland China and abroad. Chinese education emphasizes the inculcation and mastery of knowledge, emphasizing "precision" and "depth" (Li, 2007). Hence, this largely contributes to teacher-centered classrooms and teacher-oriented research perspectives. On the contrary, it has been a long tradition for international scholars especially western scholars to "focus on research into language learning and language learners/users," harboring the fear that they might leave out learners' voices (The Douglas Fir Group, 2016). However, to compare these different orientations, we made no attempt to build an opposition between teacher-centered and student-centered teaching practices or views of research. We would like to depict a comprehensive picture of different research perspectives so that teachers as well as scholars can make informed choices based on target students and readers.

Thirdly, our review also reveals that quantitative measure of learners' CSL/CFL anxiety by using FLCAS (Horwitz et al., 1986) is a noticeable characteristic of most Chinese language articles. This seems to suggest that Chinese scholars studying CSL/CFL anxiety tend to view language from an "objective" perspective and expect to quantify these "objective facts," whereas international researchers in this field are more likely to view language learning as "an activity that relied on individual psychological factors" from a more subjective perspective (Gao et al., 2001), which is evidenced by the large number of qualitative studies and mixed-method studies in the English language articles reviewed. Given that language anxiety is a subjective psychological phenomenon (Jain and Sidhu, 2013; Dewaele, 2017; MacIntyre, 2017; Boudreau et al., 2018) that may vary from person to person in different

learning contexts, we encourage Chinese language researchers to be sensitive to the contextual and interactive dimensions of anxiety and adopt diverse methodological approaches. Besides, although FLCAS has contributed significantly to the study of FLA, it has received some criticism. One primary reason is that this generic instrument is designed mainly based on students' experience of learning Indo-European languages such as English and French (Wu and Liu, 2019) and fails to address the characteristics of many other target languages such as Japanese and Chinese (Aida, 1994; Luo, 2014). Therefore, whether FLCAS remains a suitable and reliable tool to measure learners' anxiety in CSL/CFL learning is still pending. In the light of this, Luo (2014) constructed a Chinese Language Learning Anxiety Scale in an attempt to reflect the uniqueness of the Chinese language and accurately measure CSL/CFL learning anxiety. Based on this newly developed anxiety scale, we believe that more studies to cross-validate its reliability in different learning contexts may need.

Finally, with the support of information technology, second or foreign language learning has changed from face-to-face classroom activities solely to a combination of real-life classroom interaction and virtual teaching, facilitating easy access to language learning immune to the barriers of space and time (Peters and Shi, 2011; Blake, 2013). The change of teaching platforms also entails the challenges of adapting offline pedagogical practices to online environment and tackling learners' anxiety brought by different interaction patterns (Stickler and Shi, 2013). To reduce learners' anxiety in synchronous online Chinese tutorials, especially during speaking practice sessions, Shi and Stickler (2018) identified the best patterns of interaction between teachers and students in an online environment that could alleviate learners' anxiety and maximize their opportunity for speaking. This study contributes to our understanding of online teaching process and learners' psychological state in a virtual learning environment, which is highly significant especially with the global outbreak of the COVID-19 pandemic and the urgent need to transform classroom-based teaching activities to online ones.

CONCLUSION

This paper reviews the topical issues and methodological approaches of CSL/CFL anxiety research published in and outside mainland China from 1999 to 2020. The results showed that in comparison with mainland Chinese researchers, international scholars examined a wider range of topical issues in diverse contexts and dedicated to exploring the latest theoretical approach to alleviate CSL/CFL learners' anxiety. While most Chinese empirical studies are dominated by the quantitative paradigm, qualitative and mixed-method approaches were also largely adopted by international researchers in this field. The review also reveals an evident disconnection and insufficient academic communication between mainland Chinese and international scholars in field of CSL/CFL.

To be specific, while scholars in and outside mainland China are constantly expanding their perspectives when undertaking

relevant research, scholars overseas investigated a broader range of topical issues in various contexts. For example, they explored the uniqueness of CSL/CFL anxiety in a multilingual context (e.g., McEown and Sugita-McEown, 2020) and examined how learners' anxiety in CSL/CFL learning was affected by online language education [e.g., Horwitz et al. (1986)'s FLA theory; Wang et al., 2017; Shi and Stickler, 2018]. The analysis also revealed that non-empirical studies that are largely based on personal experiences and views are absent from English language articles, whereas they account for one fourth of the Chinese language articles. In addition, most of the Chinese empirical studies are dominated by a quantitative approach that views anxiety as an objective 'reality' that can be scientifically studied and measured (Gao et al., 2001; Gong et al., 2018). In contrast, qualitative methods such as classroom observations and in-depth interviews are also widely adopted by international researchers to interpret the complex psycho-social phenomenon of language anxiety from a learner's perspective. The review concludes that although Chinese language scholars have drawn on well-established and widely adopted theories and concepts originating from FLA research, they failed to keep track of the emerging trends in CSL/CFL anxiety research fronts and lacked pioneering initiative to pursue advancements in this domain. Therefore, we draw on our findings to proffer the following advice to scholars inside and outside mainland China to enhance research in this field. We hope that such efforts can help relevant research achieve greater impact in international mainstream journals.

First, it was noted in the review process that Chinese scholars working on CSL/CFL learning anxiety drawn heavily on previous literature published in mainland China and referred to limited theories and concepts appeared in international journals around two decades ago. Therefore, we strongly recommend that Chinese researchers in this field carefully review previous relevant literature published both in and outside China, so as to be well informed of the updated and emerging theoretical perspective and methodological approaches in CSL/CFL learning anxiety scholarship. For example, social network analysis (SNA) has been widely used in social and behavior science to explore relationships among diverse social entities in face-to-face encounters and the patterns formed in naturally occurring interactions (Wasserman and Faust, 1994). This method was later applied as an analytical tool in online education to reveal the best teacher–learner interaction patterns that can reduce learners' level of anxiety during online Chinese tutorials (Shi and Stickler, 2018). We believe that this new methodological approach can offer a large amount of valuable data on diverse interpersonal relations in both face-to-face and online language classrooms, the result of which has implications for teachers to enhance their competence to modify interaction patterns and create low-anxiety classroom atmosphere. Besides, previous research on the integration of CALL in language learning has proffered solid evidence of how CALL, compared with face-to-face classroom interaction, can promote interactive learning (Warschauer, 2000), "genuine communication" (Bax, 2003, p. 23) in target languages, build up teacher–learner rapport and alleviate learners' anxiety (Jiang and Ramsay, 2005). However, how and to what extent can CALL foster the social relationship between teacher and students in

CSL/CFL teaching context remain a neglected area of research and need more future studies. At last, apart from the frequently inspected variables that are associated with CSL/CFL learning anxiety such as learners' ethnic background (Fan, 2009) and Chinese language proficiency (Yu and Watkins, 2008), Yu (2010) observed that international students' sociocultural and academic adaptation also closely related to their language learning attitudes and level of anxiety. This finding has implications for both researchers and teachers to lay more emphasis on how CSL/CFL students from abroad integrate into local communities and host institutions. The introduction of new methodological approaches and theoretical perspectives to CSL/CFL anxiety research may facilitate scholars to cast new light on this complex psychological phenomenon and enable classroom practitioners to alleviate CSL/CFL learners' feeling of nervousness and apprehension.

Second, the content analysis as well as the bibliometric analysis of the selected Chinese language publications reveals a tendency to address the issue of CSL/CFL learners' anxiety mainly from teachers' perspective. Chinese scholars may now want to take diverse perspectives and gain insight into this topical concern from learners' perspective. This means that apart from giving instructions to teachers on how to implement some specific teaching practice or strategy and view learners as passive beneficiaries of teachers' conduct (e.g., Deng, 2008; Tao, 2013; Wei, 2016), language researchers as well as classroom practitioners can design student-oriented activities or learner-generated content tasks (e.g., Lambert and Zhang, 2019) in which learners can gain relaxed and enjoyable experience directly. The integration of virtual reality tools into CFL learning in an attempt to create an authentic setting and alleviate learners' anxiety when delivering presentations in a foreign language is a good example to follow (e.g., Xie et al., 2019b). Furthermore, starting from learners' point of view also requires the researchers to view CSL/CFL learning anxiety as a subtle, fluid and subjective psychological phenomenon. This means that the "pure" quantitative methods such as the use of questionnaires (e.g., Hoxur, 2001) or anxiety test scale (e.g., Zhang, 2002) only may not be adequate to accurately measure learners' anxiety during a dynamic learning process. Driven by the specific research questions, qualitative methods such as classroom observations, writing reflective journals and individual interviews that can generate comprehensive and naturalistic data may also needed. This should encourage researchers to equip themselves with qualitative techniques as well as rigorous data collection and analytical and interpretation methods in order to conduct high-quality research.

Last but not least, we hope that more researchers could draw their attention to how and to what extent CSL/CFL learners' anxiety levels are affected by online or remote language teaching, which becomes even more inevitable and ubiquitous with the advent of the COVID-19 pandemic. On the one hand, it has been documented that computer-mediated communication has been a popular method in foreign language teaching (Chun et al., 2016) due to the fact that it can increase motivation toward foreign language learning (Abrams, 2011) and facilitate a more comfortable and relaxed learning environment (Doughty and Long, 2003; Jochum, 2011). On the other hand, the sudden change of classroom settings, the lack of direct interaction between teachers and learners, the weak emotional bond, and the unstable internet access are all potential variables that can affect foreign language learners' level of anxiety (Mahyoob, 2020). Therefore, we urge scholars in and outside mainland China to work collaboratively to address the critical issues related to anxiety of CSL/CFL learners globally emerging from the virtual language education environment. Moreover, opportunities and resources in and outside CSL/CFL classrooms need to be integrated to improve learners' Chinese proficiency and communicative competence in daily situations, which can be a crucial and useful means to reducing their learning anxiety (Gong et al., 2020b, 2021).

The current study has several limitations. First, given that the journal publications are valued more than other types of publications in institutional research assessment exercises, only the journal articles published in the CSSCI and SSCI journals were reviewed, whereas the non-CSSCI/SSCI journal articles, books, or book chapters were excluded, which might devalue the investigation on the account of leaving out some valuable academic monographs. Second, in view of the sociocultural and historical differences between diverse learning contexts, the articles published from Taiwan, Hong Kong, and Macau were also excluded. Therefore, various types of publications (i.e., books) and database sources (i.e., Taiwan Social Science Citation Index) can be included in the future studies to provide more insights into CSL/CFL anxiety research.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

AUTHOR CONTRIBUTIONS

SY, DZ, and QS contributed to conception and design of the study. SY organized the database. DZ performed the statistical analysis. QS wrote the first draft of the manuscript. All the authors contributed to manuscript revision, read, and approved the submitted version.

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Lexical Orthographic Knowledge Mediates the Relationship Between Character Reading and Reading Comprehension Among Learners With Chinese as a Second Language

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Reading in Chinese is complex because readers should not only recognize characters by basic units (i.e., characters) but also integrate characters into words when reading text. While many efforts have been devoted to investigating the effect of sub-lexical orthographic knowledge in Chinese character reading, less is known about the role played by lexical orthographic knowledge at word level. A total of 424 secondary learners with Chinese as a second language (CSL) in Hong Kong were assessed with character reading, reading comprehension, and two lexical orthographic knowledge tasks: lexical orthographic choice (OKC) and lexical orthographic choice in context (OKCC). Path analysis results demonstrated that these lexical orthographic skills significantly mediated the effect of character reading on comprehension, in which OKCC was a more critical mediator as its mediating effect was bigger than that of OKC. Further analyses showed that these mediating effects were significant only among students with richer learning experience (i.e., learning Chinese for 4 years or above). Our results illustrate the possible trajectory of CSL learners' literacy development from character reading to reading comprehension and provide pedagogical implications for teaching and learning.

Keywords: lexical orthographic knowledge, character reading, reading comprehension, Chinese as a second language, mediating effect

INTRODUCTION

The growing number of learners with Chinese as a second language (CSL) (refer to CSL hereafter) worldwide in recent decades has been driving the research in exploring factors accounting for students' individual difference in Chinese learning (Gong et al., 2018, 2020a,b). In Hong Kong, there were about 33,000 ethnic-minority students who are mostly descendants of migrants from India, Pakistan, Nepal, and the Philippines in 2019–2020 academic year, consisting 4.5% of the total school-aged children population (Legislative Council of Hong Kong SAR, 2020). These students attend local kindergartens and primary/secondary schools but mostly take Chinese as a second language. Consequently, their reading proficiency significantly lags behind their Chinese counterparts for about 3–4 years, which largely undermines their confidence in Chinese language learning and in turn hinders their academic achievements, social integration and upward social mobility (Leong et al., 2011; Loh and Tam, 2016). To address the pressing need, teachers

and researchers have been seeking effective and tailor-made approaches derived from empirical evidence about CSL students' characteristics in learning Chinese (Gong et al., 2020b).

The learning of Chinese usually starts from recognizing characters as it is the basic unit representing meaning and syllable in Chinese. Meanwhile, each Chinese character is also visually complex. Thus previous studies have suggested that mastery of Chinese orthographic rules could be important to character recognition (Loh et al., 2017; Wong, 2019; Chan et al., 2021) or reading comprehension among CSL learners (Shen, 2013; Wong, 2019; Dong et al., 2020). However, most of these studies have focused on character-level orthographic knowledge (i.e., sub-lexical orthographic knowledge), and surprisingly another type of orthographic knowledge, i.e., lexical orthographic knowledge, was ignored. In fact, character reading does not necessarily ensure a successful word reading because plenty of words in Chinese comprised of two or more characters (i.e., morphemes), and their meaning are usually holistically bound. The word reading process is found rather different from that of single characters reading in terms of the possible skills involved (Li and McBride-Chang, 2014; Pan et al., 2021). In this case, lexical orthographic knowledge was assumed to be employed by learners to integrate characters into words and achieve a smooth and fluent recognition of words during reading.

In this study, we hypothesized that lexical orthographic knowledge could mediate the relationship between character reading and reading comprehension among CSL learners. We also explored whether students' length of experience in learning Chinese affects this mechanism. To our knowledge, this is the first study dedicated to the role of Chinese lexical orthographic knowledge in reading comprehension, which may not only contribute to the theoretical studies on the second language but also shed light on important practical implications for CSL learning and teaching.

LITERATURE REVIEW

Basic Properties of Chinese Writing System

With characters as the basic graphic unit, the Chinese writing system is a morpho-syllabic writing system that distinctively differs from alphabetic languages (Wang et al., 2003; Perfetti et al., 2005; Shen, 2005; Tong et al., 2009; Li et al., 2012; Lü and Koda, 2017). In other words, each character represents a morpheme that is a unit with specific syllable and meaning. Each Chinese character is a two-dimensional, visual-spatial unit (Cheung et al., 2006) and most Chinese characters (96%) are compound characters, consisting of at least two radicals (Su, 2001). The radical is a stroke pattern that hints full or partial cues of sound/meaning of a character (i.e., phonologically or semantically related to the morpheme represented by the character), though the indication accuracy is sometimes rather weak (Zhou, 1978). Additionally, some radicals are with fixed positions (Taylor and Taylor, 2014). For instance, the semantic radical 亻 [jan4, human being] only appears on the left of a character.

The term of words in Chinese language is complicated (e.g., Packard, 2000). Although a number of single morphemes are words (such as 水 [water]), most Chinese words (around 80%) are polymorphemic, which means they contain two or more characters, making them a so-called *complex word* (Perfetti and Tan, 1999; Ke and Koda, 2019). Whereas some two-character words' meaning could be inferred by combining the meaning of each character (e.g., the meaning of 升起 *[uprising]* can be retrieved from the two morphemes 升 *[up]* and 起 *[rise]),* the meaning of many polymorphemic word is somewhat opaque and may not always be equal to the sum of its component morphemes (Gong et al., 2020b). For example, the meaning of 一起 *[together]* cannot be obtained in the same way as 升起 (i.e.,一 *[one]* + 一*[rise]*).

Furthermore, boundaries between words in written Chinese are not as salient as in alphabetic languages. For instance, 桌上擺滿各種可口的食物 [*There are many delicious foods on the table*] contains several words, i.e., 桌上 *[on the table]*/擺滿 *[placing]*/各種 *[various]*/可口 *[delicious]*/的 *[aux.]*/食物 *[foods]*. Though arrayed in line, characters are with syntagmatic relations, rather than linearly related. Therefore, to process sentences, readers need to segment words in a string of characters, which requires word and word-constituent knowledge at both form and meaning levels (Li et al., 2009; Li and Pollatsek, 2020; Cui et al., 2021).

Lexical Orthographic Knowledge in Chinese Reading

Orthographic knowledge is commonly considered to benefit word recognition and subsequent reading comprehension across languages (e.g., Burt, 2006; Leong et al., 2011, 2019; Wong, 2017; Deacon et al., 2019; Zarić et al., 2020). In alphabetic languages such as English, there are generally two separate but correlated types of orthographic knowledge, one is called "general/sub-lexical orthographic knowledge" (e.g., identifying the letter patterns that violate the orthographic regularities, such as "bbaf"), and the other is called "lexical orthographic knowledge" (e.g., choosing the correct word form between "rain" and "rane") (Apel, 2011; Conrad et al., 2013; Rothe et al., 2015).

In response to the complexity of Chinese orthography, sub-lexical orthographic knowledge could be defined as one's knowledge of legal character forms, including positional knowledge and functional knowledge of radicals (Ho et al., 2003; Loh et al., 2018; Chan et al., 2021). Taking the character "花 [faa1, flower]" as an example, a learner with rich sub-lexical orthographic knowledge not only notices that the radical "艹" [plant] only appears at the top of a character, but also understand that a character with "艹" may be plant-related in meaning. For CSL learners, it has been well documented that they rely more on sub-lexical orthographic knowledge to recognize characters than their Chinese native counterparts do (Shen and Ke, 2007; Chang et al., 2014; Wong, 2017; Loh et al., 2018; Chan et al., 2021).

As another important type of Chinese orthographic knowledge, the lexical orthographic knowledge is defined as the knowledge of writing conventions of complex words,

including the written form of word constituents and their combinations (Leong et al., 2011, 2019; Conrad et al., 2013). Given the fact that it has been less studied, we referred to the dual-route model (Coltheart et al., 2001) to explore the role of lexical orthographic knowledge. According to this model, words could be recognized from two routes, namely the sub-lexical route and the lexical route. For the sub-lexical route, readers retrieve the meaning/sound of a word analytically to integrate sub-lexical information. Therefore, the sub-lexical orthographic knowledge is assumed to support learners to decode Chinese words in this way. For instance, readers employ such knowledge to recognize morphemes 花 [faa1, flower] and 瓶 [peng4, bottle] individually and linearly, so that they form the word 花瓶 [faa1 peng4, lit. vase] and get the meaning of the word.

On the contrary, lexical orthographic knowledge would be necessary for decoding words from a direct and lexical route. Researchers tended to argue that with this knowledge, readers could automatically process the familiar word-form as a single unit and access the meaning/sound of the word directly, so that they could quickly and fluently comprehend text at higher linguistic levels (e.g., sentence and text levels) (Conrad et al., 2013; Zarić et al., 2020). In considering the fact that there are a large number of Chinese words whose meanings are more or less opaque, the analytical approach may not be applicable in reading these words, therefore, the lexical orthographic knowledge could help readers to quickly recall the correct meaning of each word in reading texts. Recent studies conducted among primary students (Chu and Leung, 2005) and undergraduate students (Cui et al., 2021) have also suggested that the Chinese native students tended to adopt a holistically processing in reading frequent words. In a similar way, we could assume that with more knowledge in Chinese gained in learning, the CSL learners could be more familiar with the holistically processing.

Furthermore, the lexical orthographic knowledge is assumed to help CSL learners to recognize the frequent words and access the meaning quickly when reading larger linguistic units (e.g., sentence or above). Because the boundary between words is inconspicuous, the more lexical orthographic knowledge gained, the better CSL learners could holistically read the words and understand the texts. To our knowledge, only Leong et al. (2011) used two tasks to measure a group of CSL (N = 80) students' lexical orthographic knowledge, i.e., *orthographic choice task* and *orthographic choice in context,* corresponding to lexical orthographic knowledge at word- and sentence-level, respectively. They found that students' performance in *orthographic choice in context* could significantly predict their reading comprehension performance. However, the complicated role of lexical orthographic knowledge during reading comprehension was not investigated.

The Mediating Role of Lexical Orthographic Knowledge in the Relationship Between Chinese Character Reading and Reading Comprehension

As the character is the basic unit of Chinese writing system, character reading is a fundamental skill to decode Chinese

texts. The significant association between character reading and reading comprehension in Chinese has been well documented although the character reading tasks used in the literature were not consistent (Joshi et al., 2012; Shen and Jiang, 2013; Yeung et al., 2013a; Wong, 2017; Yan et al., 2020). For instance, Yeung et al. (2013a) pointed out that word reading (i.e., two-character words) accounted for 33% of the variance in total reading comprehension scores among 248 Chinese Primary 4 students in Hong Kong after controlling for age and IQ. Shen and Jiang (2013) found a moderate-high positive correlation between students' performance on the reading comprehension test and single character-reading accuracy ($r = 0.64$) among a small group of first-year CSL adult learners ($N = 44$). Besides, Wong (2017) conducted a longitudinal study among a sample of 142 Grade 4 CSL students in Hong Kong and found that students' character reading (i.e., the total score of both one-character and two-character reading) significantly correlated with their reading comprehension concurrently and in the long run ($r = 0.78–0.81$ in Grade 4 and Grade 5, respectively).

As noted, the single-character and two-character reading were interchangeably used in previous studies. With increasing evidence suggesting that the skills required for them could be different (e.g., Wang and McBride, 2016; Lo et al., 2019; Pan et al., 2021), the exact effect of character reading on comprehension among a larger group of CSL learners should be examined. Furthermore, in-depth exploration should also go beyond the simple correlation or regression results to reveal the mechanism of how character reading contributes to reading comprehension.

In recognizing the importance of lexical orthographic knowledge in word reading, we hypothesized that such knowledge could mediate the effect of character reading on comprehension among CSL learners. Since the characters only represent morphemes in Chinese thus the character reading is not sufficient to decode words, lexical orthographic knowledge could thus assist readers to recognize specific word forms in a string of characters. To our understanding, first, the character reading skill is expected to predict the lexical orthographic knowledge since it provides a foundation for readers to recognize the constituents of words; second, this knowledge is anticipated to facilitate readers to access the meaning of a word more speedily through the familiar word form based on holistic word recognition, contributing to a fluent literal understanding for comprehension. If these associations are significant, we could expect a significant mediating effect played by the lexical orthographic knowledge.

Individual Difference in Lexical Orthographic Knowledge's Mediating Effect Among Students With Different Lengths of Learning Experience

Theoretically, the length of learning experience has been well acknowledged as a critical predictor of L2 proficiency (Sasaki, 1991). However, to what extent that the learning experience impacts the CSL learning needs a more comprehensive investigation (Conti and Lepadat, 2021). The learning experiences of Hong Kong CSL learners are very diverse. Many of them came to Hong Kong after partial or full

completion of primary school in their respective countries. Due to administrative arrangements, they are usually allocated to the same class with peers who have completed primary school in Hong Kong with a fluent command of conversational Chinese, regardless of their limited Chinese learning experiences. As a result, students' length of learning experience could be significantly different even though they are the same age and learn Chinese in a same classroom. This provided us with a unique opportunity to examine whether the individual differences in the length of learning experience could affect the relationships between orthographic skills and language skills, such as character reading and reading comprehension.

In the present study, we assumed that the direct and indirect effect of character reading on comprehension could be varied among students with different lengths of learning experience. The hypothesis was grounded on multiple pieces of evidence found in Chinese L1 students. First, the effect of character reading on comprehension may not be static, although the results were not conclusive. For instance, Joshi et al. (2012) found that the explained variance of reading comprehension by character recognition measured by pinyin writing task increased from Grade 2 (22%) to 4 (32%). On the contrary, Yan et al. (2020) found that the contribution of single character reading to reading comprehension decreased from Grade 1 (29%) to Grade 3 (8%). Second, the relationship between the orthographic knowledge on comprehension could also be varied. Yeung et al. (2013b) showed that orthographic knowledge of children in Grade 1 did not have a strong direct effect on character/word reading, whereas, in Grade 2–4, the effect became significant. Third, the acquisition of lexical orthographic knowledge could be partially contributed to the increase of learning experience. Generally, it is believed that with increasing experience of language learning (e.g., reading experience), both quality and quantity of lexical representations improve (Perfetti, 1992), which would allow learners to form better lexical orthographic knowledge. For instance, lower form students in Hong Kong tended to take the character level strategies to read two-character words while higher form students (Grade 5) were able to read these words holistically (Chu and Leung, 2005). While these grade differences are similar to the length of learning experience in CSL learners, one would anticipate that as students have accumulated more lexical orthographic knowledge, the mediating effect of lexical orthographic knowledge in students with more learning experience could therefore be stronger.

THE PRESENT STUDY

Based on the literature outlined above, we tried to address the following two research questions: (1) Does CSL students' Chinese lexical orthographic knowledge mediate the relationship between character reading and comprehension? If yes, (2) do the mediating effects of lexical orthographic knowledge vary between groups of CSL learners with different lengths of learning experiences?

To measure students' lexical orthographic knowledge, we followed Leong et al. (2011) and adapted two lexical orthographic

knowledge tasks used in their study. The orthographic choice task (OKC) and orthographic choice in context (OKCC) tasks were used to capture CSL students' lexical orthographic knowledge at word- and sentence-levels respectively. In constructing the path model demonstrating the direct and indirect effects of character reading on comprehension, we put the OKC as the first mediator followed by the OKCC as the second one based on the following assumptions: (a) Following a bottom-up approach in reading (Gough, 1972; LaBerge and Samuels, 1974), reading is a process starting from the recognition of the smallest linguistic units (i.e., character) to larger units (words, clauses, sentences, and paragraphs). As hypothesized in the literature, the lexical orthographic knowledge could help readers surpass character-level reading and achieve quickly and fluently comprehend text at higher linguistic levels such as sentence- and text-levels (Ziegler et al., 2003; Jiang et al., 2020). Therefore, it was reasonable to arrange the variables with regard to the fine-grained linguistic units; (b) In terms of task difficulty, we considered OKCC was more challenging than OKC to CSL students because they had to additionally recognize characters and understand the context of sentences in order to complete the task.

Participants

The present study was conducted among a group of CSL learners in Hong Kong. A total of 424 Secondary 1 CSL students (216 males and 208 females) from six secondary schools which admitted a large number of ethnic minority (EM) students were voluntarily recruited. According to the data of a self-reported language background questionnaire, students' age ranged from 11 to 18 years old, $M = 13.73$, $SD = 1.41$. Among them, there were Filipinos ($n = 50$), Pakistanis ($n = 184$), Nepalese ($n = 115$), Indian ($n = 45$), and others (e.g., Brazilian, Bengalis, Nigerian, Russian, Thai, $n = 30$). All reported being mentally normal without dyslexia problems.

The mean of "Years learned Chinese" reported by the students is 7.23 ($SD = 3.13$). In considering the varied length of learning experiences, we decided to classify the participants into two groups by using mean minus an SD, which allowed us to purposely select the extremes of the distribution in the length of experience (i.e., the students with least learning experience) so that we could further determine the possible minimum requirement in the length of learning for the mediating effect. This classification method has also been adopted to identify the lower achievers in other reading-related studies (e.g., MacArthur et al., 2012; Duff and Brydon, 2020). As a result, the low experience group was for students with 4 years (or less) of experience in learning Chinese ($n = 81$), and the other was for those with more than 4 years of learning experience ($n = 343$).

Measures
Sub-Lexical Orthographic Knowledge
This task was adapted from Wang et al. (2003) that was used to measure students' sub-lexical orthographic knowledge. Students were required to determine whether the character shown on a card was a real character or not. The items were manipulated in four types of characters: (1) high frequency single characters, (2) high frequency compound characters; (3) low-frequency

single characters; (4) low-frequency compound characters. 40 characters were selected for each category with a total of 160 items. Characters were selected from *Frequency statistics of commonly used Modern Chinese characters* (Ho and Kwan, 2001). 50% of these items were real characters, and the remaining 50% were non-characters. The frequency effect and number of radicals were matched for the four aforementioned types of characters. It took the students about 15 mins to complete the task. One point was given to each correct item. The Cronbach's alpha was 0.955.

Lexical Orthographic Knowledge

There were two tasks used to measure students' lexical orthographic knowledge: *orthographic choice task* (OKC) and *orthographic choice in context (OKCC)*.

(1) The OKC task was used to measure students' lexical orthographic knowledge without context. The original task was from Olson et al. (1985), consisting of one real English word and one homophonic pseudoword with a similar word shape (e.g., soap-sope; gawn-gone). Leong et al. (2011) modified it into the Chinese version. Adapted from Leong et al. (2011), we set 20 pairs of two-character words. These 20 questions consisted of (a) 10 pairs of words for each with one simple character and one regular consistent character (i.e., characters that are pronounced in the same way as its phonetic radical in tone and syllable, like 蜻 [cing1, dragonfly]), e.g., 青山 [cing1 saan1, green mountain] – 蜻山 [cing1 saan1, homophonic pseudoword]; (b) 5 pairs of words for each with one simple character and one regular inconsistent character (i.e., characters that are pronounced the same way as the correct answer; they shared the same phonetic radical but with different tones, like 飯 [faan6, meal]), e.g., 米飯 [mai5 faan6, rice] – 米反 [mai5 faan2, homophonic pseudoword]; and (c) 5 pairs with irregular or exception characters (i.e., characters that are pronounced in completely different ways from its phonetic radical, such as 直線 [zik6 sin3, line] – 直練 [zik6 lin6, homophonic pseudoword]. All characters and words were randomly selected from the Lexical Items for Fundamental Chinese Learning in Hong Kong Schools (Hong Kong Education Bureau, 2003)[1]. Each item contained two pairs of words, one being a real word, and the other a pseudoword. Students were required to read 20 pairs of word silently that were printed on a sheet of paper and circle the correct options. The task took about 10 mins to complete, and the maximum score was 20. The Cronbach's alpha was 0.683.

(2) The *OKCC* task was used to measure the students' lexical orthographic knowledge in context. It was first designed by Stanovich and West (1989) and the Chinese version was developed by Leong et al. (2011). This task consisted of 18 short sentences in total, with a maximum score of 18. Students were asked to read each Chinese short sentence silently and circle the only correct word among four options to complete the sentence meaning. Options consisted of two-character words, with three distractors that were orthographically or phonologically similar words of regular consistent, regular inconsistent, exception real, or pseudowords.

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[1]https://www.edbchinese.hk/lexlist_ch/

For example: 早上(洋光/陽光/揚光/羊光) 照進課室 [ocean-light (pseudoword)/sunshine/blowing-light (pseudoword)/ sheep-light (pseudoword) shines into the classroom in the morning]. All characters and words were randomly selected from the Lexical Items for Fundamental Chinese Learning in Hong Kong Schools (Hong Kong Education Bureau, 2003; see text footnote 1). The testing time was 15 mins. One point was given to each correct item. The Cronbach's alpha was 0.678.

Chinese Character Reading

The test consisted of 86 traditional single characters. All characters were randomly selected from textbooks used in the sampled schools, considering first the character frequency and then the complexity of strokes constituted the characters. The test was designed as an individual test, and participants were required to read aloud all characters one by one, following the instructions given by a trained test administrator. Each correct pronunciation was awarded one mark. The Cronbach's alpha of the task was 0.980. The test items are listed in **Appendix**.

Chinese Reading Comprehension

Students' reading comprehension ability was measured by using Chinese Language Reading Papers of the Territory-wide System Assessment (TSA). TSA is a low stake assessment measuring students' basic literacy at the end of each key learning stage (i.e., Grade 3, 6, and 9, respectively) administered to all students in Hong Kong every year. For CSL students, we ascertained that their levels of reading and writing in Chinese were at about Grade 3 level based on literature (Loh et al., 2019) and teachers' observation. Therefore, the TSA paper for Grade 3 students was adopted.

Students were required to read two passages (465 and 487 Chinese characters respectively) and answer 20 questions with 20 marks (one mark awarded for each correct answer) in 25 mins. The paper and the marking scheme were provided by the Hong Kong Examinations and Assessment Authority (2019), only single- or multiple-choice questions were included. The following three levels of reading competence were examined (Basaraba et al., 2013): (1) literal comprehension (retrieving explicitly stated information), eight questions; (2) inferential comprehension (understanding the implicit relationships in the passage), nine questions; and (3) evaluative comprehension (analyzing and critically interpreting the text), three questions. All scores were validated by two experienced Chinese language teachers. The Cronbach's alpha for the test was 0.697.

Procedure and Data Analysis

All scripts were marked by two raters with rich knowledge in Cantonese phonology who were trained prior to the tests. A sample of 40 scripts of each task were marked for trials, and discrepancies were resolved before formal marking. Since most of the items in all tasks were objective items (e.g., multiple-choice items), the inter-rater reliability as measured by Spearman rank-order correlation coefficients (rho) were relatively high, *r* ranging from 0.920 to 0.960.

All data were input into SPSS 26. Preliminary data analysis was first performed to check data adequacy, such as normality

TABLE 1 | Descriptive data of students' performance in four tasks.

Item (Max. scores)	All sample (*n* = 424)		Low experience (*n* = 81)		High experience (*n* = 341)		*t*-test	Cohen's *d*
	Mean	SD	Mean	SD	Mean	SD		
1 Sub-lexical orthographic knowledge (160)	135.39	20.04	125.25	24.19	137.78	18.16	*t* = −4.38, *df* = 102.30, *p* < 0.001	0.64
2 OKC (20)	14.00	3.30	12.48	3.34	14.36	3.19	*t* = −4.73, *df* = 422, *p* < 0.001	0.58
3 OKCC (18)	6.81	3.24	5.58	2.47	7.10	3.33	*t* = −4.64, *df* = 156.03, *p* < 0.001	0.52
4 Character reading (86)	26.94	19.20	15.89	15.30	29.55	19.11	*t* = −6.87, *df* = 145.25, *p* < 0.001	0.74
5 Reading Comprehension (20)	4.66	3.10	3.82	2.20	4.86	3.25	*t* = −3.46, *df* = 173.37, *p* = 0.001	0.34

Digits in the brackets are total number of tasks. OKC, lexical orthographic choice; OKCC, lexical orthographic choice in context.

and outliers. The *t*-test was performed to examine the differences between both groups in all variables of this study. Due to the unequal sample sizes of the two learning experience groups, we calculated the Cohen's *d* effect size. Cohen's *d* between 0.2 and 0.4 represented small effects; between 0.5 and 0.7 medium effects; and above 0.8 large effects.

Path analysis was performed to explore the possible mediating effect of two lexical orthographic skills. It allowed us to simultaneously examine the structural relationships between variables and determine the direct and indirect paths. The indirect effect and mediating effect could be used interchangeably under different circumstances in this study. The maximum likelihood method was selected as it generated the estimation of all model path coefficients and to compute model fit statistics. To determine the significance of the indirect effects in each model, the bias-corrected bootstrapping was performed by 2,000 random sampling with replacements at a confidence level of 95%. The indirect effects were assumed significant when zero was beyond the confidence interval.

After the path model was built, a further multiple-group comparison was conducted to test whether the model structure was invariant for both groups. Following the procedure recommended by Byrne (2013), we compared a series of models to determine the paths that were variant between groups.

RESULTS

Descriptive Analysis

Students' performance in five tasks is presented in **Table 1**. Prior to further analysis, we checked the values of skewness and kurtosis and found that data of all variables was considered normally distributed, as the absolute values of skewness were less than 2 and kurtosis were below 5 (Kline, 2015).

Students' performance in all tasks was relatively poor. Students with more than 4 years' learning experience outperformed their

counterparts with less experience in all tasks, and all *p*-values of *t*-test were less than 0.05.

Correlations Between Students' Character Reading, Orthographic Knowledge and Reading Comprehension

Table 2 presents correlation coefficients among variables after controlling the age effect. As seen in **Table 2**, they were correlated with each other significantly at a moderate to high level. The reported length of learning experience in Chinese also correlated significantly with other tasks. However, the magnitude was at a weak to moderate level, r ranging from 0.103 to 0.247.

Direct and Indirect Effects of Character Reading on Comprehension

To explore the possible mediating effect of lexical orthographic knowledge in the relationship between character reading and reading comprehension, we first conducted a regression analysis using character reading to predict reading comprehension. The results showed that character reading significantly

TABLE 2 | Partial correlation between performances of four tasks after controlling age effect.

	1	2	3	4	5	6
1 Sub-lexical OK	1					
2 OKC	0.415***	1				
3 OKCC	0.303***	0.527***	1			
4 Character reading	0.405***	0.627***	0.614***	1		
5 Reading comprehension	0.206***	0.426***	0.508***	0.515***	1	
6 Years learned Chinese	0.209***	0.192***	0.164**	0.247***	0.103*	1

****p* < 0.001, ***p* < 0.01, **p* < 0.05.*
Sub-lexical OK, Sub-lexical orthographic knowledge; OKC, Orthographic choice; OKCC, Orthographic choice in context.
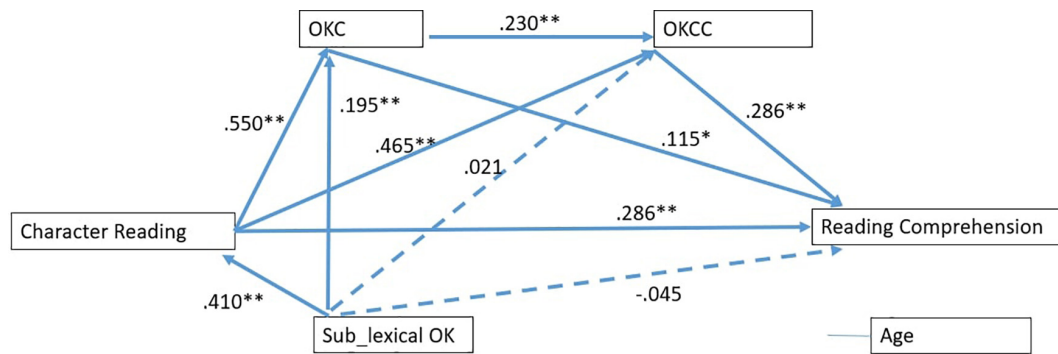
FIGURE 1 | Path model demonstrating relationship between character reading and reading comprehension. $**p < 0.01$, $*p < 0.05$, Sub-lexical OK, Sub-lexical orthographic knowledge; OKC, Orthographic choice; OKCC, Orthographic choice in context. Coefficients for the controlled variable age were not shown for simplicity.

explained a total of 27.8% variance of reading comprehension, $F(1, 422) = 162.38$, $t = 12.74$, $\beta = 0.527$. This could be considered as the total effect of character reading.

Next, we built a path model as hypothesized (see **Figure 1**) using two lexical orthographic knowledge tasks as mediators. Sub-lexical orthographic knowledge and age were added as controlled variables. By explaining a total of 34% variance of reading comprehension, the model was saturated. All standardized coefficients between variables were considered significant. As seen in **Figure 1**, character reading significantly predicted the two types of lexical orthographic knowledge, which further had positive effects on reading comprehension. Noted the direct effect of character reading on reading comprehension decreased from 0.527 to 0.286, which means the total indirect effect of lexical orthographic knowledge was about 0.241.

After decomposing the indirect effects into three pathways (see **Table 3**), we found that the indirect effect of character reading via OKC was significant, $\beta = 0.063$, $p = 0.025$, and OKCC significantly mediated the effect of character reading on reading comprehension ($\beta = 0.133$, $p = 0.001$) and could form a significant two-stage indirect effect ($\beta = 0.036$, $p = 0.001$) together with OKC, suggesting the more important role of OKCC.

Difference in the Relationship Between Variables Among Two Groups With Different Learning Experiences

A multi-group analysis was undertaken to check if mediating effects of lexical orthographic knowledge varied between two groups with different lengths of Chinese learning experience. The model shown in **Figure 1** was saturated in two groups of students separately (see **Figures 2, 3**), and then the unconstrained model (i.e., with free structural parameter coefficients) was also saturated. To conduct the multi-group analysis, we compared the constrained model (i.e., all parameters were constrained equal across groups) with the unconstrained model (Byrne, 2013). The results revealed that model fit had significantly changed [$\Delta \chi^2(10) = 42.94$, $p < 0.001$], indicating that the model fit could be varied across two groups. In the low experience group, the model accounted for a 16% variance of reading comprehension,

while in the high experience group, the model explained a 37.1% variance of reading comprehension.

To investigate the specific paths that varied between groups, we constructed more models by releasing the constraint one by one for each path, and compared each model with the unconstrained model using chi-square difference tests. The results indicated that all paths were invariant across groups while the other two paths had significant differences. The effect of character reading on OKCC was [$\Delta \chi^2(1) = 10.91$, $p = 0.001$], and the effect of OKCC on reading comprehension [$\Delta \chi^2(1) = 12.11$, $p = 0.001$].

Taking a closer look, we found that all indirect effects via two mediators were non-significant in the low experience group (see **Table 3**), but significant in the high experience group. This might suggest that as high experience CSL students developed both OKC and OKCC better, they were able to apply them to facilitate reading comprehension.

DISCUSSION

Along with the increasing number of CSL learners in recent decades, more attention has been devoted to exploring the role of orthographic knowledge in the development of Chinese literacy. In this study, the mediating effect of lexical orthographic knowledge in the relationship between character reading and reading comprehension was examined among a group of CSL learners in Hong Kong. The research not only enriched our understanding of literacy acquisition from character reading to reading comprehension but also provided pedagogical implications for teaching Chinese reading comprehension to second language learners.

From a bottom-up perspective, reading comprehension builds on word recognition. In response to the complex property of Chinese characters, it is believed that learners should master multiple linguistic skills necessary for successful recognition of words. Previous studies have suggested that the sub-lexical orthographic knowledge was a crucial skill in supporting learners to quickly recognize the characters among native
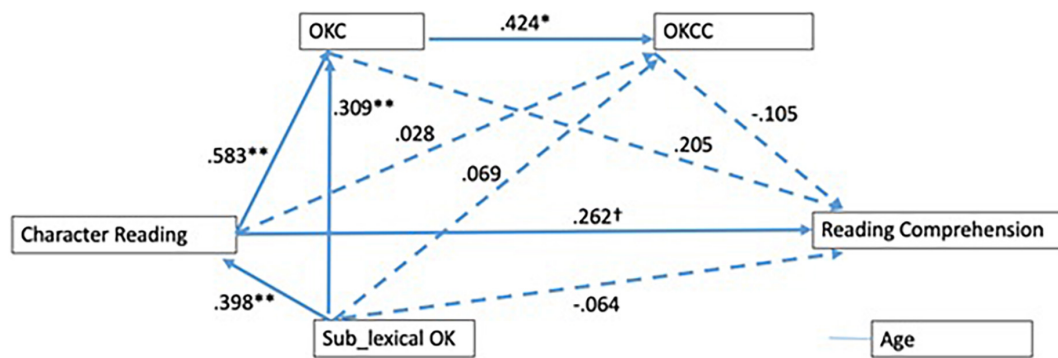
FIGURE 2 | Path model demonstrating relationship between character reading and reading comprehension in the low-experienced group. **$p < 0.01$, *$p < 0.05$. †Represents marginally significant ($p = 0.053$). All values were standardized coefficients. OKC, lexical orthographic choice; OKCC, lexical orthographic choice in context.
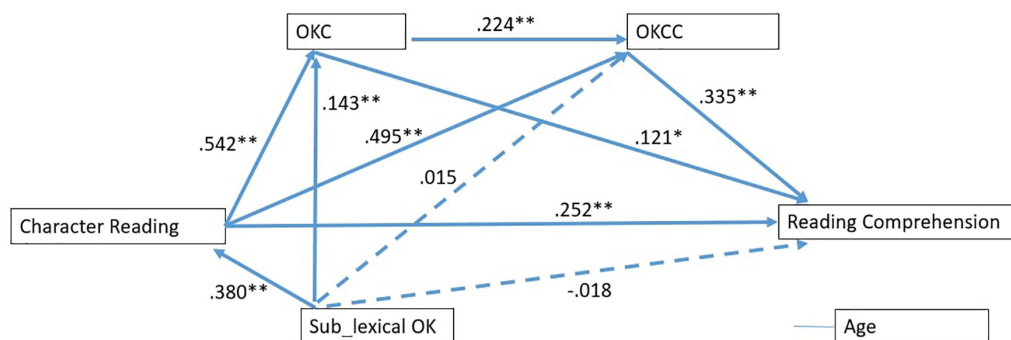

FIGURE 3 | Path model demonstrating relationship between character reading and reading comprehension in in the high-experienced group. **$p < 0.01$, *$p < 0.05$. All values were standardized coefficients. OKC, lexical orthographic choice; OKCC, lexical orthographic choice in context.

TABLE 3 | The indirect effect of character reading on comprehension via two mediators.

	All sample		Low experience		High experience	
	Effect	95%CI	Effect	95%CI	Effect	95%CI
1.CR-OKC-RC	0.063*	[0.011, 0.121]	0.133	[−0.017, 0.342]	0.066*	[0.013, 0.124]
2.CR-OKCC-RC	0.133**	[0.072, 0.200]	−0.004	[−0.085, 0.048]	0.167**	[0.100, 0.253]
3.CR-OKC-OKCC-RC	0.036**	[0.016, 0.068]	−0.029	[−0.130, 0.022]	0.041***	[0.019, 0.081]
Total indirect effect	0.232**	[0.144, 0.324]	0.100	[−0.061, 0.300]	0.274**	[0.177, 0.384]

***$p < 0.001$, **$p < 0.01$, *$p < 0.05$.
CR, character reading; OKC, lexical orthographic choice; OKCC, lexical orthographic choice in context; RC, reading comprehension.

(e.g., Ho et al., 2003) and CSL learners (Shen and Ke, 2007; Chang et al., 2014; Loh et al., 2018; Chan et al., 2021). However, because characters, as a basic unit of the Chinese writing system, only represent "morpheme" rather than "word" (Packard, 2000), it is not very clear about the exact effect of character reading on reading comprehension among CSL learners and how these learners could achieve comprehension at higher levels (i.e., word level and above).

It is tended to believe that the recognition of words relies on the analytical way of processing by integrating the morphemes (mostly characters) linearly (e.g., Ku and Anderson, 2003; McBride-Chang et al., 2003; Tong et al., 2009; Li et al., 2012; Ke and Koda, 2019), many studies were thus conducted on the related skills supporting this processing (e.g., Ku and Anderson,

2003; McBride-Chang et al., 2003; Tong et al., 2009; Li et al., 2012; Ke and Koda, 2019). While the analytical processing is surely important and indispensable, it should also be noted that due to CSL learners' limited knowledge of Chinese morphemes, it is difficult for them to decode word meanings in an analytical way (Gong et al., 2020b). The growing number of studies have also shown that learners recognize words holistically in reading (e.g., Chu and Leung, 2005; Liu et al., 2010; Cui et al., 2021), and lexical orthographic knowledge helps to predict students' reading comprehension performance (Leong et al., 2011). Therefore, we argued that lexical orthographic knowledge may play a vital role in CSL learners' acquisition of reading comprehension skills.

To answer research question 1, the findings of the present study showed that lexical orthographic knowledge

significantly mediated the effect of character reading on reading comprehension after controlling the effects of age and sub-lexical orthographic knowledge. As there is no salient space between Chinese words, CSL readers may develop the ability to recall their knowledge of orthographic word forms from their mental lexicon and integrate characters into words for further processing. In our study, among the three indirect effects of character reading on comprehension via two sub-types of lexical orthographic skills (i.e., OKC, OKCC), OKCC had the strongest mediation effect, indicating that CSL students' lexical orthographic skill in sentence reading context could be a more important factor in explaining their Chinese reading comprehension performance.

Based on our results, we could also extend our discussion on the different roles played by two types of orthographic knowledge in the process of Chinese text reading among CSL learners. With reference to the process of word reading models proposed in the literature (e.g., Taft and Zhu, 1997; Li et al., 2009), readers are commonly believed to form multiple presentations at various linguistic levels during word reading, such as radical, character and word levels. In the process from radical to character level, the sub-lexical orthographic knowledge could be employed to help learners to quickly and correctly recognize the characters. Furthermore, the lexical orthographic knowledge would be subsequently involved in the process from characters to words as it helps readers to recognize words in the case that readers are already familiar with the written form of a word. However, it should be noted that the comprehension process from character level to word level is very complicated, in which character reading and word recognition could take place parallel and interactively (Li et al., 2009), therefore the sub-lexical and lexical orthographic knowledge could also function interactively with each other. Follow-up studies in this research area could be conducted, particularly among CSL learners.

In response to research question 2, we found that the mediating effects of lexical orthographic knowledge varied between different experience groups. The three paths of indirect effects were only significant in the high experience group but not the low experience group. In other words, character reading could have both direct and indirect effects on reading comprehension among high experience CSL learners, while for low experience learners, only the direct effect could be significantly observed. That might be because learners with less experience rely more on character-by-character reading (Chu and Leung, 2005) due to the insufficient orthographic word forms stored in their mental lexicon. Similar findings are also found among native Chinese learners. For example, Chen and Su (2009) and Su and Samuels (2010) pointed out that native Chinese beginning learners process words in an analytical way (i.e., reading character by character, instead of processing multi-character words as a single unit), but they are able to decode multi-character words automatically and holistically in senior grades. We assumed that CSL learners were able to gain more lexical orthographic knowledge through engaging in various learning activities (such as after-class reading), which would enable the mediating effects of lexical orthographic knowledge to function more effectively. Nevertheless, our results indicated that lexical orthographic knowledge could be an important factor in explaining the individual differences in students' reading performance.

LIMITATIONS AND IMPLICATIONS

The current study has a few limitations. First, no causal associations between lexical orthographic knowledge and reading comprehension can be established from this correlational study. Meanwhile, as an initial exploration on lexical orthographic knowledge in Chinese reading comprehension, we did not take longitudinal data into account nor experimental data in the study, therefore more empirical studies should be conducted in the future. Second, the participants' age range in the present study was wide, which may cause a confounding effect on the analysis. Third, our classification of students' length of learning experience was based entirely on their self-reports, for which more related measurements and more robust methods (e.g., cluster analysis, latent profile analysis) could be adopted in future studies.

Despite the limitations, our study is pedagogically useful. Learning from CSL teachers, we know that learners commonly encounter difficulties in reading comprehension, though they have already mastered the knowledge of Chinese characters. We noticed that the main difficulty encountered by the students was not able to correctly identify words in a sentence. The findings in this study provide some references to address this situation. Currently, in CSL teaching, learners are commonly taught to learn single characters by rote. Previous research has suggested explicit instructions on orthographic knowledge are necessary for reading CSL (e.g., Nguyen et al., 2017; Gong et al., 2018; Ke, 2020). In light of our findings, teachers are recommended to help students better grasp the written form of words, rather than simply memorizing more characters. To be specific, teachers are suggested to adopt explicit teaching while instructing their CSL students to discern the two-character form of words. Therefore, more teaching activities related to lexical orthographic knowledge using words to form sentences are recommended.

Moreover, group differences found in our study calls for more attention to the learning experience of CSL learners. In Hong Kong, due to administrative arrangements, they are usually allocated to the same class as peers of the same age who completed their primary education in Hong Kong with a good command of conversational Chinese. To compensate the relatively less learning experience of CSL learners, more reading exposure is recommended for CSL learning. Teachers are encouraged to organize more reading activities both in the curriculum, as well as after-class activities.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Education University of Hong Kong (Reference Number: EdUHK-E2019-2020-0032) and the University of Hong

Kong (Reference Number: HKU-EA1502041). Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

EL initiated the study and designed the research instruments. XL carried out the experiments and collected the data with EL. XL and MC analyzed the data and drafted the manuscript. EL worked on the elaboration of the manuscript while maintaining close communication with XL and MC. All authors provided critical feedback, contributed to the article, and approved the submitted version.

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APPENDIX

Chinese Character Reading

六、刃、次、文、權、師、分、火、嗎、問、下、共、漢、近、興、五、字、友、州、長、牙、黿、
乙、上、田、石、女、劇、西、那、母、早、力、再、百、考、她、末、在、不、有、四、只、本、
沒、白、老、毛、打、台、術、日、先、少、用、生、主、父、去、他、十、因、年、月、費、中、
天、認、車、外、工、達、多、來、太、機、我、半、對、論、左、功、走、北、級、小

Enhancing Syntactic Complexity in L2 Chinese Writing: Effects of Form-Focused Instruction on the Chinese Topic Chain

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Syntactic complexity, as one aspect of the Complexity, Accuracy and Fluency (CAF) model, is integral to the writing ability of second language (L2) learners. Previous research found that T-unit-based measures of syntactic complexity in writing tasks of English as a second language (ESL) learners increased with more instruction, yet it remains unclear whether the same can be observed in Chinese as a second language (CSL) learners. To fill this gap, this study compared the development of syntactic complexity of a training group ($N = 64$) and a control group ($N = 51$), both composed of CSL students in a first-year Chinese course at a university in North America. While participants in the control group only participated in the regular course, the training group received an additional 10-week, explicit form-focused instruction (FFI) on the Chinese *topic chain*. Results on the posttest and delayed posttest show that the FFI on the topic chain had a positive and durable effect on the participants' syntactic complexity; instructional intensity and feedback type may have influenced its effectiveness and durability. Characteristics of measures and task complexity may have affected the observation of syntactic complexity.

Keywords: syntactic complexity, topic chain, second language writing, form focused instruction, Chinese as a second language (CSL)

INTRODUCTION

The development of writing abilities in a second language is critical in that it "is increasingly perceived as a central mechanism via which language competencies...perhaps must be acquired (Norris and Manchón, 2012, p. 221). To date, the triad model of CAF – complexity, accuracy and fluency – has been widely used for the assessment of second language writing abilities (Wolf-Quintero et al., 1998; Housen et al., 2012). Complexity, as the youngest dimension in the model, is the most complex and least understood dimension (Housen and Kuiken, 2009). At the syntactic level, complexity refers to the range and the sophistication of grammatical resources exhibited in language production (Ortega, 2015).

Previous studies investigating L2 written syntactic complexity have validated different measures of syntactic complexity (Wolf-Quintero et al., 1998; Lu, 2011; Kyle and Crossley, 2018) and used these measures to investigate the L2 writing development with and without pedagogical intervention (Ortega, 2003, 2015). Studies have found that syntactic complexity of L2 writing increases with more instruction (Mazgutova and Kormos, 2015; Vyatkina et al., 2015). However,

currently available studies primarily focused on learners of English as a second language (ESL, Polio, 2017), leaving syntactic complexity in other languages like Chinese under-explored. More importantly, the measures and indicators for syntactic complexity in English may not necessarily be applicable or appropriate for measuring that in Chinese as a second language (CSL, Jin, 2007; Yu, 2021). Additionally, it is unclear whether syntactic complexity of Chinese, whether measured in oral or written discourse, can be enhanced by explicit instruction (Yu, 2019).

Therefore, guided by Norris and Ortega's (2009) proposal for an organic approach to investigate syntactic complexity in instructed second language acquisition (SLA), as an exploration, this study attempts to examine if CSL learners' syntactic complexity, based on current, validated measures for CSL learners proposed by Yu (2016, 2021), can be enhanced through a 10-week researcher-designed form-focused instruction.

LITERATURE REVIEW

Topic Chain in Measuring Syntactic Complexity in Chinese

Syntactic complexity is a multidimensional construct that can be measured through multiple scales (Norris and Ortega, 2009; Lu, 2011). Like English, Chinese syntactic complexity can be measured on global, clausal, and phrasal levels (Pan, 2018). However, since syntactic complexity entails features of language components and their composing mechanisms, the measurements of syntactic complexity used for one language may not be equally applicable to another.

Li and Thompson (1976) categorized English as a subject-prominent language whose sentences are formed with a structure of subject-predicate. In other words, an English sentence has one subject which is generally in the form of a noun or noun phrase (NP), and one predicate of which verb or verb phrase (VP) is the essential part. In contrast, Chinese is regarded as a topic-prominent language whose structure is better characterized as topic-comment (Chao, 1968; Li and Thompson, 1976; Chu, 1998). What distinguishes a topic from a subject is its thematic continuity and semantic "aboutness" in the discourse rather than a grammatical relationship with the rest of the clause (Chao, 1968; Givón, 1992). Given this character, a topic in Chinese can be not only a noun/NP but also a verb/VP or adjective; the comment is not limited to a verb/VP like in English but can also be a noun/NP. Therefore, the following sentence is grammatical in Chinese:

a. Wǒ shí suì. 我十岁。
   [I ten year old].
   I'm 10 years old.

The second difference between English and Chinese is that in English, the subject is usually stated to achieve a subject-predicate constituency, whereas Chinese is a pro-drop language whose subject or topic can be omitted when understood in the context (Huang, 1989). Therefore, when successive English clauses/sentences share one same subject, their subject positions need to be filled by either the full form of the subject, pronouns or demonstratives. However, in Chinese, when successive topic-comment structures share the same topic, the topic can be overtly stated only once and represented with zero anaphora in the rest of the positions, thus resulting in a topic chain (Tsao, 1979, 1990). Because the topic chain is constituted with multiple topic-comment structures despite the overtness of the topics, and the topic-comment structures are actually clauses (Tsao, 1990; Chu, 1998), the topic chain has a supra-clause character. In other words, the overt topic of the topic chain dominates successive clauses. Li (2004b) identified 10 types of topic chains, the most simple and typical form of which is one with overt topic in the first clause, just like the example provided here:

b. Wǒ jiào Xiǎohóng, jīnnián shí suì, zài shàng xiǎo xué.
   我叫小红，Ø今年十岁，Ø在上小学。
   [I$_i$ call Xiaohong, Ø$_i$ this year 10 year old, Ø$_i$ ZAI-progressive marker attend primary school]
   I'm called Xiaohong. I'm 10 years old this year. I'm attending primary school.

It is proposed that topic chains are the basic and the most frequently used structure to construct discourse in Chinese, a discourse-oriented language (Tsao, 1979). Further, the order of the clauses in a topic chain follows the sequential order of events (Tai, 1985), therefore, complex sentences in Chinese can be understood as topic chains (Yu, 2021). English complex sentences, on the other hand, are realized through subordination of clauses, on which the measure of English syntactic complexity is based (Hunt, 1965).

Based on clausal subordination, Hunt (1965, 1970) developed a T-unit-based system of indices to measure the English syntactic complexity, which has been extensively used in a wide variety of languages (Cooper, 1976; Larsen-Freeman, 1978, 1983; Henry, 1996; Iwashita, 2006). A T-unit is defined as one independent clause plus, however, many subordinate clauses there are that are attached to the independent clause (Hunt, 1970). Although initially proposed to measure the syntactic complexity in L1 English (Hunt, 1965, 1970), T-unit related measurements such as T-unit length, error-free T-unit length, percentage of error-free T-unit, clauses per T-unit were used to assess the syntactic complexity of various Indo-European languages as L2s, and were proven sound measurements in L2 development (Scott and Tucker, 1974; Larsen-Freeman, 1978; Wolf-Quintero et al., 1998). However, due to the different constructions of complex sentences, it is argued that Chinese syntactic complexity should be measured based on topic chains, instead of Hunt's T-unit system (Jin, 2007; Yu, 2021).

Syntactic Complexity Development in Chinese as a Second Language

Studies have used both specific measurements and general measurements to investigate Chinese L2 syntactic complexity. Using specific measurements, studies have focused on the development of a collection of syntactic forms that are specific to Chinese (Han and Feng, 2017; Yang and Zhao, 2018). For example, the *ba*-construction, passive structure marked with

bei, comparison sentences marked with *bi*, VOV 得 (de), etc. However, since studies covered different structures and employed different methods to calculate the complexity, their results are not always comparable. In addition, since the development of these syntactic forms are insignificant either across groups or across time according to the studies, and different syntactic forms usually have different developmental trajectories, the specific scale measurements, like Wolf-Quintero et al. (1998) suggested, are not the best indices to describe the syntactic complexity due to a lack of generalizability.

Studies using general measurements have utilized a T-unit system or topic-chain-based measurements. Drawing on the above-mentioned T-unit analysis, Jiang (2013) and An (2015) both found T-unit length sensitive in discriminating between the writings of higher-level Chinese L2 learners, but not so in discriminating between learners of lower language levels (Jiang, 2013). However, in Jin's (2007) study measuring three levels of learners from intermediate to high levels and a group of native speakers, neither T-unit length, clause per T-unit nor T-unit per sentence effectively and significantly increased with language level. In fact, in her study, all three indices in native speakers' language decreased. In other words, using the T-unit measurement, L2 Chinese learners were assessed to be utilizing more complex language than Chinese native speakers. In contrast, all indices based on the topic chain, mean length (character) of topic chain, clause per topic chain, and zero anaphoras per topic chain discriminated against each language level well in Jin's (2007) study. A replication study (Wu, 2016) assessing novice, intermediate and advanced level learners and native Chinese speakers found the same results; namely, all of the topic chain measurements and none of the T-unit indices discriminated between the writings of the four language levels. Based on the findings mentioned above, it is clear that although subordination does exist in Chinese, subordination-based measurements like the T-unit system may not be the most sensitive measure in Chinese syntactic complexity. Following Norris and Ortega's (2009) proposal for measuring complexity multi-dimensionally, we argue that topic-chain-based measurement should be more seriously considered in CSL research.

In light of the results in Jin (2007); Wu (2016), and Yu (2021) proposed an organic measure of Chinese syntactic complexity based on the topic chain, which resolved two remaining questions in Jin (2007): the relationship between topic chains and non-topic chain clauses, and the boundary of topic chains. In her analysis, Yu (2021) proposed a terminable Topic-Comment unit (TC-unit) and a single TC-unit as the basic operationalizable units capturing syntactic complexity of Chinese in the supra-clausal and clausal levels, respectively. "A terminable TC-unit is a supra-clausal-level unit that takes the form of a topic chain, and a single TC-unit is one clausal or subclausal level unit in Chinese" (Yu, 2021, pp. 9-10). A terminable TC-unit is a simple terminable TC-unit when it only contains one independent single TC-unit, or one topic-comment structure; it is a complex terminable TC-unit when it contains two or more dependent single TC-unit whose shared topic overtly appears once and represented with zero anaphora or coreferential zero in the remaining positions.

Example *c* below is a complex terminable TC-unit consisting of two single TC-units, whereas Example *d* are two simple terminable TC-units each containing one single TC-unit.

c. Wǒ jiào Xiǎohóng, jīnnián shí suì. 我ᵢ叫小红，Øᵢ今年十岁。
   [Iᵢ call Xiaohong, Øᵢ this year 10 year old]
   I'm called Xiaohong. I'm 10 this year.
d. Wǒ jiào Xiǎohóng, wo jīnnián shí suì. 我叫小红，我今年十岁。
   [I call Xiaohong. I this year 10 year old.]
   I'm called Xiaohong. I'm ten this year.

Further, Yu (2021) validated four measures of Chinese syntactic complexity in both written and spoken production of L1 and L2 Chinese speakers: (1) mean length of terminable TC-unit (MLTTCU), (2) complex terminable TC-unit in all terminable TC-units (CTTCU/ATTCU), (3) mean length of single TC unit (MLSTCU), and (4) single TC-units per terminable TC-unit (STCU/TTCU). The former two were considered as a global level measure and the latter two clausal level measures. Her results showed that participants with higher Chinese proficiency produced longer terminable TC-units consisting of more dependent single TC-units. Specifically, MLTTCU was the most effective indicator of spoken Chinese syntactic complexity and the combination of MLTTCU and STCU/TTCU was the most effective indicator of written Chinese syntactic complexity.

Form-Focused Instruction, Topic Chain, and Syntactic Complexity in Chinese as a Second Language

The topic chain is one of the Chinese discourse features that may be subtle and opaque in nature to learners whose first languages do not employ such a feature. Given that learners allocate a varied level of attention to different layers of language (Talmy, 2008), they were found to display a lack awareness toward Chinese-specific discourse features (e.g., Jin, 1994; Polio, 1994; Yuan, 1995; Liu, 2015; Lu, 2019). However, on the other hand, the topic chain appears in the very first lesson of first-year Chinese textbooks, yet it is rarely taught explicitly in class (Li, 2004a, 2006). This fact naturally leads to the question of whether CSL learners' syntactic complexity in writing can be enhanced through *form-focused instruction* (FFI, e.g., Collins and Ruivivar, 2020), by explicitly directing their attention to the language form (in this case, topic chain) through direct instruction integrated with activities focused on communicating in the target language.

To date, only a handful of studies have investigated the effectiveness of FFI in CSL focusing on vocabulary, phonology (tones), grammar, and pragmatics (Yuan, 2018). Among the studies on grammar, most of the research was conducted on some form of pedagogical treatment (e.g., consciousness raising activities) or task conditions (e.g., dictogloss task) combined with different participant grouping on discrete syntactic forms such as the aspect marker *le* (Yuan, 2010, 2012a, 2014a,b).

Only one study explored the effect of explicit instruction on the syntactic complexity of L2 Chinese learners. Yu (2019) elicited oral production in a class of second-year L2 learners in a university setting ($N = 12$). In the first week, the researcher showed a video in English about the Chinese New Year, and

immediately asked the students to retell the story based on the video, followed by a 20-min explicit instruction on Chinese syntactic complexity. The students were then asked to complete another retell task based on the earlier prompt. In the following 3 weeks, the researcher conducted a 5-min explicit instruction each week on the topic chain compositionality. In week 3, the same video was shown again, and students were asked to complete the third retell task. The four measures validated in Yu (2021) were employed to compare students' oral production in the three retell tasks. The results showed that MLTTCU and STCU/TTCU in the second retell task were significantly greater than that in the first, suggesting the immediate impact of the explicit instruction on the learners' oral syntactic complexity. However, all four measures in the third retell task did not differ from that in the first, indicating a diminished effect of the researcher-designed instruction.

The results in Yu (2019) only demonstrated the positive role of the explicit instruction in enhancing L2 learners' syntactic complexity in the oral modality. However, it is unclear if improved syntactic complexity through oral training can necessarily and readily improve that in writing (e.g., Bulté and Housen, 2009). Therefore, whether syntactic complexity in writing can be enhanced through explicit instruction remains unclear. Additionally, the intensity of the instruction in Yu's (2019) study was relatively low, and the only available resources to students were limited to the instructor's 35-min lecture across 4 weeks. These factors might have contributed to the low durability of the instructional effects. Moreover, it is difficult to tease apart the effect of natural growth vs. instructional effect, since there was no control group in the study.

To summarize, syntactic complexity in English and in Chinese is measured in different ways based on their respective linguistic features. The topic chain has been found to be a much more sensitive measure of syntactic complexity in CSL research, different from the T-unit-based measures widely used in other languages. The paucity of research exploring the instructional effect of the topic chain in CSL propelled us to investigate the effect of explicit instruction on syntactic complexity. Through a researcher-designed 10-week FFI focusing on the Chinese topic chain, the current study investigated the following questions:

1. Does explicitly teaching students how topic chains are constructed improve their syntactic complexity in writing tasks?
2. Does the explicit instruction have any delayed effect on the participants' performance in writing tasks?

METHODOLOGY

Participants

Participants were recruited from a first-year Chinese course from a Chinese program at a large public university in the United States. Sixty-four out of the 115 students in the first-year course volunteered to participate and were considered as the training group ($N = 64$; 35 female and 29 male). They were given extra credit for finishing 80% of the tasks. The remaining fifty-one students who did not participate were considered as the control

group ($N = 51$). None of the student had any prior experience learning the language nor the writing system, and were all considered true-beginners. Throughout the entire semester, the two groups followed the same instructional plan offered by the curriculum, while the training group received 10 weeks of explicit FFI on the Chinese topic chain and completed weekly writing assignments (12 in total across 10 weeks) in addition, at the end of the quarter, both the training group and the control group participated in a posttest, and a delayed posttest 2 weeks later.

Since this study lasted 10 weeks, individual-level random attrition (Pan and Zhan, 2020) – participants dropping out before the end of the study for a variety of reasons – was observed. Since individual attrition occured along the 10-week study, and the number of participants for each task was provided in **Table 3** below. For the current study, incomplete datasets were not included in the final analysis.

Instructional Materials
Instructional Videos

All of the instruction and writing assignments were delivered through the online platform Moodle. There were six instructional videos in total, designed and narrated by the first author, and ranged from 3 to 5 min long. The six instructional videos were based on the content of the first-semester Chinese curriculum, and their release date synchronized with the teaching schedule of the course. Following Yu; Yu's (2016; 2019) summary of the rules of thumb and boundaries of the topic chain, the videos included the form, function, and appropriate contexts for the usage of the Chinese topic chain. The contents of the videos are as follows:

> Video 1: Introduction to the function and form of topic chains, or why and how to use them.
> Video 2: Three conditions where topic chains were not applicable, or the chain boundaries.
> Videos 3–5: Each video included detailed explanations and examples of one condition mentioned in Video 2.
> Video 6: Review of the content in the previous five videos and comments on frequent errors found in the participants' assignments.

TABLE 1 | A coding sample of free writing task (ID: 101).

	STCU	TTCU	CTTCU	TTCUL
我$_i$姓高 [I$_i$ surname Gao] My family name is Gao	1	1	1	3
Ø$_i$叫高文中 [Ø$_i$ call Gao Wenzhong] My name is Gao Wenzhong	1			4
Ø$_i$是美国人。 [Ø$_i$ be American] I'm an American	1			4
我是学生。 [I be student] I'm a student	1	1		4
Total	4	2	1	15

STCU, single TC-unit; TTCU, terminable TC-unit; CTTCU, complex terminable TC-unit; TTCUL, length of terminable TC-unit.

Two written assignments (detailed below) were given for each instructional video; participants' responses to these written assignments were collected as data points for later analysis. On average, the participants have spent 180 min completing all the required tasks according to our log on Moodle[1].

Assignments

Each assignment contained two questions using three types of tasks (1) delete repetitive elements from a sentence Deletion Task (DT); (2) rearrange sentences into an appropriate order and rewrite them into a cohesive paragraph rearrange and rewrite task (RRT), (3) write a coherent paragraph(s) according to the given instructions free writing task (FWT). DT was the least challenging and appeared in the assignments the earliest because it only required students to recognize and delete repeated topics. RRT appeared after DT because the ability of grouping sentences based on "aboutness" was needed in addition to deleting repeated topics. FWT came last because it required students to initiate topic chains without scaffolding, and was thus considered most challenging. All assignments were untimed but students were instructed to complete them within about 15 min. Through weekly emails to all participants in the training group, the instructor summarized and explained common errors found in the participants' assignments with grammatical rules and examples.

Posttest and Delayed Posttest

There was a 2-week interval between the posttest and the delayed posttest. Each posttest included one RRT and one FWT of the same format and difficulty level. The RRT consisted of 12-13 sentences, and the FWT was based on a set of pictures which depicted a series of events involving multiple characters, therefore requiring the participants to pay attention to topics, and their changes, in constructing clauses.

Scoring

For DT, since the target noun or pronoun can be either correctly or incorrectly deleted, we assigned one (1) point to every correctly deleted element and zero (0) point to an incorrectly deleted element and then calculated the total raw score. For this measure, 20% of the data was double-coded by the two researchers, and complete agreement (100%) was reached. Participants' responses on RRT and FWT were based on the following four validated measurements of Chinese syntactic complexity (Yu, 2021), namely, MLSTCU and STCU/TTCU on clausal level; MLTTCU and CTTCU/TTCU on global level.

First, the researcher segmented sentences into STCUs and identified TTCUs. Second, the total number of STCU, TTCU, CTTCU, and the length of TTCU, STCU, and CTTCU in character in each participant's written production in each task were counted either manually or using formulas in Excel. Character-based length measures rather than word-based measures were chosen because the two measures do not make any difference in presenting L2 Chinese writing development, and

the former is more reliable for length calculation (Jiang, 2013). Third, scores of each of the four measures: Mean Length of terminable TC-unit (MLTTCU), Complex terminable TC-unit/all terminable TC-units (CTTCU/TTCU), Mean length of single TC-unit (MLSTCU), and Single TC-units per terminable TC-unit (STCU/TTCU), were calculated. The length was measured in characters.

A coding sample is provided in **Table 1**. It codes an entry on a FWT from participant 101: Wǒ xìng Gāo, jiào Gāo Wénzhōng, shì Měiguó rén. Wǒ shì xuésheng. 我姓高，叫高文中，是，美国人。我是学生。[I$_i$ surname Gao, Ø$_i$ call Gao Wenzhong, Ø$_i$ be American. I be student.] My family name is Gao. My name is Gao Wenzhong. I'm an American. I'm a student. There are four *single TC-units*, therefore four STCUs. TTCUs were segmented based on overt topics. Since there are two overt topics "我" (*I*), there are two TTCUs. Because there is only one topic chain that contains more than one single TC-unit, the number of CTTCU is one. And since TTCU includes both single STCU and CTTCU, the lengths of the TTCUs are 15 characters, 11 characters in the CTTCU and 4 characters in STCU, respectively. **Table 2** shows an example of the calculations based on the example provided in **Table 1**.

Procedures

This project was designed based on the syllabus of the 10-week Chinese course and started in the second week of the quarter. In the first week of the quarter, all students enrolled in First Year Chinese were invited to join this researcher-designed training on Moodle. From Week 2 to Week 8, the training group engaged in the training program as we described above, in addition to their daily 50-min class; students in the control group only participated in the daily 50-min class offered by the Chinese program. In Week 10, a posttest was given to all students enrolled in First Year Chinese, including students in both the training group and the control group. After a 2-week winter break, a delayed posttest was delivered to the same group of students.

During the 10-week study, five Deletion Tasks (DT), eight Rearrange and Rewrite Tasks (RRT), and ten Free Writing Tasks (FWT) were assigned to students in the training group. Since the three tasks all contained multiple data points, we grouped them into Stage 1 (S1), Stage 2 (S2), and Stage 3 (S3), as shown in **Table 3**, to better demonstrate the developmental trajectories of the training group in all three tasks.

The number of participants in the training group decreased gradually over time due to individual-level random attrition (Pan and Zhan, 2020). In addition, the number of participants in the training group who completed each task in the same assignment differed, because some of them finished the tasks selectively.

TABLE 2 | Calculated scores for the coding sample (ID: 101) on free writing task.

Task	MLTTCU	CTTCU/TTCU	MLSTCU	STCU/TTCU
FWT	7.5(= 15/2)	0.5(= 1/2)	3.75(= 15/4)	2(= 4/2)

FWT, free writing task; MLTTCU, mean length of terminable TC-unit; CTTCU/TTCU, complex terminable TC-unit in all terminable TC-units; MLSTCU, mean length of single TC-unit; STCU/TTCU, single TC-units per terminable TC-unit.

TABLE 3 | Three stages of the assignments completed by the training group.

Task	Stage 1 (N)	Stage 2 (N)	Stage 3 (N)
DT	1st (63), 2nd (61)	3rd (58), 4th (53)	5th (43)
RRT	1st (50), 2nd (53), 3rd (52)	4th (50), 5th (46), 6th (45)	7th (43), 8th (33)
FWT	1st (63), 2nd (61), 3rd (57)	4th (55), 5th (51), 6th (49)	7th (46), 8th (43), 9th (43), 10th (33)

N, number of participants; DT, deletion task; RRT, rearrange and rewrite task; FWT, free writing task.

Therefore, we only included data for those who completed a substantial portion (at least 66%) of each task during the 10-week training considering sufficient participation is required to guarantee learning. The detailed numbers of participants for each task are listed in **Table 4**.

RESULTS

Table 4 shows the mean scores of each measure in all tasks completed by both the training group and the control group. In terms of the assignment results of the training group during the 10-week study, the score of DT decreased from S1 to S2 before a spur in S3. Meanwhile MLTTCU, MLSTCU and STCU/TTCU of

TABLE 4 | Mean values of each measure in all the tasks.

Task	Stage	N	MLTTCU	MLSTCU	CTTCU/ TTCU	STCU/ TTCU	Correct
Training group in the 12 written assignments							
DT	S1	53	–	–	–	–	1.79
	S2	49	–	–	–	–	1.23
	S3	43	–	–	–	–	2.37
RRT	S1	38	10.66	7.80	0.36	1.42	–
	S2	38	12.80	8.64	0.47	1.51	–
	S3	33	17.31	9.37	0.46	1.86	–
FWT	S1	45	7.16	4.06	0.65	1.80	–
	S2	43	10.47	7.59	0.45	1.45	–
	S3	30	11.60	8.24	0.23	1.43	–
Training group in the posttest (comparing with control group in posttest)							
RRT		41	10.73	7.51	0.38	1.44	–
FWT		43	10.56	7.55	0.26	1.42	–
Control group in the posttest							
RRT		31	9.66	7.78	0.22	1.44	–
FWT		25	9.28	7.61	0.15	1.23	–
Training group in the posttest (comparing with delayed posttest)							
RRT		32	10.75	7.50	0.39	1.44	–
FWT		31	10.50	7.46	0.26	1.42	–
Training group in the delayed posttest							
RRT		32	9.21	6.61	0.32	1.40	–
FWT		31	12.42	8.44	0.25	1.49	–

MLTTCU, mean length of terminable TC-unit; MLSTCU, mean length of single TC-unit; CTTCU/TTCU, complex terminable TC-unit in all terminable TC-units; STCU/TTCU, single TC-units per terminable TC-unit; correct, scores of deletion task; RRT, rearrange and rewrite task; FWT, free writing task; DT, deletion task; S1, S2, S3, stage 1, stage 2, stage 3; N: number of participants.

RRT all grew from S1 to S3 while CTTCU/TTCU saw a moderate dipping in S3 after an increase from S1-S2. Although both length measures MLTTCU and MLSTCU of FWT increased from S1 to S3, its two ratio measures CTTCU/TTCU and STCU/TTCU decreased along the way.

Comparing the post-test results of the training group and the control group, it was found that in both the RRT and FWT, the training group scored higher in MLTTCU, CTTCU/TTCU but slightly lower in MLSTCU; the two groups' scores on STCU/TTCU were identical.

In terms of the performance of the training group in the posttest and the delayed posttest, all four measures of RRT were lower in the delayed posttest than in the posttest. In FWT, on the contrary, MLTTCU, MLSTCU and STCU/TTCU were higher and CTTCU/TTCU was lower in the delayed posttest than in the posttest.

Research Question 1: Does Explicitly Teaching Students How Topic Chains Are Constructed Improve Their Syntactic Complexity in Writing?

To answer Research Question 1, the developmental trajectories of syntactic complexity of the training group's scores on the three tasks were calculated and compared, and the posttest results of this group and the control group were compared. Syntactic complexity was measured by the scores of the three tasks, namely, Deletion Task, Rearrange and Rewrite Task, and Free Writing Task.

Non-parametric Friedman tests were used to detect differences in the performance of the training group among the three stages on each task because our data did not meet the normality assumption of the repeated measures ANOVA. In addition, post hoc analysis with Wilcoxon signed-rank tests was further conducted with a Bonferroni correction (corrected $p = 0.017$) to compare each pair of stages. Results are listed in **Table 5**.

In terms of the Deletion Task, an overall significant difference between the three stages on the score of correct deletion was found, $\chi^2(2) = 25.389$, $p = 0.000$. *Post hoc* analysis found a significant decrease from S1 to S2 ($Z = -5.276$, $p = 0.000$), and a significant increase from S2 to S3 ($Z = -3.969$, $p = 0.000$). However, the difference between S1 and S3 ($Z = -1.959$, $p = 0.025$) was not significant. This suggested that the training group's ability to correctly delete redundant topics and create topic chains (complex TTCUs) remained at the same level throughout the three stages although fluctuation occurred in the process, indicating a stable performance of the training group with the Deletion Task.

On the Rearrange and Rewrite Task, an overall significant difference (increase) between the three stages on measures MLSTCU [$\chi^2(2) = 36.741$, $p = 0.000$] and STCU/TTCU [$\chi^2(2) = 16.280$, $p = 0.000$] was found, indicating a development in the syntactic complexity on the clausal level. On the other hand, an overall significant difference (increase) between the three stages was found on MLTTCU [$\chi^2(2) = 40.963$, $p = 0.000$] but not on CTTCU/TTCU [$\chi^2(2) = 4.168$, $p = 0.125$], yet

TABLE 5 | Z and p values of Wilcoxon signed-rank tests of the training group on all tasks in the written assignments.

	MLTTCU		MLSTCU		CTTCU/TTCU		STCU/TTCU		Correct	
	Z	**p**	**Z**	**p**	**Z**	**p**	**Z**	**p**	**Z**	**p**
Deletion task										
S2-S1	–	–	–	–	–	–	–	–	−5.276	0.000
S3-S1	–	–	–	–	–	–	–	–	−1.959	0.025
S3-S2	–	–	–	–	–	–	–	–	−3.969	0.000
Rearrange and rewrite task (RRT)										
S2-S1	−4.693	0.000	−4.898	0.000	−3.190	0.000	−2.085	0.000	–	–
S3-S1	−4.741	0.000	−4.741	0.000	−2.026	0.021	−3.960	0.000	–	–
S3-S2	−3.752	0.000	−3.752	0.000	−0.681	0.252	−2.877	0.001	–	–
Free writing task (FWT)										
S2-S1	−5.645	0.000	−5.645	0.000	−4.692	0.000	−5.351	0.000	–	–
S3-S1	−4.703	0.000	−4.703	0.000	−4.703	0.000	−4.552	0.000	–	–
S3-S2	−1.826	0.035	−2.955	0.001	−3.844	0.000	−0.985	0.168	–	–

MLTTCU, mean length of terminable TC-unit; MLSTCU, mean length of single TC-unit; CTTCU/TTCU, complex terminable TC-unit in all terminable TC-units; STCU/TTCU, single TC-units per terminable TC-unit; Correct, scores of deletion task; S2-S1, the difference between stage 2 and stage 1; S3-S1, the difference between stage 3 and stage 1; S3-S2, the difference between stage 3 and stage 2.

a post hoc analysis revealed that the score of CTTCU/TTCU significantly grew from S1 to S2, indicating that the syntactic complexity also increased significantly at the global level.

On the Free Writing Task, an overall significant increase was found on the two length measures MLTTCU [$\chi^2(2) = 40.231$, $p = 0.000$], MLSTCU [$\chi^2(2) = 43.923$, $p = 0.000$], and an overall significant decrease was found on the two ratio measures CTTCU/TTCU [$\chi^2(2) = 42.117$, $p = 0.000$] and STCU/TTCU [$\chi^2(2) = 29.176$, $p = 0.000$]. This suggests that as their learning progressed, students in the training group produced longer but fewer topic chains. Although the ratio measures decreased, the increased length measures of MLSTCU and MLTTCU still suggest a growing syntactic complexity on both clausal and global levels, respectively. The implication of this finding will be further discussed in the next section.

In addition, due to the unequal sample sizes, a Welch's t-test was conducted to compare the posttest performance of the training group and the control group. The results are listed in **Table 6**.

On the Rearrange and Rewrite Task, the training group had significantly higher scores than the control group in MLTTCU, $t(65.780) = 2.830$, $p = 0.006$, CTTCU/TTCU, $t(58.943) = 3.222$, $p = 0.002$ and STCU/TTCU, $t(64.447) = 3.108$, $p = 0.003$; yet its score on MLSTCU, $t(55.646) = -2.346$, $p = 0.023$, was significantly lower than the control group. On the Free Writing Task, participants in the training group scored significantly higher than the control group in the measures MLTTCU, $t(41.868) = 2.871$, $p = 0.006$, CTTCU/TTCU, $t(42.725) = 3.121$, $p = 0.003$, and STCU/TTCU, $t(50.831) = 3.423$, $p = 0.001$. The two groups did not differ on MLSTCU, $t(55.358) = -0.181$, $p = 0.857$. The results above indicated that the training group had a significantly greater syntactic complexity than the control group on both clausal level and global level in both Free Writing Task and Rearrange and Rewrite Task. The decreased MLSTCU in RRT will be further discussed in the next section.

In sum, our findings suggested that the syntactic complexity of the training group grew significantly during the 10-week period and better performance was observed in the training group than the control group based on the results of the posttest, at both clausal and the global levels.

Research Question 2: Does the Explicit Instruction Have Any Delayed Effect on the Participants' Performance?

To answer Research Question 2, performance on the posttest and the delayed posttest of the training group were compared through a Wilcoxon signed-rank test because our data did not meet the normality assumption of the dependent t-test.

TABLE 6 | Mean and standard deviation of the training and the control group on posttest in Welch's t-test.

Measure	Experimental group		Control group	
	M	**SD**	**M**	**SD**
Free writing task				
MLTTCU	10.56	1.52	9.28	1.90
MLSTCU	7.55	1.32	7.61	1.17
CTTCU/TTCU	0.26	0.12	0.15	0.15
STCU/TTCU	1.42	0.23	1.23	0.23
Rearrange and rewrite task				
MLTTCU	10.73	1.62	9.66	1.57
MLSTCU	7.51	0.41	7.78	0.52
CTTCU/TTCU	0.38	0.18	0.22	0.21
STCU/TTCU	1.44	0.25	1.25	0.25

M, mean value; SD, standard deviation; MLTTCU, mean length of terminable TC-unit; MLSTCU, mean length of single TC-unit; CTTCU/TTCU, complex terminable TC-units in all terminable TC-units; STCU/TTCU, single TC-units per terminable TC-unit; correct, scores of deletion task.

TABLE 7 | An example of metalinguistic explanation provided to participants in the study.

	Examples and explanation
Error	*这是我妈妈，是医生。 "This is my mom, is doctor"
Full form sentence	这 subj 是 verb 我妈妈 obj。我妈妈 subj 是 verb 医生 obj。 "This is my mom. My mom is a doctor"
ME	我妈妈obj and 我妈妈subj are repetitive, but not on the same side of the verb, therefore it cannot be omitted, but could be replaced by a pronoun
Correct sentence	这是我妈妈。她是医生。 "This is my mom. She is a doctor"

ME, metalinguistic explanation.

Results of the Wilcoxon signed-rank test showed that on the Rearrange and Rewrite Task, the scores of the measures CTTCU/TTCU ($Z = -1.831$, $p = 0.067$) and STCU/TTCU ($Z = -1.211$, $p = 0.226$) did not differ in the delayed posttest from the posttest, yet the scores of MLTTCU ($Z = -4.338$, $p = 0.000$) and MLSTCU ($Z = -4.937$, $p = 0.000$) decreased significantly in the delayed posttest, indicating an undermined delayed training effect on this task.

With the Free Writing Task, the scores of MLTTCU ($Z = -2.972$, $p = 0.003$) and MLSTCU ($Z = -4.086$, $p = 0.000$) increased significantly in the delayed posttest while the scores of CTTCU/TTCU ($Z = -0.625$, $p = 0.532$) and STCU/TTCU ($Z = -0.660$, $p = 0.509$) did not have a significant difference between the posttest and the delayed posttest. This suggested a durable training effect on this task.

To summarize, the 10-week explicit FFI did have a delayed effect on the participants' performance, especially on the Free Writing Task.

DISCUSSION

Our study examined whether CSL learners' syntactic complexity can be enhanced by a 10-week researcher-designed FFI on constructing the Chinese topic chain. Our overall findings suggest that the 10-week FFI on constructing the topic chain had a positive and durable effect on learners' syntactic complexity on both the clausal and global levels. Our discussion here highlights the important roles of instructional intensity and feedback type in influencing the effectiveness and durability of FFI, and the characteristics of measures and task complexity in affecting the observation of syntactic complexity.

Unequal Sensitivity and Asynchronous, Non-linear Development of the Measures
The first research question focuses on the immediate effects of the 10-week FFI on syntactic complexity. The training group's development over time, and the control group's performance of the posttest showed that the instruction had an immediate effect in improving the participants' Chinese syntactic complexity. However, different measures showed unequal sensitivity under

different comparing conditions: when performances of the same group (in our case the training group) were compared across time, syntactic complexity was better reflected by length measures MLTTCU and MLSTCU, whereas when two different groups were compared (training vs. control group), ratios measures CTTCU/TTCU and STCU/TTCU and the global-level length measure MLTTCU demonstrate the syntactic complexity better.

In addition, opposite to the training group's positive development and better performance in general, some measures showed decreased or less competitive results during the training period and in the posttest respectively, indicating that the four measures did not necessarily develop in the same pattern or synchronously, and their development was not linear. In the 10-week training period, the ratio measures CTTCU/TTCU and STCU/TTCU in the Free Writing Task decreased significantly. This is somewhat different from Yu's (2021) finding that the two measures positively predicted the syntactic complexity in the Free Writing Task. However, this may not necessarily suggest that our training did not have any effect, or had a negative impact on learners' syntactic complexity in the Free Writing Task. The decreased performance on one task is certainly possible, especially when the 10-week instruction is rather brief compared to the time one would spend on learning a language. One possible explanation to the decreased trend is that with the natural growth of the training groups' language performance, they produced a greater number of sentences in the Free Writing Task, resulting in a larger TTCU as the denominator, thus the two ratio measures CTTCU/TTCU and STCU/TTCU shrank. Meanwhile, in the posttest, the training group scored significantly lower than the control group in the clausal-level length measure MLSTCU in the Rearrange and Rewrite Task. Although this result seems to undermine the training effect, MLSTCU was found to be not predictive of written syntactic complexity (Yu, 2021). Despite its insignificance, the decreased trend of MLSTCU could be due to the tendency that the repetitive subjects/topics were more likely to be deleted by the training group than by the control group, resulting in topic chains (CTTCU) in greater length and number. This can be supported by the significantly greater ratio measures (CTTCU/TTCU and STCU/TTCU) and global-level length measure (MLTTCU) in the training group, compared to the control group. Such complementary findings in the current study are in line with Norris and Ortega's (2009) argument that complexity should be measured multidimensionally, and the idea that increased clausal complexification can be achieved via coordination; the findings are also consistent with Yu (2021), which found that MLSTCU was not predictive of written syntactic complexity.

The second research question investigated the delayed effect of the 10-week FFI on syntactic complexity. In the delayed posttest, the training group's performance was maintained well on all four measures of the Free Writing Task, yet in the Rearrange and Rewrite Task, it was only maintained on the ratio measures but not the length measures. This result indicates that on one hand, our 10-week FFI, in contrast to that in Yu (2019), had a delayed training effect on the participants; on the other hand,

the delayed training effect was unevenly reflected by the two writing tasks.

The Influence of Instructional Intensity and Feedback Type

Regarding the positive delayed training effect, despite the modality difference, we believe that the instructive intensity and the available learning resources contributed greatly to the different results between Yu (2019) and the present study. In Yu (2019), the only resource for students to learn about the topic chain or syntactic complexity was the instructor's 35-min instruction in total, whereas in the present study, in addition to the 24-min video instructions, students also spent 180 min on average to practice what was taught through the 12 assignments of three task types.

Additionally, the instructor-provided feedback in the two studies were different. Yu (2019) provided corrective feedback (CF) to individual students in class orally. In contrast, the feedback provided in the weekly emails and the last instructional video in the present study can be categorized as written and oral metalinguistic explanation (ME), respectively (Sheen, 2007; Shintani and Ellis, 2013). For example, students tended to overgeneralize topic omission, illustrated in the following example (**Table 7**). In the email feedback addressed to all participants, the learned rule was listed first, *repetitive subjects that are in the same chain should be on the same position, or to the same side of the verb*, followed by the ME and correction.

The ME provided in the current study, exemplified in **Table 7**, may have directed the learners' awareness to the understanding level (Schmidt, 1995), rather than just at the noticing level. Our explanation is also supported by findings from previous studies comparing ME and other types of feedback in classroom settings. Previous studies have found advantages of ME, either oral or written, over CF (Carroll and Swain, 1993; Shintani and Ellis, 2013) and ME in conjunction with CF over CF alone (Bitchener et al., 2005; Bitchener, 2008; Bitchener and Knoch, 2009), in their immediate effects on ESL learners' acquisition of English articles and dative verbs, as well as their durable effects (Sheen, 2007; Bozorgian and Yazdani, 2021). In contrast, immediate feedback provided as CF was ineffective in developing learners' awareness of the rule as the learners only developed consciousness at the noticing level (Sheen, 2007; Shintani and Ellis, 2013).

Similarly, research on the effects of ME on CSL learners' acquisition of Chinese-specific grammatical features has found that ME had significant immediate and durable effects in both oral and written modalities (*wh*-questions, and classifiers, Wu, 2019), and the effects were stronger for lower-proficiency level learners (Li, 2014). Additionally, ME was more effective on the rule-governed syntactic structures *wh*-question and perfective aspect *le* than the more salient, exemplar-based lexical items, classifiers. Li (2014) used selective attention (Gass, 1997) to explain the imbalanced ME effects and stated that ME helped direct the limited attention/resources of L2 learners, especially beginners, to semantically opaque structures. The Chinese topic chain structure can also be regarded as a rule-governed structure that requires learners' selective

attention, and our findings contributed to our understanding of how metalinguistic explanation, embedded in form-focused instruction, can contribute to the development of novice learners' syntactic complexity through writing tasks. Given that the learners' language system is feedback-sensitive, it would be interesting for future studies to explore if intermediate level CSL learners, who are still learning Chinese-specific grammatical patterns, can also benefit from ME.

Task Complexity and Attention

The uneven delayed effect of the two tasks may be explained by task complexity. The Free Writing Task in the current study can be considered cognitively more complex than the Rearrange and Rewrite Task along the resource-directing dimension, according to the criteria for task complexity proposed by Robinson (2001, 2003, 2011, 2015). Meanwhile, the same hypothesis claims that compared to simpler tasks, increasing the cognitive complexity of task demands on the resource-directing level leads to more complex production, and greater depth of processing and long-term retention of input. Although empirical studies generated mixed evidence based on this hypothesis, there are studies showing that writing tasks of higher cognitive complexity due to increased number of elements and increased level of reasoning lead to greater syntactic complexity (Abrams, 2019; Rahimi, 2019; Golparvar and Rashidi, 2021). As discussed above, in addition to deleting repetitive topics and combining sentences as Rearrange and Rewrite Task, the Free Writing Task also required an extra element of reasoning – forming basic sentences – which made it more cognitively complex. Therefore, it might be reasonable to conclude that task complexity of the Free Writing Task was a potential contributing factor to the imbalanced durability of the 10-week instruction. However, existing evidence supporting the effect of cognitively complex tasks on learners' written syntactic complexity is mostly from European languages as target languages. To our best knowledge, only one study (Yuan, 2012b) investigated the effects of tasks with different cognitive complexity on syntactic complexity in the CSL context. Yuan (2012b) found that CSL learners' written syntactic complexity did not change significantly depending on the provision of the outline of a composition, while their written fluency increased due to the decreased cognition load. Although this finding does not contribute to the interpretation of our results directly, it lends supportive evidence to Robinson's Cognition Hypothesis. However, more studies are needed to further discuss the influence of task complexity on CSL learners' syntactic complexity.

Pedagogical Implication

Though the topic chain is an important feature of the Chinese language (Tsao, 1979, 1990; Li, 2004b), and that researchers have studied its difficulty levels (Li, 2006), its acquisition patterns (Jin, 2007), and made pedagogical proposals (Li, 2006; Jin, 2007), but "[S]urprisingly, few studies have taken steps further to test the recommendations in research." (Yuan, 2018, p. 42). This current study, therefore, serves as one of the first studies to empirically test whether explicitly teaching the topic chain through form-focused instruction to true beginners can lead to

increased syntactic complexity in their writing. We provided empirical evidence to show such an endeavor is meaningful, and our findings suggest that the explicit instruction of the topic chain should be emphasized in CSL classrooms. In addition, we proved the effectiveness and the necessity of metalinguistic explanation in improving CSL learners' syntactic complexity. Widely used textbooks for CSL learners in North America, such as *Integrated Chinese* (Liu et al., 2017), do include practices about the topic chain, yet such components usually appear at the end of each chapter, a place least likely to be noticed by learners. Explicit instruction of the topic chain is usually not included in Chinese instructors' teaching plans (Li, 2006), despite its importance for developing syntactic complexity. Our findings suggest that the topic chain cannot be easily mastered through self-learning. As a rule-governed syntactic structure, its mastery requires metalinguistic explanation to direct beginning learners' limited attention to such a semantically opaque structure.

CONCLUSION

This study examined whether CSL learners' written syntactic complexity can be enhanced by a 10-week researcher-designed form-focused instruction on constructing the Chinese topic chain. In general, immediate and sustainable training effects with statistical significance were found through the training group's development in the training period; the training group displayed better performance than the control group in the posttest and well maintained their performance in the delayed posttest. Meanwhile, the findings point to the importance of instructional intensity and types of feedback in influencing the effectiveness and durability of form-focused instruction, as well as characteristics of measures and task complexity in affecting the observation of syntactic complexity.

Limitations

The study has several limitations. First, the study only examined the performance of one single proficiency level, and the sample size was relatively small and unequally distributed in different tasks due to attrition. However, as students' participation was strictly voluntary, it was difficult to ensure uniformity across the 10 weeks for all participants. Second, the study did not randomly assign students to the training vs. control groups because the Institutional Review Board of the institution where the study took place required the study to be implemented on a voluntary basis. Therefore, though a randomized design would be ideal, it was not feasible at the time. Thirdly, since the training was conducted online, it was hard to know whether students really invested themselves in the learning activities or only finished them quickly based on their existing knowledge in order to earn the extra credits, especially when the 10-week training can be weary and make participants gradually lose interest. Relatedly, the study did not address how individual differences at the learner level can affect the effectiveness of the training. In addition, due to COVID19, a quarter before the onset of this project, all instruction at the university abruptly went virtual. Therefore,

during the implementation of this project, there was no in-person communication between the instructor and the learners; there could have been other unknown factors in the participants' lives which may have influenced their performance in this study and their academic performance in general.

While encouraging findings were found in the present study, further research is needed to replicate or refine the present study with larger and more stable sample size, ideally with random assignment, under a more controllable teaching environment, as results found under one condition or context may not necessarily generalize under another (e.g., Rogers and Cheung, 2021). Further, the effects of the form-focused instruction across different proficiency levels and across modalities deserve further exploration. Additionally, future studies can also investigate how long the syntactic complexity can be maintained.

DATA AVAILABILITY STATEMENT

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found below: Open Science Framework: https://osf.io/h7zgj/.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by University of Washington. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

CL provided conceptualization and design of the study. JZ and CL designed and reviewed all the instructional and test materials used in the study. JZ collected the data, and conducted the statistical analysis. Both authors wrote the first draft of the manuscript and contributed to manuscript revision, read, and approved the submitted version.

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The Influence of Form-Focused Instruction on the L2 Chinese Oral Production of Korean Native Speakers

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Form-focused instruction (FFI) can help second language (L2) learners notice the forms of language, which is conducive to the acquisition of linguistic forms. Two types of FFIs had been proposed, including *focus-on-formS* (FonFs) and *focus-on-form* (FonF). Previously, studies on FFI in L2 classroom teaching have focused mainly on the influence of two types of FFIs on the L2 acquisition of grammar and vocabulary. The influence of FonFs and FonF on L2 oral production, however, has been addressed less often. The advantages and disadvantages of different teaching methods in FonFs and FonF have not been well investigated. On the basis of Schmidt's noticing hypothesis, VanPatten's input processing hypothesis, and Long's interactive hypothesis, we investigated the effects of teaching goals, teaching steps, and interactive activities in FonFs and FonF on the complexity, accuracy, and fluency of 32 native Korean speakers' L2 Chinese oral production. We found that FFI significantly improved the performance of L2 Chinese oral production, although different FFIs had different effects on complexity, accuracy, and fluency. FonF and FonFs could improve both complexity and accuracy, whereas FonF also significantly improved fluency, which was not observed in FonFs. Furthermore, we found that the level of L2 proficiency could modulate the interaction between instruction methods and learning outcomes. For low-proficiency learners, FonF was more helpful for the improvement of fluency. For high-proficiency learners, FonFs was more helpful for the improvement of accuracy. These results demonstrated that teachers should pay attention to the interaction between specific teaching conditions with different L2 proficiency and learning outcomes when implementing FFI. The findings of this study have important implications for the design of procedures and interactive activities of L2 spoken Chinese teaching.

Keywords: L2 Chinese oral production, form-focused instruction, *focus-on-formS*, *focus-on-form*, Korean native speaker

INTRODUCTION

Determining how to integrate linguistic forms into a communicative language teaching (CLT) classroom has always been a great challenge in the field of second language (L2) acquisition. Ellis (1997) categorized the current L2 pedagogical approaches to the teaching of form and meaning of language into two types: meaning-focused instruction (MFI) and form-focused instruction (FFI). The former requires learners to focus on the meaning of expression, whereas the latter includes not only the traditional teaching of linguistic forms but also the teaching strategy of using forms in meaning-based communication activities. Some studies (DeKeyser, 1998; Norris and Ortega, 2000) have reported that MFI does not improve grammar ability, whereas FFI helps learners pay more attention to linguistic forms when they appear in meaningful communicative activities, which is more conducive to language acquisition (Ellis, 2016; Sippel, 2021). In recent years, the research on FFI has shifted from focusing on the impact of FFI on L2 acquisition to the effects of teaching conditions of different types of FFI on learning outcomes (Khezrlou, 2021; Michaud, 2021; Saeed and Reinders, 2021).

The FFI refers to all of the planned or incidental teaching activities that guide learners to pay attention to linguistic forms, including traditional teaching ways based on structural syllabus and CLT (Ellis, 2016). FFI helps learners to acquire language by emphasizing the formal elements of language. Long (1988; 1991; 1996) first proposed two types of formal pedagogical approaches to grammar: one focused on forms (FonFs) and another focused on form (FonF). FonFs refers to the discrete and explicit teaching of syntactic forms based on a structural syllabus (Long, 1988, 2018). FonF, however, refers to a temporary shift in learners' attention from linguistic meaning to linguistic form triggered by communicative need in the context of meaning-focused communication (Long, 1991). The advantages and disadvantages of these two approaches have raised significant concern and discussion (Ellis, 2016). Some researchers (Doughty and Williams, 1998; Ellis et al., 2002) have proposed that FonFs is a teaching method that does not focus on communication and cannot effectively promote learning, whereas other researchers (e.g., Sheen, 2005) have claimed that FonFs is better than FonF in L2 acquisition. Therefore, an in-depth investigation and discussion of the inconsistency of these studies is necessary.

Note that there are research gaps in previous studies. First, previous studies on FFI have focused mostly on L2 learners in Indo-European languages, such as English, French, German, and Spanish. Few studies have been reported in L2 Chinese learners (Gong et al., 2018, 2020a,b). Second, most of the previous studies on FFI had focused on the specific linguistic items (Afshar, 2021) and have ignored L2 oral competence. For L2 Chinese teaching, the acquisition of oral competence has always been the focus of classroom teaching (Ma et al., 2017; Gong et al., 2021). Much effort is needed for teachers to find suitable strategies to prepare L2 spoken Chinese lessons. It is unclear that the influence of FFI on L2 spoken Chinese. Third, previous studies have paid little attention to the modulation effects of L2 proficiency on learning outcomes based on different pedagogical approaches (Sok et al., 2019). To fill the research gaps and provide guidance for L2 spoken Chinese teaching, we examined the effects of two different types of FFI on the oral production of L2 Chinese learners with different levels of L2 proficiency. We further explored what conditions are most effective for improving L2 Chinese oral competence.

LITERATURE REVIEW

Focus on Forms and Focus on Form

In FonFs, the teacher provides opportunities for learners to use syntactic forms to promote the automation of language skills and the accuracy of the linguistic forms (DeKeyser, 1998; Nielson and DeKeyser, 2019). FonFs pays more attention to form and less attention to meaning and is similar to mechanical practice. In FonF, learners' attention is focused on linguistic meaning, and only when communication difficulties arise do learners shift their attention to form. Learners thus pay attention to the form and meaning of language alternately, which helps them map form to function (Long, 1991; Long and Crookes, 1992).

Ellis (2016) divided FonF into preemptive FonF and reactive FonF, according to whether the focus on form is preemptive or reactive in meaning-focused communicative activities. In preemptive FonF, even if there are no errors in linguistic forms or difficulties in understanding, the teacher or the learner still takes time from communicative activities to focus on the linguistic forms that may potentially cause problems. This time out means that the learner temporarily switches their role from that of language user to that of language learner. In reactive FonF, the teacher gives feedback on learners' errors in communicative activities so that they learn to use linguistic forms correctly. As a benefit of this mechanism, the teacher and learners incidentally pay attention to form, so their attention is broadened (Ellis, 2001). When communication problems occur, the teacher and learners conduct "negotiation of meaning" or "negotiation of form." The teacher gives two types of feedback: implicit and explicit. Implicit feedback includes requests for confirmation, clarification, and recasting, whereas explicit feedback includes elicitation, metalinguistic explanation, and explicit correction (Ellis et al., 2002).

In short, FonFs is based on a synthetic syllabus and adopts an explicit way to teach. Language acquisition is regarded as a learning process based on accumulating isolated grammar items. In FonFs, learners integrate the isolated items needed for communication (Long and Robinson, 1998). FonF, meanwhile, presents grammatical knowledge in a communicative context, which is not a simple regression to FonFs. The essential difference between FonFs and FonF is that FonFs separates linguistic elements from the communicative context and endows learners with the role of language learner. In contrast, FonF always takes communication as a prerequisite for learning and regards learners as language users. Therefore, the focus of FonFs is solely on linguistic elements and ensuring that learners gradually improve accuracy, whereas FonF highlights the importance of form–function mapping, which is more

helpful in improving fluency and accuracy of speech production (Doughty and Williams, 1998).

Theoretical Framework

Our study investigated the effects of FonFs and FonF on L2 Chinese oral production with the guidance of the noticing hypothesis (NH), the input processing hypothesis (IPH), and the interaction hypothesis (IH). The NH emphasizes the attention to the linguistic forms. The IPH underscores the comprehension of the meaning attached to the linguistic forms. The IH highlights the meaning and form negotiation in interaction. The assumptions of the three hypotheses and their relationships with our study are discussed next.

Noticing Hypothesis

According to the NH (Schmidt, 1990), the premise of language acquisition is that learners must consciously pay attention to the linguistic form in input. Only when learners pay attention to the features of the target language can they store language features into working memory and convert them to "intake" (Schmidt, 1994). Learners then test the hypothesis, rule reconstruction, modification, and output, and finally transform the input into acquired knowledge (Doughty and Williams, 1998; Skehan, 1998). The teaching purpose of FonFs is to make learners notice these linguistic forms. FonF, however, enables learners to notice not only the linguistic forms but also the linguistic meaning. In theory, a linguistic feature is more likely to be internalized only when it receives attention from the learner.

Input Processing Hypothesis

The IPH proposes that learners must pay attention to the linguistic forms in language input before they can establish a connection between the form and the meaning of language because of limited attention resources. In theory, learners need not only to notice the linguistic forms but also to understand the meaning underlying those forms (VanPatten, 2007). For FonFs, which focuses on the linguistic forms, learners may not be able to comprehend the meaning of the language features. In contrast, for FonF, the meaning-based communicative activities, learners can process the language features only when they notice the form elements of language features and understand the meaning of those features.

Interaction Hypothesis

The IH (Long, 1996) proposes that learners notice the linguistic forms when they are difficult to understand and have a chance to negotiate the linguistic meaning during meaning-based communication. This negotiation helps the learner to highlight the linguistic forms that are hard to understand, notice the gap between the input and their own interlanguage (Schmidt and Frota, 1986), and gives learners the opportunity to produce output. This kind of meaning negotiation focused on specific forms will improve L2 acquisition. For FonFs, the learners have few opportunities for meaning negotiation when they encounter comprehension difficulties. Moreover, when learners have difficulty in the production of the linguistic forms, they may not be able to construct the connection between form and

meaning for the lack of negotiation of form. Unlike FonFs, in the meaning-centered communication (i.e., FonF), learners can build connections between form and meaning through the negotiation.

The Influence of Form-Focused Instruction on L2 Acquisition

Regarding the impact of FFI on L2 acquisition, previous studies focused more on grammar and vocabulary than on L2 oral competence. We examined the progress made in previous studies and analyzed their limitations.

The Influence of Form-Focused Instruction on L2 Grammar Acquisition

Previous studies on the impact of FFI on L2 acquisition focused primarily on syntax, covering learners' native language in English, German, French, and Spanish. Most of these studies found that FFI can promote L2 syntactic acquisition (Koster and Cadierno, 2019; Shabani and Hosseinzadeh, 2019; Trahey and Spada, 2020). The researchers also investigated the teaching conditions that could potentially improve the role of FFI. The comparative study of explicit and implicit teaching has shown that explicit teaching was more beneficial to improve the accuracy of L2 syntactic structure and strengthen syntactic awareness than implicit teaching (Shintani, 2015; Dhiorbhain and Duibhir, 2017). The comparative study of different testing times has shown that compared with post-task and online-task FFI, pre-task FFI was the most effective strategy in improving the complexity, accuracy, and fluency of English subjunctive expression (Michaud, 2021). Khezrlou (2021) found that pre-task FFI and post-task FFI were effective in improving the fluency of English passive expression, while pre-task FFI combined with online-task FFI demonstrated the best performance in improving the accuracy of passive structure.

The Influence of Form-Focused Instruction on L2 Vocabulary Acquisition

Previous studies on the impact of FFI on L2 vocabulary acquisition have focused mostly on the differences of the effects of FonFs and FonF on the acquisition of verbs, nouns, plural -s, and copula-be for L2 English learners. Compared with FonFs, FonF was reported to be more conducive to L2 vocabulary acquisition (Marefat and Hassanzadeh, 2016), and helped learners pay attention to the vocabulary forms (Fuente and Maria, 2006). For example, FonF based on task-based instruction was more effective than FonFs based on present, practice, and production (3P instruction) in the acquisition of L2 English adjectives and plural-s (Shintani, 2013, 2015). Contrary to these previous findings, Laufer (2005, 2006) claimed that FonFs was more conducive to L2 vocabulary acquisition because it could make learners pay attention to the correct linguistic forms. Hong and Wang (2016) found that FonFs played a more active role in L2 Chinese lexical collocation and word meaning association than FonF. Interestingly, some studies have found that both FonF and FonFs were effective in L2 vocabulary acquisition (Shintani, 2013; Khezrlou, 2021). Other studies, however, have shown that FonF and FonFs do not have significant effects on some vocabulary items, such as the copula-be (Shintani, 2015).

Overall, the inconsistency of these results may be explained by the attributes of the target structure selected by the researchers (Xu and Lyster, 2014) and the processing characteristics of different teaching methods (Shintani, 2013).

The Influence of Form-Focused Instruction on L2 Oral Acquisition

Existing studies on the impact of FFI on L2 oral acquisition have focused mostly on accuracy and fluency, whereas few have examined complexity. Moreover, the participants of these studies mainly have been L2 English learners. Most studies have found that FFI has a positive impact on L2 oral acquisition (Snellings et al., 2002; Toni and Hassaskhah, 2018). Research on children's L2 acquisition has shown that FFI is beneficial to improve fluency (Pena and Pladevall-Ballester, 2020) and accuracy (Hyun, 2021). Compared with non-FFI instruction, FFI was more beneficial for college students' L2 oral grammar, vocabulary, and fluency (Lee, 2016). Form-focused FFI is less effective than meaning-focused instruction in fluency (Arslanyilmaz, 2013). Other studies have focused on the impact of teaching conditions in FFI on L2 oral acquisition. For example, a study on the impact of interactive tasks on L2 oral English acquisition found that single-person tasks were beneficial only to lexical complexity, whereas double-person interactive tasks were beneficial to accuracy, syntactic complexity, and lexical diversity (Li, 2015). Another study on teaching timing found that FonF in the post-task stage improves accuracy, syntactic complexity, and lexical complexity (Li, 2013). A study on the impact of interaction and feedback on L2 oral English revealed that peer interaction and corrective feedback contributed to the improvement of accuracy, but peer interaction was more effective in improving fluency (Sato and Lyster, 2012).

The Modulation Effects of L2 Proficiency on the Effects of Form-Focused Instruction

L2 proficiency can significantly modulate the effects of FFI. A meta-analysis of the effects of FFI in L2 teaching in the past 35 years found that FFI was beneficial to learners at all L2 levels (Kang et al., 2019). Moreover, the impact of FFI on beginning learners was greater than that of intermediate learners and advanced learners (Kang et al., 2019). The researchers attributed these results to the fact that beginners need more external support for their lack of L2 knowledge. Other studies (Williams, 2001; Nassaji, 2010), however, have found that high-proficiency learners benefit more from FFI and pay more attention to forms than low-proficiency learners. These findings indicated that low-proficiency learners may inhibit attention to forms when they encounter difficulties in decoding and encoding meaning (see VanPatten, 1990). The inconsistency of these conclusions may be related to the explicitness of target language features and the characteristics of outcome measures. In general, although L2 proficiency modulates learners' participation and the benefits of FFI to some extent (Ellis, 2016), the variable of L2 proficiency is usually underestimated. Most FFI studies have focused on elementary and intermediate learners and rarely have considered advanced learners (Kang et al., 2019; Sok et al., 2019). Moreover,

many studies have lacked the standardized measurements of L2 proficiency or have not reported L2 proficiency (Kang et al., 2019; Sok et al., 2019). In summary, the modulation effect of L2 proficiency on the teaching effect of different types of FFI must be explored.

The Modulation Effects of Outcome Measures on the Effects of Form-Focused Instruction

To a certain extent, outcome measures modulate the effectiveness of the instruction. First, the instruction effects of different FFIs are different for different types of measured knowledge. Early studies mainly have used controlled measures of explicit knowledge (e.g., multiple choice and cloze tests), which helped produce more significant explicit instruction effects. Recent studies have relied more heavily on free production (Kang et al., 2019), which can stimulate learners' spontaneous use of implicit knowledge and lead to more significant effects of implicit instruction (Spada and Tomita, 2010). Note that the test timing is associated with different degrees of instruction effectiveness. Goo et al. (2015) and Kang et al. (2019) found that both explicit and implicit instruction produced significant immediate learning effects, but the learning effects of implicit instruction lasted for longer than explicit instruction (Goo et al., 2015; Kang et al., 2019). Second, the instruction effects of different types of FFIs also changed with the variable modes of outcome measures. Learners' performance in the oral mode was significantly better than in the written mode. Most oral measures used selected responses (e.g., multiple choice), whereas most written measures used metalanguage judgment tasks, which may be more difficult than selected responses (Norris and Ortega, 2000). Overall, it seems that if more measures are used, the opportunity is better to observe the instruction effects (Goo et al., 2015). Thus, the outcome measures should reflect not only implicit knowledge but also explicit knowledge. In addition, oral mode measures also have been used in recent studies (Kang et al., 2019). Therefore, these measures should be able to make a comprehensive assessment of oral production to explore the instruction effects of different types of FFIs with different types of measured knowledge.

THE RESEARCH QUESTIONS

The objectives of this study were to explore the specific conditions for optimizing L2 spoken Chinese teaching, to clarify the modulation effects of L2 proficiency on the learning outcome in different types of FFI, and to identify the pedagogical approaches suitable for high- and low-proficiency learners. In summary, our study examined the following two questions:

> RQ1. Do different FFIs (FonFs and FonF) have different effects on L2 Chinese learners' oral production?

> RQ2. Does L2 proficiency modulate the learning outcomes in different pedagogical approaches?

RESEARCH METHOD

Experiment Design

This experiment was a three-way mixed analysis of variance (ANOVA), using a within-subjects design with the variable of testing time, including pretest, immediate posttest, and delayed posttest. We also designed two between-subjects variables in this study: the instruction group (FonFs and FonF) and L2 proficiency (low and high). The dependent variables were the oral production measures of complexity, accuracy, and fluency (see Section "Measurement of Dependent Variables" for details).

Participants

The participants included 32 native Korean speakers who were L2 Chinese learners from Seoul, Busan, Gyeonggi do, and Daegu in South Korea. The participants were between 19 and 30 years old ($M = 24.06$; $SD = 2.44$). Korean native speakers face various challenges when communicating in L2 Chinese, including weak communication initiative, strong dependence on written language, low fluency, and complexity of oral production (Wang and Wang, 2014). In this study, we investigated which teaching conditions in FFI could improve native Korean speakers' oral production.

The participants were undergraduate or graduate students from Beijing Language and Culture University, Beijing University of Science and Technology, and Capital Normal University. Among the participants, there were 16 males, with an average age of 24.18 years ($SD = 2.50$) and 16 females, with an average age of 24 ($SD = 2.48$). Because Hanyu Shuiping Kaoshi (HSK) is a standardized international Chinese proficiency test for non-native speakers (Zhang, 2018, 2021; Zhang et al., 2020), this study placed learners into either a high-proficiency group or a low-proficiency group based on their HSK grades. Sixteen high-proficiency learners had achieved HSK-5 ($n = 8$) or HSK-6 ($n = 8$) and had studied Chinese for about 3 or 4 years. Sixteen low-proficiency learners had achieved HSK-3 ($n = 8$) or HSK-4 ($n = 8$) and had studied Chinese for about 1 or 2 years.

Instruction Grouping

All 32 participants were randomly divided into four groups with eight people in each group (see **Table 1**).

We used four oral production tasks as pretests (see Section "Instruments" for details). The independent sample t-test results (see **Table 2**) of the pretest did not find any significant difference between the two low-proficiency and two high-proficiency groups in terms of fluency ($t = -0.632$, $df = 14$, $p = 0.537$; $t = -0.007$, $df = 14$, $p = 0.994$), lexical complexity ($t = 0.160$, $df = 14$, $p = 0.876$; $t = 1.121$, $df = 14$, $p = 0.281$), syntactic complexity ($t = 0.052$, $df = 14$, $p = 0.959$; $t = 0.289$, $df = 14$, $p = 0.777$), lexical accuracy ($t = -0.417$, $df = 14$, $p = 0.683$; $t = 0.275$, $df = 14$, $p = 0.788$), and syntactic accuracy ($t = -0.203$, $df = 14$, $p = 0.842$; $t = 0.275$, $df = 14$, $p = 0.788$).

Teaching Procedure

All of the teaching activities in this experiment were undertaken by the same teacher to avoid the bias of different teaching styles

TABLE 1 | Biographical and proficiency characteristics of the L2 Chinese learners.

Instruction group (4)	L2 proficiency	Number	Sex (female/male)	Age (mean/SD)	Learning experiences (mean/SD)
FonF	Low	8	6/2	24.1 (3.2)	1.5 (0.5)
	High	8	5/3	25.4 (3.5)	3.5 (0.5)
FonFs	Low	8	6/2	25.3 (3.8)	1.5 (0.5)
	High	8	5/3	25.9 (2.9)	3.4 (0.5)

on the experimental results. The participants were asked to come together to form temporary groups. The teaching process lasted 2 weeks and consisted of five classes, wherein the last was a review class. Two teaching sessions were conducted in the first week and three were conducted in the second week. Each class lasted 40 min. The differences between FonFs and FonF in teaching procedures in terms of goals, contents, steps, and interactive methods are described in the following sections.

Teaching Goals

The teaching goal of FonFs is to enable learners to accurately master the linguistic forms and achieve the processing automation of lexical and syntactic structure, and thus improve the accuracy and complexity of linguistic forms. The teaching goal of FonF is to enable learners to realize the conversion of attention according to communicative needs, and at the same time. to notice fluency, complexity, and accuracy.

Learning Content

The learning material consisted of four articles. Each article contained about 225 Chinese characters, 10 new words, and two grammar points that learners had not learned. The topics of the article involved travel planning, online life, and shopping. Learners with the same language level received the same learning materials. To design the learning materials, we considered that learning materials should conform to learners' existing language level, which not only replicated the ecological validity of a real classroom environment but also conformed to the ethics of teaching experiments. The oral tasks implemented in this study were the same for all learners. Therefore, we strictly controlled the difficulty level of vocabulary and syntactic structure of the learning materials for different language levels with reference to the *Outline of Chinese Vocabulary and Chinese Character Difficulty Level* published by The National Chinese Language Examination Committee (2001) and the *Outline of the Standard and Grammar Level of the Chinese Proficiency* published by The Office of the National Leading Group for Foreign Language Teaching (1996). For example, when learning how to make a travel plan (see **Supplementary Appendix 1**), the learning materials were designed to be different only in the HSK level of the target words and grammar points, while other contents remained the same. The words and grammar points learned by low-proficiency learners were required by HSK 3–4 levels, and those learned by high-proficiency learners were required by HSK 5–6 levels. Moreover, the oral production tasks in this study did not measure the difficulty level of vocabulary and syntax structures produced by participants in tests, which offset

TABLE 2 | Descriptive statistical results for the pretest.

Proficiency	Instruction group	Fluency	Lexical complexity	Syntactic complexity	Lexical accuracy	Syntactic accuracy	Number
Low	FonFs	4.007 (0.668)	15.924 (3.251)	1.736 (0.232)	0.294 (0.167)	0.323 (0.168)	8
	FonF	4.186 (0.445)	15.690 (2.592)	1.729 (0.264)	0.326 (0.142)	0.337 (0.071)	8
High	FonFs	6.135 (1.227)	24.821 (3.176)	1.962 (0.188)	0.233 (0.064)	0.289 (0.055)	8
	FonF	6.139 (0.476)	23.352 (2.361)	1.928 (0.256)	0.220 (0.118)	0.278 (0.095)	8

the potential impact of the difficulty level of vocabulary and grammar points in the learning materials to a certain extent. Each participant studied one article in each class. Teaching topics were related to the testing topics, but the tasks were different. For example, the travel planning lesson in the teaching sessions was designed for the student and their friends to go to cities in southern China, whereas the travel planning lesson in the testing phase was designed for their parents' weekend trip to Beijing.

Teaching Steps

The teaching steps for FonFs were introduced as follows: In FonFs, the teacher followed the 3P instruction sequential guideline (Ur, 1996; Ellis, 2001) to teach vocabulary and syntactic rules.

Teaching Steps of FonFs

At the presentation stage, the teacher used a picture display and dialog to enable learners to learn new words and syntactic rules by the deduction or induction method. For example, the teacher taught the word "queue" (排队) through the dialog method (see the example for word instruction), and used the induction method to teach "from + place A + to + place B" (从+地方A+去+地方B; see the example for grammar instruction).

Example of word instruction:

T (Teacher): There are a lot of people when we go shopping. What should we do in this situation?

T: 我们买东西的时候, 人很多, 这个时候我们要怎么做?

S (Student): Wait in line.

S: 排队买。

T: Good! So, we say, "line up to buy something" and "line up to buy tickets."

T: 很好! 所以我们说"排队买东西"、"排队买门票"。

Example of grammar instruction:

T: Where did they set out from?

T: 他们是从哪里出发的?

S: Beijing Capital International Airport.

S: 北京首都国际机场。

T: Where did they go?

S: 去了哪里?

S: Hangzhou.

S: 杭州。

T: Please say the complete sentence.

T: 请说完整的句子。

T and S: They left for Hangzhou from Beijing Capital International Airport.

T and S: 他们从北京首都国际机场出发, 去了杭州。

T: And then? Where have they been?

T: 然后呢? 又去了哪里?

S: Chengdu and Dali.

S: 成都和大理。

T: Where did they leave for Chengdu and Dali this time?

T: 这次他们是从哪里出发, 去的成都和大理呢?

S: Hangzhou.

S: 杭州。

T: Please say the complete sentence.

T: 请说完整的句子。

T and S: This time they set out from Hangzhou to Chengdu and Dali.

T and S: 这次他们从杭州出发, 去了成都和大理。

T (Summary): What's the common structure between the two complete sentences above?

T (Summary): 我们刚才说的两个完整的句子, 在结构上有什么共同点?

S: They are all "Set out from + place A, go to + place B."

S: 都是"从哪里出发, 去了哪里"。

T: Very good! This structure is "Set out from + place A, go to + place B" (At this time, the teacher wrote the structure on the blackboard).

T: 很好, 所以我们说"从+地方A+出发, 去+地方B"。

At this stage of practice, the teacher used mechanical drills, such as word filling and sentence replacement, to help learners consolidate their knowledge of vocabulary and grammar. Example drills are as follows:

Please combine the following two sentences into one sentence.

David set off from Shanghai yesterday. David went to Wuhan yesterday.

大卫昨天从上海出发。大卫昨天去了武汉。

Answer: David left Shanghai for Wuhan yesterday.

Answer: 大卫昨天从上海出发去了武汉。

At this stage of development, learners paid more attention to the linguistic forms by completing exercises, such as word selection and retelling.

Teaching Steps of FonF

FonF is a crucial feature of task-based language teaching (Ellis, 2016). According to a previous study (Williams, 1995), we defined the three teaching stages of FonF as follows: pre-task stage, task processing stage, and language-focused stage.

In the pre-task stage, the teacher assigned information gap tasks to learners, such as decision-making or reasoning tasks. The teacher provided learners with target language input by introducing requirements and operation methods as well as task purposes. Learners could obtain for L2 input and output from the learning materials. For example, when learning how to make a travel plan, the teacher provided learners with an opportunity

for meaning negotiation through task requirements (see the pre-task example).

Pre-task example: How do you make a travel plan?

Two people work together to complete the task and make a travel plan according to the following pictures (select up to three scenic spots), keywords, and content clues.

(I) Pictures of scenic spots (omitted).

(II) Keywords (omitted).

(III) Content clues (see **Table 3**).

In the task-processing stage, learners were required to complete tasks and prepare and submit oral reports. Meaning negotiation in group discussion could enable learners to obtain comprehension input. This input would help learners notice the gap between their native language and the target language. Therefore, learners could more deeply process the linguistic forms. The teacher used various interactive ways to provide suggestions and requirements for the learners' oral report (see Section "Interactive Method"). The teacher did not interfere with the learners' behavior during the task-processing stage, which would have helped the learners pay more attention to the expression of meaning. Thus, the learners had to pay attention not only to the meaning of language but also to the choice of linguistic forms in the task-processing stage.

In the language-focused stage, the learners had to analyze the linguistic forms in the standard text provided by the teacher. Then, learners were required to use these linguistic forms for the new tasks. The lexical and syntactic structures in the standard texts were underlined or marked in red to strengthen learners' attention to the linguistic forms.

Interactive Method

The interaction between the teacher and learners affected the attention learners gave to linguistic forms (Ellis, 2016). Therefore, the current study controlled the interaction in the different instruction groups. The FonFs and FonF interactive methods are described in greater detail in the following sections.

Interaction in FonFs

The FonFs followed an interactive strategy known as initiate-response-feedback (IRF) (Long, 2018). The first step was to initiate, which meant the teacher helped the learners to focus on the linguistic forms through closed questions when presenting the linguistic forms. The second step, response, meant that learners responded to the teacher's questions. Feedback refers to the teacher's correction of the answers from the learners. The teacher provided feedback in the form of "yes" or "no" and "right" or "wrong," and the purpose of this feedback was to solve common problems in learners' speech expression. In FonFs, the interaction occurred primarily between the teacher and learners, and the topic of interaction was predetermined. Following are some interactive examples of FonFs:

T: Where did David go? (Initiate)

T: 大卫去哪里旅行了？(Initiate)

S1: He went to Xi'an. (Response)

S1: 他旅行去西安了。(Response)

T: No. The correct response should be "He went to Xi'an on a trip." He went to Xi'an on a trip. (Feedback)

T: 不对，应该是他去西安旅行了，去西安旅行。(Feedback)

S1: He went to Xi'an on a trip. (Response)

S1: 他去西安旅行了。(Response)

S2: David went to Xi'an on a trip. (Response)

S2: 大卫去西安旅行了。(Response)

T: Very good! (Feedback) Did Mary go to Xi'an too? (Initiate)

T: 非常好！(Feedback) 玛丽也去西安了吗？(Initiate)

S2: No, Mary went to Chengdu on a trip. (Response)

S2: 没有，玛丽去成都旅行了。(Response)

T: Yes, Mary went to Chengdu on a trip. (Feedback)

T: 对，玛丽去成都旅行了。(Feedback)

Interaction in FonF

The interaction in FonF existed not only among learners but also between teachers and learners. During the interaction between teachers and learners, both sides could initiate new topics through one-on-one interaction. In this interaction, the teacher's questions were relatively open and had no determined answers (e.g., "what is your first impression of this place?"), which helped learners produce more complex syntactic structures. The teacher directed learners' attention to the linguistic forms that might cause difficulties in communication, and learners could ask the teacher questions about these linguistic forms. When an error occurred in the learner's output, the teacher and other learners corrected it using negotiation and feedback. Negotiation included negation of both meaning and form. Feedback included both implicit and explicit feedback. In implicit feedback, recasting was used to help learners identify errors by repeating learners' sentences or using rising tones. If the learner did not correct the errors, the teacher would correct the answer by repeating the correct sentences. For some difficult syntactic structures, the teacher used the feedback of metalinguistic explanation. Following is an example of one such interaction in FonF:

S: I cleaned the room. It's very clean. Hmm... So, I clean the room?

S: 我把房间打扫了，很干净。嗯……所以说我把房间打扫干净？

T: You clean the room?

T: 你把房间打扫干净?

S: (No response)

T: Has the room been cleaned up now?

S: 现在房间打扫干净了吗?

S: It's clean now.

S: 打扫干净了。

T: Good. What is the result of "cleaning"?

T: 很好，"打扫"这个动作的结果是什么?

S: I cleaned up the room.

S: 我把房间打扫干净了。

T: Good. You cleaned up the room.

T: 很好，你把房间打扫干净了。

Note: The parts highlighted and marked in red are the prosodic focus.

Instruments

These tests were conducted three times, including a pretest (the day before the first class), immediate posttest (the second day after the last class), and delayed posttest (the seventh day after the last class). To prevent participants from perceiving the purpose

of the experiment and reducing the practice effect, participants completed four oral tasks in each test, in which the topics of the tasks were related to the learning content. Two of the four topics appeared repeatedly in the three tests (the target topics), such as *How do you make a travel plan?* and *How do you shop online?* The other six filling topics involved *shopping* (pretest), *career choice* (pretest), *renting* (immediate posttest), *travel way* (immediate posttest), *gift giving* (delayed posttest), and *fitness* (delayed posttest). All topics were coded with numbers. Each participant randomly selected the numbers and completed the chosen tasks in order. The testing task provided the participants with the keywords and syntactic structures of the topic as a reference for oral production.

Data Collection

The study used the same testing tasks across proficiency levels. Each participant performed a monolog task for 3 min. All participants completed the tests in a quiet classroom. For each testing task, the participants had 3 min to prepare. If they had any questions about the task, they could ask the teacher for help before the test started. There was no time limit for participants to complete the test. The recording equipment was a notebook computer (Asus R417S) and the recording software was PRAAT. The recording sample was 16-bit mono and had a sampling rate of 44,100 Hz.

Measurement of Dependent Variables

We used analysis of speech units (AS-units) to calculate complexity and accuracy of oral production (Foster et al., 2000, p. 365). Division into AS-units was achieved based on the characteristics of Chinese syntactic structure, referring to the three principles constructed by Chen and Li (2016). According to the first principle, a single sentence with strong independence is regarded as one AS-unit. A single sentence can be a word, phrase, or clause with a significant declined intonation and a long pause at the end. According to the second principle, a complex sentence composed of multiple subclauses is one AS-unit, and a close semantic relationship exists between the subclauses, whether or not the complex sentences use conjunctions. A pause can be observed at the end of a subclause, but it is significantly shorter than the pause at the end of a complex sentence. The declination of the intonation at the end of a subclause is small, and a long pause and significant declined intonation at the end of a complex sentence can be found. According to third principle, a false start, repetition, and self-correction all are calculated as one AS-unit, but these speech components should be deleted when calculating complexity and fluency.

We used two measurements of complexity: syntactic and lexical complexity. Syntactic complexity was measured by the number of subclauses per AS-unit (Yu and Lowie, 2020). Lexical complexity was measured by the Guiraud index (Guiraud, 1954). We calculated the accuracy of the two measurements as the number of lexical errors per AS-unit (lexical errors/AS-units) and the number of syntactic errors per AS-unit (syntactic errors/AS-units; Chen, 2015). We measured fluency by the mean length of run (MLR), which was calculated as the mean number

TABLE 3 | Content clues for a travel plan.

Travel plan
Departure time
Vehicle
Tourist routes
Accommodation arrangement
Payment
Other activities

of syllables produced in utterances between pauses of >0.2 s (Towell et al., 1996).

Transcription and Annotation

We collected 192 recordings of learners' oral production. Two graduate students with a background in linguistic completed the transcription and annotation of the oral production corpus. The transcription and annotation were completed following two steps: First, the two annotators transcribed as they listened to the recordings. After transcription, they exchanged their transcriptions with each other and checked the consistency. For any inconsistencies, the two annotators negotiated to reach an agreement. Second, the two annotators not only labeled the learners' oral production for complexity, accuracy, and fluency but also double-checked the annotation results.

RESULTS

We systematically analyzed the influence of the instruction method on the oral production of Korean native speakers. At the same time, we also analyzed the modulation effects of testing time and L2 proficiency on learning outcomes. On the basis of the normality tests (see **Supplementary Appendix 2**) and Levene's test of equality of error variances (see **Supplementary Appendix 3**), we found that the data of pretest, immediate posttest, and delayed posttest were close to the normal distribution, and the error variance of the dependent variables were equal across groups. Therefore, we conducted a multiway ANOVA. Three independent variables and five dependent variables were involved in this experiment. To verify the existence of multiple variables and their complex relationships, we conducted three-way mixed ANOVA for each dependent variable. The descriptive statistical results of oral production are shown in **Table 4**.

The Complexity of Oral Production

The results of three-factor mixed ANOVA (see **Table 5**) of lexical complexity and syntactic complexity showed that the main effects of the instruction method were not significant with $F(1,28) = 0.085$, $p = 0.772$, $\eta_p^2 = 0.003$ and $F(1,28) = 0.257$, $p = 0.616$, and $\eta_p^2 = 0.009$. The main effects of the L2 proficiency, however, were significant with $F(1,28) = 52.725$, $p = 0.000$, $\eta_p^2 = 0.653$ and $F(1,28) = 10.622$, $p = 0.003$, and $\eta_p^2 = 0.275$. The lexical complexity and syntactic complexity of the high-proficiency groups were significantly higher than those of the low-proficiency groups. The main effects of the

TABLE 4 | Descriptive statistical results for oral production.

Oral production		Instruction group	L2 proficiency	Pretest	Immediate posttest	Delayed posttest	N
Complexity	Lexical complexity	FonF	L	15.690 (2.592)	17.774 (2.806)	17.964 (2.033)	8
			H	23.352 (2.361)	24.588 (3.946)	26.961 (3.763)	8
		FonFs	L	15.924 (3.251)	17.268 (3.006)	18.981 (4.030)	8
			H	24.821 (3.176)	25.768 (5.266)	25.363 (6.174)	8
	Syntax complexity	FonF	L	1.729 (0.283)	1.886 (0.166)	1.863 (0.230)	8
			H	1.928 (0.274)	2.147 (0.230)	2.013 (0.242)	8
		FonFs	L	1.736 (0.248)	1.790 (0.213)	1.773 (0.293)	8
			H	1.962 (0.200)	2.102 (0.106)	1.990 (0.211)	8
Accuracy	Lexical accuracy	FonF	L	0.326 (0.118)	0.244 (0.104)	0.160 (0.082)	8
			H	0.220 (0.142)	0.218 (0.103)	0.170 (0.087)	8
		FonFs	L	0.294 (0.167)	0.213 (0.066)	0.224 (0.092)	8
			H	0.233 (0.064)	0.157 (0.077)	0.128 (0.062)	8
	Syntactic accuracy	FonF	L	0.337 (0.076)	0.267 (0.049)	0.277 (0.052)	8
			H	0.278 (0.102)	0.204 (0.079)	0.197 (0.055)	8
		FonFs	L	0.323 (0.179)	0.233 (0.058)	0.251 (0.076)	8
			H	0.289 (0.059)	0.240 (0.095)	0.176 (0.091)	8
Fluency	Mean length of run	FonF	L	4.186 (0.445)	5.069 (0.810)	5.149 (0.742)	8
			H	6.139 (0.476)	6.693 (0.853)	7.223 (2.014)	8
		FonFs	L	4.007 (0.668)	4.461 (0.501)	4.458 (0.686)	8
			H	6.135 (1.227)	6.215 (0.947)	6.50 (0.889)	8

testing time were significant, with $F(2,56) = 6.967$, $p = 0.002$, $\eta_p^2 = 0.199$ and $F(2,56) = 7.821$, $p = 0.001$, and $\eta_p^2 = 0.218$. Least significant difference (LSD) multiple comparison showed the lexical complexity of the immediate posttest and delayed posttest were significantly higher than the pretest ($p < 0.05$; $p < 0.01$), the lexical complexity of the delayed posttest was significantly higher than the immediate posttest ($p < 0.05$), and the syntactic complexity of the immediate posttest was significantly higher than that of the pretest ($p < 0.01$) and delayed posttest ($p < 0.05$). We did not find a significant difference between the pretest and delayed posttest ($p > 0.05$) of the syntactic complexity. The interactions among the testing time, instruction method, and L2 proficiency were not significant (see **Table 5**).

The Accuracy of Oral Production

The results of three-way mixed ANOVA of lexical accuracy and syntactic accuracy showed that the main effects of the instruction method were not significant with $F(1,28) = 0.260$, $p = 0.614$, $\eta_p^2 = 0.009$ and $F(1,28) = 0.110$, $p = 0.742$, and $\eta_p^2 = 0.004$. The main effects of the L2 proficiency were marginally significant with $F(1,28) = 3.568$, $p = 0.069$, and $\eta_p^2 = 0.113$ on lexical accuracy and were significant with $F(1,28) = 4.261$, $p = 0.048$, and $\eta_p^2 = 0.132$ on syntactic accuracy. The lexical accuracy and the syntactic accuracy of the high-proficiency groups were better than that of the low-proficiency groups. The main effects of the testing time were significant with $F(2,56) = 15.266$, $p < 0.001$, $\eta_p^2 = 0.353$ and $F(2,56) = 14.595$, $p < 0.001$, and $\eta_p^2 = 0.343$. LSD multiple comparison showed that the lexical accuracy of the immediate posttest and delayed posttest was significantly better than the pretest ($p < 0.01$, $p < 0.001$), and the lexical accuracy of

the delayed posttest was significantly better than the immediate posttest ($p < 0.01$), and the syntactic accuracy of the immediate posttest and delayed posttest was significantly better than that of the pretest ($p < 0.001$, $p < 0.01$). We did not find a significant difference between the immediate posttest and delayed posttest ($p > 0.05$) of the syntactic accuracy. The interactions among the testing time, instruction method, and L2 proficiency were not significant (see **Table 6**).

The Fluency of Oral Production

The results of three-way mixed ANOVA of fluency showed that the main effect of the instruction method was marginally significant, with $F(1,28) = 3.666$, $p = 0.066$, and $\eta_p^2 = 0.116$, and the mean length of run of the FonF group was longer than that of the FonFs group. The main effect of the L2 proficiency was significant, with $F(1,28) = 46.208$, $p = 0.000$, and $\eta_p^2 = 0.623$. The mean length of run of the high-proficiency groups was significantly longer than that of the low-proficiency groups. The main effect of the testing time was significant with $F(2,56) = 7.269$, $p = 0.002$, and $\eta_p^2 = 0.206$. LSD multiple comparison showed that the mean lengths of run of the immediate posttest and delayed posttest were significantly longer than the mean lengths of run of the pretest ($p < 0.001$; $p < 0.01$). We did not find, however, any significant difference between the immediate posttest and delayed posttest ($p > 0.05$). The interaction between the testing time and instruction method was marginally significant, with $F(2,56) = 3.118$, $p = 0.05$, and $\eta_p^2 = 0.100$. The other interactions were not significant (see **Table 7**).

Because we observed a marginal significant interaction between the instruction method and the testing time, we carried

TABLE 5 | Results of three-factor mixed ANOVA for oral production complexity.

Oral production complexity	Source	df	F	p	η_p^2
Lexical complexity	Between subjects				
	Instruction method	1	0.085	0.772	0.003
	L2 proficiency	1	52.725	0.000***	0.653
	Instruction method × L2 proficiency	1	0.004	0.951	0.000
	Error	28			
	Within subjects				
	Testing time	2	6.967	0.002**	0.199
	Instruction method × testing time	2	0.427	0.655	0.015
	L2 proficiency × testing time	2	0.124	0.884	0.004
	Instruction method × L2 proficiency × testing time	2	1.711	0.190	0.058
	Error	56			
Syntactic complexity	Between subjects				
	Instruction method	1	0.257	0.616	0.009
	L2 proficiency	1	10.622	0.003**	0.275
	Instruction method × L2 proficiency	1	0.119	0.732	0.004
	Error	28			
	Within subjects				
	Testing time	2	7.821	0.001**	0.218
	Instruction method × testing time	2	0.930	0.400	0.032
	L2 proficiency × testing time	2	1.081	0.346	0.037
	Instruction method × L2 proficiency × testing time	2	0.037	0.964	0.001
	Error	56			

** p < 0.01; *** p < 0.001.

TABLE 6 | Results of three-factor mixed ANOVA for oral production accuracy.

Oral production accuracy	Source	df	F	p	η_p^2
Lexical accuracy	Between subjects				
	Instruction method	1	0.260	0.614	0.009
	L2 proficiency	1	3.568	0.069*	0.113
	Instruction method × L2 proficiency	1	0.257	0.616	0.009
	Error	28			
	Within subjects				
	Testing time	2	15.266	0.000***	0.353
	Instruction method × testing time	2	1.311	0.278	0.045
	L2 proficiency × testing time	2	0.095	0.410	0.031
	Instruction method × L2 proficiency × testing time	2	2.236	0.116	0.074
	Error	56			
Syntactic accuracy	Between subjects				
	Instruction method	1	0.110	0.742	0.004
	L2 proficiency	1	4.261	0.048*	0.132
	Instruction method × L2 proficiency	1	0.462	0.502	0.016
	Error	28			
	Within subjects				
	Testing time	2	14.595	0.000***	0.343
	Instruction method × testing time	2	0.331	0.720	0.012
	L2 proficiency × testing time	2	1.188	0.312	0.041
	Instruction method × L2 proficiency × testing time	2	0.526	0.594	0.018
	Error	56			

* p < 0.1; *** p < 0.001.

out simple effect tests (see **Figure 1**). We found a significant effect on the mean length of run of the FonF group, with $F(2,27) = 8.726$, $p = 0.001$, and $\eta_p^2 = 0.393$. The multiple comparisons showed that the mean length of run of the immediate posttest and delayed posttest was significantly longer than that of the pretest ($p < 0.001$; $p < 0.01$). However, the difference between the immediate posttest and delayed posttest was not significant ($p > 0.05$). The effect of the testing time on mean length of run in the FonFs group was not significant, with $F(2,27) = 1.460$, $p = 0.250$, and $\eta_p^2 = 0.098$. The effects of the instruction method on the mean length of run for the immediate posttest and delayed posttest were both significant. The mean length of run of the FonF group was marginally or significantly

higher than that of the FonFs group, with $F(1,28) = 3.734$, $p = 0.06$, and $\eta_p^2 = 0.118$ and $F(1,28) = 4.737$, $p = 0.038$, and $\eta_p^2 = 0.145$.

Analysis of Oral Production of Different L2 Proficiency

We carried out multiple one-way ANOVA to further analyze the effects of three testing times on different proficiency learners with different instruction methods. The results showed that the testing time significantly affected the lexical accuracy, with $F(2,24) = 4.363$, $p < 0.05$, and $\eta_p^2 = 0.294$ and mean length of run with $F(2,24) = 4.872$, $p < 0.05$, and $\eta_p^2 = 0.317$ of low-proficiency

TABLE 7 | Results of three-factor mixed ANOVA for oral production fluency.

Oral production fluency	Source	df	F	p	η_p^2
Mean length of run	Between subjects				
	Instruction method	1	3.666	0.066*	0.116
	L2 proficiency	1	46.208	0.000***	0.623
	Instruction method × L2 proficiency	1	0.012	0.915	0.000
	Error	28			
	Within subjects				
	Testing time	2	7.269	0.002**	0.206
	Instruction method × testing time	2	3.118	0.05*	0.100
	L2 proficiency × testing time	2	0.551	0.580	0.019
	Instruction method × L2 proficiency × testing time	2	0.594	0.556	0.021
	Error	56			

*$p < 0.1$; **$p < 0.01$; ***$p < 0.001$.

learners in the FonF group. The testing time also significantly affected the lexical accuracy with $F(2,24) = 5.779$, $p < 0.05$, and $\eta_p^2 = 0.355$ and syntactic accuracy with $F(2,24) = 3.744$, $p < 0.05$, and $\eta_p^2 = 0.263$ of high-proficiency learners in the FonFs group. In the FonF group, for low-proficiency learners, the lexical accuracy of delayed posttest was significantly higher than that of pretest ($p < 0.05$), and the mean length of run of immediate posttest and delayed posttest was significantly higher or longer than that of pretest ($p < 0.05$). In the FonFs group, for high-proficiency learners, the lexical accuracy and syntactic accuracy of delayed posttest were significantly higher than that of pretest ($p < 0.01$; $p < 0.05$).

DISCUSSION

After Korean native speakers took five classes, their complexity, accuracy, and fluency of L2 Chinese oral production was significantly improved in both instruction groups. The effects of the instruction methods on these three dimensions of oral production differed, however. Additionally, in different tests, the learning effects of the different instruction methods also were different and were modulated by L2 proficiency. Therefore, we examined the influence of different instruction methods on the CAF of L2 Chinese oral production in different tests, as well as the modulation effects of L2 proficiency on learning outcomes.

The Influence of FonFs and FonF on L2 Chinese Oral Production

The influence of instruction methods on the three dimensions of L2 Chinese oral production differed. FonFs and FonF had no significant differences in complexity and accuracy but yielded a significant difference in fluency. Fluency in the immediate posttest and delayed posttest for the FonF group was marginally or significantly higher than that in the FonFs group. This observation demonstrated that, compared with the FonFs group, FonF can cultivate learners' selective attention to the linguistic meaning (Doughty, 2001) with a good retention effect, and thus can improve fluency. Interestingly, we did not find a significant difference in complexity and accuracy between the FonF group and the FonFs group, which meant that the improvement of fluency may not be at the cost of accuracy and complexity, and FonF enabled learners, whether intentionally or unintentionally, to notice the linguistic forms.

NH (Schmidt, 1990, 1994) emphasized the importance of paying conscious attention to linguistic forms in language acquisition. IH (Long, 1996) advocated to create communicative needs through interaction in language instruction, thus to make learners aware of the defects of their oral production when they encountered communicative barriers (Swain, 1998; Fuente and Maria, 2006; Spada and Lightbown, 2008). Furthermore, IPH suggested that if teaching method enables learners to construct appropriate connection between the linguistic forms and the linguistic meaning, then it might improve the processing effect of output (VanPatten et al., 2015). In this study, we found that FonF allowed the learners to notice the linguistic forms intentionally or incidentally when they noticed linguistic meaning, therefore to construct the connection between the linguistic form and the linguistic meaning. For example, in the pre-task stage of FonF, learners obtained meaning negotiation by completing the information gap task to focus on the meaning

FIGURE 1 | Effects of different instruction methods on fluency (MLU). **(A)** The MLU of the pretest. **(B)** The MLU of the immediate posttest. **(C)** The MLU of the delayed posttest.
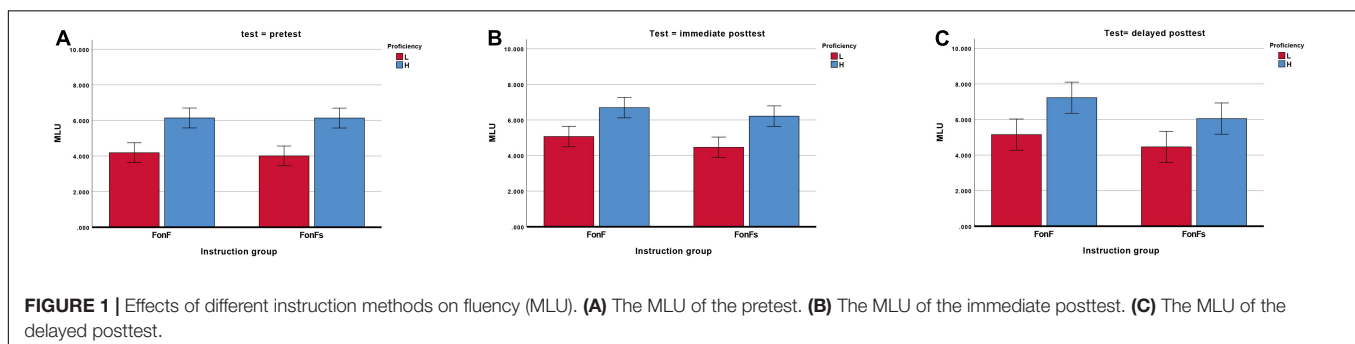
of language. In the task-processing stage, learners not only obtained rich comprehensible input by meaning negotiation but also strengthened attention to the linguistic forms by form negotiation. In the language-focused stage, learners strengthened attention to the linguistic forms with enhanced learning materials. FonFs, however, focused on teachers' instruction and controlled practice and did not create real communicative needs at different teaching stages. The learners lacked the opportunity of meaning negotiation, resulting in no significant improvement in fluency. Regarding feedback, FonFs adopted only direct correction, whereas FonF adopted feedback that was dominated by recasting and that was supplemented by metalinguistic interpretation. The strategy of integrating explicit and implicit feedbacks helped learner notice the complexity and accuracy of the linguistic forms. FonF was found to enable learners to obtain sufficient meaning negotiation and form negotiation, which is helpful for constructing the connection between the linguistic meaning and form. This observation is consistent with previous studies that a teaching approach with rich interaction and meaning-focused activities is beneficial to fluency (Sato and Lyster, 2012; Arslanyilmaz, 2013; Pena and Pladevall-Ballester, 2020; Hyun, 2021).

The Interaction Between Instruction Method and Testing Time

The interaction between the instruction method and the testing time had a significant effect on fluency only. The simple effect test showed that a significant effect was observed on fluency in the FonF group, whereas no significant effect was found in the FonFs group. Fluency in the immediate posttest and delayed posttest for the FonF group was significantly higher than that of the pretest, although no significant difference was observed between the two posttests. We did not observe any significant difference in fluency of the FonFs group among the three tests. These results indicated that the fluency of the FonF group had been significantly improved, resulting in a greater learning effect and good retention effect. In contrast, the fluency of the FonFs group was not significantly improved. Previous studies have found that FFI can improve L2 fluency, accuracy, and the ability to use the more complex linguistic forms (e.g., Spada and Lightbown, 1993; Doughty and Varela, 1998; Lyster, 2004), but the FonF was more effective in improving fluency (Spada and Lightbown, 2008). In this study, we found that learners could notice the linguistic meaning in the FonF group, which promoted the significant development of the fluency. Unlike FonF, FonFs made learners pay more attention to the linguistic forms rather than to linguistic meaning. According to NH (Schmidt, 2001), the probability of internalization of a language feature with insufficient attention would be reduced. Here, we found that the significant improvement of fluency in FonF group in two post tests, which indicated the learners did notice the linguistic meaning. However, unlike FonF, there was no significant improvement in fluency in FonFs group, which suggested that the learners paid more attention to the linguistic forms and resulted in a lower automaticity of oral production.

The interaction between the instruction method and the testing time had no significant impact on complexity and accuracy, whereas the tests had a significant impact on the complexity and the accuracy of both groups. In terms of lexical complexity and accuracy, performance in the immediate posttest and delayed posttest was significantly better than in the pretest, and the performance of the delayed posttest was significantly better than the immediate posttest, which indicated that the learning effects were well maintained. For syntactic complexity and syntactic accuracy, performance in the immediate posttest was significantly better than the pretest, the delayed posttest was not significantly different from the pretest, which indicated that the learning effects remained poor. The differences between the immediate posttest and the delayed posttest in syntactic accuracy were not significant, however, which indicated that the learning effects were maintained well. In summary, no matter what kind of instruction conditions were used for the learners, the learning effects for lexical forms were maintained better than the syntactic forms, and the learning effects for syntactic complexity were the worst. The explanation for this is that syntactic abilities, such as sentence structure organization, cohesive construction, and semantic integration were more difficult to acquire because of their weak explicitness (Ahmadian and Tavakoli, 2011; Ellis, 2012; Chen and Li, 2016; Kang et al., 2019), and more cognitive efforts were needed to increase the number of AS-unit clauses. Therefore, it is necessary to explore the relationship between learners' attention to syntactic complexity and oral production. The exploration will help to design divergent teaching approaches, which enable learners to better establish the mapping relationships between syntactic complexity and its meaning.

The Modulation Effects of L2 Proficiency

In this study, FonF was found to be more helpful to promote lexical accuracy and fluency of low-proficiency learners, whereas FonFs was more beneficial to improve the accuracy of high-proficiency learners. In FonF, lexical accuracy had delayed learning effect, and the mean length of run had immediate and delayed learning effect for low-proficiency learners. We also found, however, delayed learning effects on lexical accuracy and syntactic accuracy for high-proficiency learners in FonFs. These results indicated that L2 proficiency was able to modulate the relationship between instruction methods and outcomes to a certain extent (Spada and Lightbown, 2008; Kang et al., 2019).

Compared with FonF, high-proficiency learners paid more attention to the linguistic forms in FonFs. FonFs highlights the focus on the linguistic forms, which leads high-proficiency learners to encounter fewer difficulties in decoding and encoding of linguistic meaning by paying more attention to the linguistic forms (see VanPatten, 1990). Additionally, the emphasis for the linguistic forms in FonFs is conducive to the development of the accuracy of representing explicit knowledge. Compared with high-proficiency learners, low-proficiency learners need more external supports for their lack of L2 knowledge and skill (Kang et al., 2019). In this study, we found that FonF paid more attention to the linguistic meaning compared with FonFs. Therefore, it was helpful to pay more attention to the

linguistic meaning for low-proficiency learners who have greater difficulties in decoding and encoding linguistic meaning, which was conducive to the development of fluency that reflected implicit knowledge. In addition, FonF paid attention to the linguistic forms while also noticing meaning, which helped low-proficiency learners notice the linguistic forms to a certain extent, such as lexical accuracy. It is noteworthy that the existing traditional L2 Chinese instruction pays more attention to the linguistic forms in the elementary level, while the instruction in the advanced level pays more attention to the expression of the linguistic meaning (Gong et al., 2020b, 2021). However, low-proficiency learners should also accept instructions that pay attention to both linguistic meaning and linguistic forms. And, the training of the linguistic forms can never be ignored and should be carried out iteratively for high-proficiency learners.

CONCLUSION

In this study, we investigated the effects of different instruction methods of FFI, including FonF and FonFs, on the complexity, accuracy, and fluency of oral production of native Korean speakers' L2 Chinese. We found that FonF paid attention to both linguistic meaning and linguistic form, which achieved significant learning effects on fluency while also kept accuracy and complexity. FonFs, however, mainly focused on the linguistic forms, which were not conducive to the improvement of fluency because fluency did not obtain significant immediate and delayed learning effects. We also found that the outcome measures had modulation effects on learning effects. The learning effects of the lexical forms were better than those of syntactic forms, whether in FonF or FonFs. Last, we found that L2 proficiency had modulation effects on learning effects. The oral fluency of low-proficiency learners benefited the most from FonF, whereas the oral accuracy of high proficiency learners benefited the most from FonFs.

The findings of this study have some practical implications for the instruction of L2 spoken Chinese. For instance, teachers should adopt appropriate approaches to help learners construct the connection between linguistic forms and linguistic meaning to improve oral production. In FonF, teachers can create communicative needs by using multiple negotiation and feedback strategies. Thus, learners can realize the gap between their own language and native speakers of the target language when they encounter communicative obstacles. Doing so will promote attention to the linguistic forms. Our findings are a reminder that teachers should be aware that learners gain different benefits from different instruction methods because of different L2 proficiency. Low-proficiency learners better accept instruction methods that pay attention to both linguistic form and linguistic meaning, which are beneficial for learners to build connections between linguistic form and linguistic meaning during the elementary stage of L2 learning. For high-proficiency learners, instruction should be carried out iteratively. It is not sufficient to pay attention only to the language meaning, and the linguistic forms also should be given continuous attention. In this way, learners can carry out in-depth learning from their personal learning experiences with the linguistic forms and can further internalize the connection between linguistic meaning and linguistic form. In addition, the outcome measures can modulate these learning effects, which remind us that the learning effects of different instruction methods are different with different types of knowledge measured. Therefore, global assessments should be used to explore the impact of different types of FFI on these different oral dimensions.

Note that this study has some limitations. For example, the sample size of participants was relatively small. Each of the four experimental groups had only eight participants. The implementation time for each teaching experiment was only 2 weeks, which should be extended in future studies. Moreover, there was no qualitative analysis of learners' attitudes toward different instruction methods. Therefore, in the future, we will recruit more participants from different L1 backgrounds to implement teaching methods for a longer timeline, and will use reflective journals and semi-structured interviews to investigate L2 Chinese learners' attitudes toward different instruction conditions. We believe that a more comprehensive study could provide a multidimensional perspective for the scientific implementation of these instruction methods.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/**Supplementary Material**, further inquiries can be directed to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Institutional Reviewing Board (IRB) of Beijing Language and Culture University. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

MC and WL conceived and designed the study. MC drafted and revised the manuscript and got it ready for submission. WL collected the data. Both authors contributed to the article and approved the submitted version.

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How Learners' Corrective Feedback Beliefs Modulate Their Oral Accuracy: A Comparative Study on High- and Low-Accuracy Learners of Chinese as a Second Language

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This paper explores the differences in high-accuracy and low-accuracy learners' beliefs about corrective feedback when learning Chinese as a second language (henceforth, CSL). In this study, we collected data through a questionnaire survey and an oral test with 76 CSL learners in a Chinese university. The analysis revealed that both high- and low-accuracy CSL learners shared the same beliefs in whether and how the learner errors should be corrected but differed in their beliefs about when is the best time to correct, which error should be corrected, and who the corrector should be. Specifically, the discrepancy between high- and low-accuracy groups' beliefs about corrective feedback was found to be related to the participants' oral accuracy. Our results confirm that learners' CF beliefs can modulate their language accuracy. The corrective feedback beliefs held by high-accuracy groups have implications for improving low-accuracy groups' oral accuracy. Through comparison with findings on corrective feedback beliefs of English as a foreign/second language (henceforth, EFL/ESL) learners, this study suggested that language pedagogies developed from the research of EFL/ESL learners' CF beliefs should be able to shed light on this area and have significance for CSL learners. Implications for correcting learner errors in teaching CSL are also provided in the paper.

Keywords: second language acquisition (SLA), Chinese as a second language (CSL), corrective feedback, oral communication, language pedagogy

INTRODUCTION

Corrective feedback (CF) refers to the response that learners receive about their linguistic errors made in their oral or written production in a second language (Sheen and Ellis, 2011). CF has been a key issue in language teaching and learning and language pedagogy for almost half a century. Whether CF can benefit the second language acquisition process was a highly controversial issue in the early stages in this field. Studies like Krashen (1982, 1985) and VanPatten (1992) opposed the role of CF in language learning. However, with the development of empirical research,

increasing evidence has emerged to support that CF can assist language learning by improving learners' accuracy (e.g., Bitchener et al., 2005; Ellis et al., 2006; Benson and DeKeyser, 2019; Hashemifardnia et al., 2019; Kim and Emeliyanova, 2021). One of the factors to determine the effectiveness of CF has been found to be the learner's belief about CF (Ellis, 2010; Storch and Wigglesworth, 2010).

The term learner beliefs refers to the conceptions, ideas, and opinions learners have about second language learning and teaching and language itself (Kalaja et al., 2018). Many studies have shown that learners' beliefs about CF can directly influence their participation in and uptake of CF, further mediating the effectiveness of CF (Leki, 1991; Kern, 1995; Schulz, 2001; Sheen, 2011; Han, 2017). However, little is known about the relationship between learners' CF beliefs and their language performance – particularly in terms of oral accuracy. To fill this gap, the current study aims to further examine the relationship between learners' CF beliefs and their second language accuracy.

Although extensive research has been carried out on CF beliefs, it has been mostly restricted to those of English as a foreign/second language (henceforth, EFL/ESL) learners (Lyster and Ranta, 1997; Panova and Lyster, 2002; Han and Hyland, 2015; Chong, 2019). Another gap is that little research was designed to investigate the CF beliefs of Chinese as a second language (CSL) learners. Over the past two decades, there has been a tremendous growth of learning and teaching of CSL both within and outside China (Gong et al., 2020a,b). According to the Ministry of Education of China, there are cumulatively almost 200 million non-Chinese people learning Chinese languages (Xinhua News Agency, 2020). In accordance with the increasing demand for Chinese learning, there is a growing need for CSL teachers who can meet the diverse needs of CSL learners. Understanding the CF beliefs of CSL learners is of special significance to explore the pedagogical implications. Therefore, the present study also aims to obtain a comprehensive overview of the CF beliefs of CSL learners.

Overall, this study attempts to examine the relationship between learners' CF beliefs and their second language oral accuracy from a cohort of CSL learners. Three formal aspects of language – vocabulary, grammar and pronunciation – are used as the indicators of oral accuracy. As CF outcomes differ between high- and low-accuracy learners (Powell, 1987), these two groups of learners were examined.

LITERATURE REVIEW

Corrective Feedback Beliefs of Second Language Learners

In a seminal article, Hendrickson (1978) summarized five fundamental questions about CF: (1) Should learner errors be corrected? (Efficacy of CF) (2) If so, when should learner errors be corrected? (Timing of CF) (3) Which learner errors should be corrected? (Choice of Errors to Correct) (4) How should learner errors be corrected? (Choice of CF Strategy) and (5) Who should correct learner errors? (Choice of Correctors). These questions were addressed by studies like Ellis (2009b),

Zhang and Rahimi (2014), and Zhu and Wang (2019). In the following, we will review the recent studies on CF beliefs of second language learners, mostly EFL/ESL learners, based on those five questions. Regarding the efficacy of CF, there is a growing consensus that oral CF contributes to second language acquisition, at least to a certain extent. Earlier in 1978, Hendrickson already argued that oral errors should be corrected. Long (1996, 2006) specifically pointed out that recast, one of the most important types of CF, benefits learners' oral acquisition by attracting their attention to form while keeping learners focused on meaning throughout a conversational exchange. The positive effects of CF are supported both by empirical evidence (e.g., Doughty and Varela, 1998; Han, 2002; Loewen et al., 2009; Lee, 2013; Zhang and Rahimi, 2014; Zhu and Wang, 2019) and the meta-analyses of CF studies (Mackey and Goo, 2007; Li, 2010; Lyster and Saito, 2010).

Apart from the issue of whether errors should be corrected, many studies have moved on to discuss when errors should be corrected but the results are rather mixed. Some studies supported delayed correction (e.g., Walker, 1973; Harmer, 1983; Bartram and Walt, 1991) while other studies supported immediate correction (e.g., Davis, 2003; Zhang and Rahimi, 2014). Quinn (2014), Li et al. (2016), and Zhu and Wang (2019) have suggested that these mixed pictures may be caused by learners' different understandings of "immediate" and "delayed" CF. It is therefore worthwhile to explore CSL learners' beliefs about CF timing and also to ascertain if high- and low-accuracy learners have different beliefs.

As for the choice of errors to correct, Zhu and Wang (2019) summarized three taxonomies of errors based on previous studies: (1) linguistic taxonomy (e.g., grammatical, lexical, phonological errors); (2) focused CF (attention is directed to a few errors) vs. unfocused CF (all errors are addressed); and (3) the gravity of errors (whether an error impedes communication). Zhu and Wang (2019) find that "the gravity of errors might inherently be the only line of demarcation for error types in the learners' belief system." The current study therefore explored learners' CF beliefs toward different gravity of errors, as did Zhu and Wang (2019).

Regarding the choice of CF strategy, oral corrective strategies can be divided into implicit feedback and explicit feedback (Sheen and Ellis, 2011). Implicit feedback is a kind of feedback without an overt marker of errors, e.g., recast, while explicit feedback uses an overt marker, e.g., metalinguistic comment. Previous studies about EFL/ESL students' preference for the CF strategies also showed a mixed picture. Some studies found a preference for explicit correction (e.g., Katayama, 2007; Lee, 2013; Zhang and Rahimi, 2014) while some showed that learners favor implicit correction (e.g., Oladejo, 1993; Zhu and Wang, 2019). Zhu and Wang (2019) suggest that learners' preference for CF strategies might reflect "their beliefs as to whether comprehensible input or learner output is more important for language acquisition."

With regard to the CF provider, compared to peer-correction and self-correction, EFL/ESL learners generally ranked the teacher as the favorite choice of correctors. Apart from the teacher as corrector, some studies showed peer-correction is

the second favored, e.g., Schulz (2001), Zhang and Rahimi (2014), Agudo (2015), and Zhu and Wang (2019). However, a few studies like Katayama (2007) and Yoshida (2008) show learner reluctance toward peer-correction because it is not authoritative enough.

Based on the previous literature, researchers have generated a substantial amount of research on CF beliefs of EFL/ESL learners. These, by analog, may serve as useful benchmark models to investigate CSL learners' CF beliefs, though some findings for EFL/ESL learners revealed a rather mixed picture regarding timing of CF, choice of CF strategy and choice of correctors.

Studies on Corrective Feedback Beliefs and Oral Accuracy

Second language acquisition is a process that involves three core dimensions – complexity, accuracy, and fluency (Skehan, 1989, 1996, 1998; Ellis, 2009c). Most studies regarding the efficiency of CF in improving accuracy lie in the research field of written accuracy (e.g., Krashen, 1982; Truscott, 1996, 1999; Ferris, 1999; Sheen, 2007; Ellis et al., 2008; Ellis, 2009a; Frear and Chiu, 2015; Shintani and Aubrey, 2016; Benson and DeKeyser, 2019; Karim and Nassaji, 2020) and focus on the accuracy of grammar and vocabulary. By contrast, the effects of CF in oral accuracy are still under researched. Only limited studies have paid attention to the relationship between CF and oral accuracy, showing mixed findings (e.g., Chu, 2011; Rahimpour et al., 2012; Abedi et al., 2015). Thus, one of the three dimensions, accuracy, is the focus of the present study.

Chu (2011) conducted an experimental study about the effects of CF on oral English accuracy in Chinese ESL learners. The study conducted a pre-test and a post-test using class observation and interviewed two CF classes and one control class. The analysis of the recording data showed that the CF classes significantly outperformed the control class, thus proving the substantial positive effect CF had on oral accuracy. Rahimpour et al. (2012) compared the extensive and intensive focus on form strategies (recast and general feedback, respectively) on the oral accuracy of EFL/ESL learners and found no differences between the two types. Abedi et al. (2015) had different findings. Their study found recast was significantly more effective for the oral accuracy of EFL/ESL learners, in comparison with the effects of direct feedback. In short, the efficacy of CF in oral accuracy, a specific dimension of oral production, has still not been extensively examined.

Since the relationship between CF and oral accuracy is still understudied, we tried to explore the effect of learner beliefs of CF on oral accuracy by comparing high-accuracy and low-accuracy learners. In order to compare with EFL/ESL learners' findings, the current study also addresses five fundamental questions raised by Hendrickson (1978). To sum up, five research questions of the current study are:

In a comparison of CSL learners in a high-accuracy group and CSL learners in a low-accuracy group, are there any differences in their beliefs about (1) the efficacy of CF, (2) the best timing of CF, (3) the types of CF, (4) the types of errors that should be corrected, and (5) the choice of correctors?

METHODOLOGY

Research Context and Participants

Seventy-six (54 male and 22 female) CSL learners varying in their levels of Chinese participated in the research. They were in a CSL program in a Chinese university. They were selected because they agreed to participate in both the questionnaire survey and the oral test voluntarily. They were following Comprehensive Chinese courses with the aim of developing skills of reading, writing, speaking, and listening by native Chinese teachers. They majored in natural sciences, social sciences and humanities at a university in China, including Accounting, Anthropology, Business, Biology, Chemistry, China Studies, Economics, History, Law, and Music. Their ages ranged from 18 to 35 (mean (M) = 23.6, standard derivation (SD) = 3.46). Their mother tongues included English, French, Italian, German, Dutch, Hebrew, Russian, Spanish, Portuguese, Korean, Japanese, and Indonesian, etc. The average learning time was 22 months, ranging from the longest at 10 years and the shortest at 3 months. Consent from administrators of the institutes was obtained before their participation. All participants provided written informed consent forms and they were assured of the confidentiality and anonymity of the research.

Data Collection and Analysis
Research Instruments

Corrective Feedback Belief Scale (CFBS) (Fukuda, 2004) and a background demographic questionnaire (Zhang and Rahimi, 2014) were translated into Chinese with some adaptations in the current study (**Supplementary Appendix**). Students were requested to finish those two questionnaires in the lecture within 20 min. CFBS uses a five-point Likert scale, ranging from "strongly agree" (5 points) to "strongly disagree" (1 point), to elicit learners' beliefs about the provision of CF, the time of providing CF, types of CF, types of errors to correct and the choice of corrections. Cronbach's α was 0.86, indicating acceptable internal consistency for CFBS (DeVellis, 1991). Unlike Zhang and Rahimi (2014), errors and CF in second language acquisition were not explained systematically before conducting the questionnaire. However, according to their teachers, all students participated in our survey had been provided error corrections in the classroom before. In other words, all of them have perceptual experience of language errors and CF. So their CF beliefs developed naturally with limited intervention, which are the ideal objects we wish to carefully investigate.

Oral Test

In order to obtain data on the oral accuracy of each student, an oral test with four topics was conducted for each participant. Participants had 1 min to prepare for each topic before speaking and topics lasted for between 3 and 10 min. Four topics used to elicit oral Chinese were: (1) Please introduce your study and life in Nanjing this semester (up to 3 min); (2) Please introduce your travel experience in China or other places (up to 5 min); (3) Please introduce one of your acquaintances,

including his/her appearance, personality, etc. (up to 5 min); and (4) Please compare your hometown and Nanjing, including environment, weather, population, transportation and culture, etc. (up to 10 min). Speech production for those topics was recorded and transcribed into Chinese.

Assessment of Oral Accuracy

Each participant's oral accuracy was assessed in three aspects, i.e., vocabulary, grammar and pronunciation, yielding three independent indicators, i.e., vocabulary accuracy, grammatical accuracy and pronunciation accuracy. Vocabulary accuracy was defined as the ratio of the total number of correctly used words to the total number of words for each participant. Grammatical accuracy was defined as the ratio of the total number of clauses without grammatical errors to the total number of clauses (Jing-Schmidt, 2013). A clause is defined as an independent sentence or a dependent clause of a complex sentence, following the definition of Xing (1997: 13–15) and Jing-Schmidt (2013). In the assessment of vocabulary accuracy and grammatical accuracy, oral data with repetition, self-repair, a false start and pause filler like "en," "er" were not counted as errors. Based on the above mentioned criteria, all the vocabulary and grammatical errors were labeled exhaustively for each participant by two trained research assistants. While pronunciation accuracy was rated by two experienced Chinese language teachers on a scale of 1 to 10, 1 means "too many errors to understand" while 10 means "native-like pronunciation with very few errors." The interrater reliability was estimated by Pearson correlation. The ratings were given on an ordinal scale meanwhile the rank orders of the pronunciation performance were essential for us to determine high- and low-accuracy groups. The Pearson correlation coefficient between the two ratings was 0.919 ($p < 0.001$), which means the interrater reliability was strong. The pronunciation accuracy was accordingly established by means of two ratings.

For each indicator of vocabulary accuracy, grammatical accuracy and pronunciation accuracy, we classified the top 25% learners ($n = 19$) as a high-accuracy group and the bottom 25% ($n = 19$) as a low-accuracy group. In total, we obtained 6 groups, namely (I) vocabulary high-accuracy group, (II) vocabulary low-accuracy group, (III) grammatical high-accuracy group, (IV) grammatical low-accuracy group, (V) pronunciation high-accuracy group, and (VI) pronunciation low-accuracy group. The differences between high- and low-accuracy groups with respect to vocabulary (group I vs. group II: $t(36) = -16.941$, $p < 0.001$), grammar (group III vs. group IV: $t(36) = -13.514$, $p < 0.001$) and pronunciation (group V vs. group VI: $t(36) = -12.993$, $p < 0.001$) were all statistically significant.

RESULTS

To answer five research questions, high- and low-accuracy learners' responses are reported with regard to their CF beliefs from sections "Research Context and Participants," "Data Collection and Analysis," "Research Instruments," "Oral Test," and "Assessment of Oral Accuracy."

Efficacy of Corrective Feedback

Beliefs on the efficacy of CF were measured by Questions 1 and 2 of the Corrective Feedback Belief Scale (CFBS) in the **Supplementary Appendix**. With regard to Question 1, 93.4% of 76 participants responded "strongly agree" or "agree" concerning the necessity of error correction. No significant difference was observed between high- and low-accuracy groups in vocabulary ($t(36) = 1.397$, $p > 0.05$), grammar ($t(36) = 0.577$, $p > 0.05$) or pronunciation ($t(36) = 0.203$, $p > 0.05$). This result clearly shows that learners, regardless of their level of oral accuracy, were willing to accept error correction even without any explanation of CF beforehand. This consistency is attributable to learners' awareness of the benefits of CF on improving their oral accuracy. In other words, participants in the current study were all open to CF. Potential differences between high- and low-accuracy groups were not relevant to their awareness of the necessity of CF.

Question 2 is about the frequency of error correction, and we found that 82.9% of 76 participants preferred their errors to be corrected. Comparing high- and low-accuracy groups, no statistically significant difference was found between high- and low-accuracy groups in vocabulary ($t(36) = -0.651$, $p > 0.05$), grammar ($t(36) = -0.579$, $p > 0.05$) or pronunciation ($t(36) = 0.262$, $p > 0.05$). Learners' responses to the frequency of CF are in line with their responses to the necessity of CF. It indicates that the level of oral accuracy did not affect learners' beliefs in the effect of error correction.

Timing of Corrective Feedback

Questions 4 to 7 elicited learners' responses to the timing of CF. For 76 participants, "CF after students finish talking" received the highest mean ($M = 4.17$, SD = 0.661), "immediate CF" and "CF after the activity" received the second highest mean ($M = 3.09$, SD = 0.961) and the third highest mean ($M = 3.05$, SD = 0.928), "CF at the conclusion of class" received the lowest mean ($M = 2.70$, SD = 0.994). It indicates that learners generally believe their oral errors should be corrected after they finish talking.

A comparison of high- and low-accuracy groups, learners' responses are reported in **Table 1** with regard to vocabulary, grammar and pronunciation. As shown in the column of "pronunciation" in **Table 1**, there was no significant difference between high- and low-accuracy groups. **Table 1** also illustrates that high- and low-accuracy groups in terms of vocabulary and grammar have significant differences. Low-accuracy groups preferred being corrected after they finished talking more than high-accuracy groups. A possible explanation is that low-accuracy groups normally made more oral errors thus they did not want to be interrupted when talking in order to ensure the entirety of communication.

Moreover, as shown in **Table 1**, the grammatical high-accuracy group preferred the correction at the conclusion of class more than low-accuracy group. The correction of grammatical errors at the conclusion of class may be beneficial to improve grammatical accuracy because grammatical rules can be generalized at this time.

TABLE 1 | High- (H) and low-accuracy (L) group responses to the timing of corrective feedback (CF).

Timing of CF	Groups	Vocabulary		Grammar		Pronunciation	
		Mean (SD)	t (p)	Mean (SD)	t (p)	Mean (SD)	t (p)
Immediate CF	L	3.11 (0.809)	0.373 (>0.05)	3.00 (0.745)	0 (>0.05)	3.17 (0.786)	−1.288 (>0.05)
	H	3.00 (0.907)		3.00 (1.155)		3.53 (0.905)	
CF after students finishing talking	L	4.47 (0.612)	2.455 (0.019*)	4.32 (0.582)	2.089 (0.044*)	4.26 (0.562)	1.424 (>0.05)
	H	4.00 (0.577)		3.89 (0.658)		4.00 (0.577)	
CF after the activity	L	3.16 (0.688)	0.183 (>0.05)	3.00 (0.882)	−0.543 (>0.05)	3.16 (0.834)	0.884 (>0.05)
	H	3.11 (1.049)		3.17 (0.985)		2.89 (0.994)	
CF at the conclusion of class	L	2.58 (0.692)	−1.292 (>0.05)	2.16 (0.898)	−3.145 (0.003**)	2.68 (1.057)	−0.396 (>0.05)
	H	2.89 (0.809)		3.00 (0.745)		2.95 (0.621)	

P value less than 0.05 was designated with one asterisk (*).

Choice of Errors to Correct

Questions 14 to 18 elicit learners' responses to the types of errors that should be corrected. For all participants, "serious errors" were believed as the most important errors to be corrected ($M = 4.36$, SD $= 0.905$), followed by "individual errors" ($M = 4.08$, SD $= 0.903$), "frequent errors" ($M = 4.07$, SD $= 0.957$) and "less serious errors" ($M = 3.55$, SD $= 0.737$). "Infrequent errors" were believed as the least important errors to be corrected ($M = 3.32$, SD $= 0.927$).

Comparing high- and low-accuracy groups, there was no significant difference in vocabulary as shown in **Table 2**. However, in terms of grammar and pronunciation, mean responses to "infrequent errors" were significantly different between high- and low-accuracy groups. High-accuracy learners in grammar and pronunciation considered "infrequent errors" to be more important than low-accuracy learners.

Choice of Corrective Feedback Strategy

As illustrated in **Table 3**, there were no significant differences in the beliefs of high- and low-accuracy groups about the methods of CF. Learners in all groups rated explicit feedback as the most effective type of CF while recasts were thought to be the least effective type of CF. Fukuda's (2004) CFBS tested the choice of CF strategies by an error of not using verb past tense in English. When developing the questionnaire in Chinese, since there is no verb conjugation in Chinese, we adapted this verb tense error into a vocabulary error in the Chinese version. However, the vocabulary high- and low-accuracy group did not show any difference in choosing CF strategies toward this vocabulary error.

Choice of Correctors

Table 4 illustrates the responses of high- and low-accuracy groups to the choice of correctors. Regardless of vocabulary, grammar or pronunciation, CF from teachers was the most favored, CF by students themselves was the second favored, while their classmates CF was the least favored.

Moreover, the grammatical high-accuracy group valued their self-correction significantly higher than the grammatical low-accuracy group. McCormick and Vercellotti (2013) find that grammar is the largest category of self-correction comparing to vocabulary and pronunciation. It seems that grammatical errors

are more easily noticed by learners themselves. Grammatical high-accuracy learners, having a lot of overlap with high accuracy learners, should possess more grammar knowledge and are thus more aware of the effectiveness of self-correction of grammar errors, so they value this item more highly than low-accuracy learners.

DISCUSSION

Relation Between Learners' Corrective Feedback Beliefs and Their Second Language Oral Accuracy

Overall, this research shows, regardless of learners' accuracy level, that there is no significant difference between high- and low-accuracy groups' CF beliefs in the efficacy and types of CF. It also indicates that vocabulary high- and low-accuracy groups differ in their beliefs about timing of CF; pronunciation high- and low-accuracy groups differ in their beliefs on which type of errors should be corrected; grammatical high- and low-accuracy groups differ in their beliefs regarding timing of CF, which type of errors should be corrected and the choice of correctors. The discrepancy between high- and low-accuracy groups' CF beliefs suggests that these beliefs are related to speakers' oral accuracy. High-accuracy speakers have some unique CF beliefs such as the preference of correction at the conclusion of class and the preference of correction of infrequent errors. Previous research has found that learner beliefs can directly affect their learning behavior, and further influence their learning outcomes (Mori, 1999; Borg, 2003). Our results confirm that learners' CF beliefs can modulate their language accuracy. From the perspective of language pedagogy, those results can have potential implications for improving learners' accuracy. Specifically, the discrepancy between high- and low-accuracy groups' CF beliefs further suggests that in providing CF, learners' accuracy levels should be taken into account by the teacher. This confirms Ellis (2009b) guidelines for CF that "teachers should be prepared to vary who, when and how they correct in accordance with cognitive and affective needs of the individual learner." For example, teachers should pay more attention to frequent errors for low-accuracy learners while infrequent errors for high-accuracy learners. It

TABLE 2 | High- (H) and low-accuracy (L) group responses to types of errors that should be corrected.

Types of errors	Groups	Vocabulary		Grammar		Pronunciation	
		Mean (SD)	t (p)	Mean (SD)	t (p)	Mean (SD)	t (p)
Serious errors	L	4.42 (0.838)	−0.467 (>0.05)	4.21 (0.918)	−0.767 (>0.05)	4.42 (0.769)	0.000 (>0.05)
	H	4.53 (0.513)		4.42 (0.769)		4.42 (0.692)	
Less serious errors	L	3.58 (0.692)	0.248 (>0.05)	3.32 (0.885)	1.816 (>0.05)	3.68 (0.749)	0.226 (>0.05)
	H	3.53 (0.612)		3.79 (0.713)		3.63 (0.684)	
Frequent errors	L	4.21 (0.976)	1.085 (>0.05)	3.89 (1.150)	−0.748 (>0.05)	3.84 (1.015)	−1.417 (>0.05)
	H	3.89 (0.809)		4.16 (1.015)		4.26 (0.806)	
Infrequent errors	L	3.26 (1.046)	−0.997 (>0.05)	3.05 (0.848)	−2.775 (0.009**)	2.95 (0.970)	−2.419 (0.021*)
	H	3.58 (0.902)		3.79 (0.787)		3.63 (0.761)	
Individual errors	L	4.11 (0.875)	−0.019 (>0.05)	3.95 (0.848)	−0.356 (>0.05)	4.06 (0.802)	0.193 (>0.05)
	H	4.11 (0.963)		4.05 (0.970)		4.00 (0.943)	

P value less than 0.05 was designated with one asterisk (*), p value less than 0.01 was designated with two asterisks (**).

TABLE 3 | High- (H) and low-accuracy (L) group responses to corrective feedback (CF) strategies.

CF strategies	Groups	Vocabulary		Grammar		Pronunciation	
		Mean (SD)	t (p)	Mean (SD)	t (p)	Mean (SD)	t (p)
Clarification request	L	3.47 (0.841)	−0.853 (>0.05)	3.47 (0.964)	−1.478 (>0.05)	3.53 (1.020)	−0.174 (>0.05)
	H	3.68 (0.671)		3.84 (0.501)		3.58 (0.838)	
Repetition	L	3.53 (0.697)	0.193 (>0.05)	3.58 (0.838)	0.000 (>0.05)	3.68 (0.820)	1.385 (>0.05)
	H	3.47 (0.964)		3.58 (0.902)		3.32 (0.820)	
Explicit feedback	L	4.32 (0.749)	−0.450 (>0.05)	4.32 (0.885)	0.000 (>0.05)	4.21 (0.787)	−0.444 (>0.05)
	H	4.42 (0.692)		4.32 (0.820)		4.32 (0.671)	
Elicitation	L	3.74 (0.653)	−1.919 (>0.05)	4.05 (0.705)	0.000 (>0.05)	3.95 (0.848)	0.000 (>0.05)
	H	4.21 (0.855)		4.05 (0.621)		3.95 (0.621)	
No corrective feedback	L	4.21 (1.134)	1.144 (>0.05)	4.26 (0.991)	0.367 (>0.05)	4.22 (1.003)	0.035 (>0.05)
	H	3.78 (1.166)		4.16 (0.765)		4.21 (1.032)	
Metalinguistic feedback	L	3.74 (0.872)	−0.396 (>0.05)	3.58 (1.071)	−0.169 (>0.05)	3.47 (1.073)	−0.882 (>0.05)
	H	3.84 (0.765)		3.63 (0.831)		3.74 (0.733)	
Recasts	L	3.11 (1.049)	0.564 (>0.05)	2.84 (1.068)	0.144 (>0.05)	2.79 (1.084)	−0.891 (>0.05)
	H	2.89 (1.243)		2.79 (1.182)		3.11 (1.100)	

is also suggested that teachers can leave correction until the end of fluency practice for high-accuracy leaners as they also expect to develop their fluency and pragmatic competence (Gong et al., 2021a).

Additionally, the results of this study suggest that three indicators of oral accuracy, i.e., vocabulary, grammar and pronunciation, have different relations to CF beliefs. Students have different learning strategies for vocabulary, grammar and pronunciation and thus develop different CF beliefs for those aspects. For example, the acquisition of vocabulary is less interconnected and internalized than the acquisition of grammar and pronunciation. Learners can improve their accuracy of grammar and pronunciation by correcting infrequent errors. This may explain why high-accuracy groups of grammar and pronunciation considered infrequent errors more important than their low-accuracy peers, respectively. But such a difference was not found between high- and low-accuracy groups in vocabulary. This result suggests that teachers should implement a variety of CF strategies when teaching vocabulary, grammar

and pronunciation in oral communication and integrate opportunities and resources outside the classroom to improve students' communicative competence (Gong et al., 2021c). Corrections of infrequent errors in grammar and pronunciation are potentially valuable to high-accuracy learners.

Comparison With Corrective Feedback Beliefs of EFL/ESL Learners

Our results firstly showed that CSL learners of the current study shared many CF beliefs with EFL/ESL learners. For example, participants of the current study also showed strong support for the frequent provision of CF, even without a prior explanation of the purpose and significance of CF. They generally believed serious errors and frequent errors should be corrected. They also ranked explicit feedback as the best method of CF and ranked the teacher as the favorite choice of correctors. Learners of different languages and from different regions have developed those common CF beliefs probably because second language

TABLE 4 | High- (H) and low-accuracy (L) group responses to choice of correctors.

Correctors	Groups	Vocabulary		Grammar		Pronunciation	
		Mean (SD)	t (p)	Mean (SD)	t (p)	Mean (SD)	t (p)
Classmates	L	3.11 (1.049)	0.527 (>0.05)	2.68 (0.946)	−1.474 (>0.05)	3.11 (0.994)	0.808 (>0.05)
	H	2.95 (0.780)		3.11 (0.809)		2.84 (1.015)	
Teachers	L	4.68 (0.478)	0.758 (>0.05)	4.68 (0.478)	−0.722 (>0.05)	4.68 (0.478)	0.000 (>0.05)
	H	4.53 (0.772)		4.79 (0.419)		4.68 (0.478)	
Students themselves	L	4.00 (0.816)	1.102 (>0.05)	3.53 (0.841)	−2.161 (0.037*)	3.84 (0.765)	0.901 (>0.05)
	H	3.68 (0.946)		4.11 (0.809)		3.58 (1.017)	

P value less than 0.05 was designated with one asterisk (*).

learners have realized the efficacy of those CF strategies during the process of language acquisition.

However, CSL participants of the current study differ from EFL/ESL participants in their beliefs about the timing and provider of CF. For the best timing of CF, our participants chose "CF after students finish talking," i.e., delay correction, in comparison to "as soon as errors are made." First, questions used in our questionnaire resolve the ambiguity of "delay correction" and "immediate correction" as noted by Zhu and Wang (2019) by clearly noting when CF is given (see section "Timing of Corrective Feedback"). We further compare our results with Zhang and Rahimi (2014) because we use the same questionnaire as they did. While Zhang and Rahimi (2014) find the best timing of CF is "immediate CF," our participants preferred "CF after students finish talking". What causes the difference in beliefs about timing of CF between the two studies? One justification for this difference is that participants of the two studies were taking different courses and thus had different expectations for the timing of oral correction. Learners in oral communication classes probably preferred immediate correction while learners in other classes preferred correction after they finished talking. Zhang and Rahimi (2014) distributed the questionnaire in an oral communication course. In the oral course, students focused on improving their speaking skills so they expected their oral errors to be corrected without any delay. However, our survey was conducted in comprehensive Chinese courses. Students not only practiced their speaking skills but also their reading, listening and writing skills in the class. Thus they wanted to express their meaning completely without interruption. Teachers need to take into account the course type when deciding whether to correct immediately or not, because learners' expectation of immediate error correction is probably higher in an oral communication course than in other types of courses.

Moreover, our study found peer correction was the least favored and self-correction was the second favored, while in Schulz (2001), Zhang and Rahimi (2014), Agudo (2015), and Zhu and Wang (2019), participants preferred peer correction more than self-correction. This difference can be attributed to the accessibility of peer correction. Participants of Schulz (2001) were Colombian students; participants of Zhang and Rahimi (2014) were Persian EFL learners studying in Iran; participants of Agudo (2015) were Spanish EFL secondary school students; participants of Zhu and Wang (2019) were Chinese university students. What they have in common is that participants were from the

same countries and shared similar language backgrounds. On the one hand, students from the same countries may know more about the language problems in their peers' oral production and know how to correct these errors. On the other hand, it can be speculated that participants in the above four studies should have plenty of social connection after class. However, participants of the current study originated from 28 different countries and spoke 23 different mother tongues. They are speculated to have less contact outside the classroom, or more social isolation (Sawir et al., 2008; Gong et al., 2021b), than participants of Schulz (2001), Zhang and Rahimi (2014), Agudo (2015), and Zhu and Wang (2019). Having classmates with different language backgrounds and cultural backgrounds may reduce students' expectations of the CF from classmates. As a result, participants of the current study relied more on self-correction than peer correction. The implication for CSL teaching is that CSL learners in China may depend more on self-correction than peer-correction if there is less contact with their classmates or language partners after class. In this case, the teacher should suggest appropriate and adequate references about target language to facilitate learners' self-correction.

Generally speaking, our results show that CSL and EFL/ESL learners share many common CF beliefs. The differences between them have little to do with the target language of learning but are more relevant to the research design. Therefore, many language pedagogies developed from the research of EFL/ESL learners' CF beliefs such as Ellis (2009b) should be able to shed light on this area and have significance for CSL learners.

CONCLUSION

Our research questions sought to explore the differences in high-accuracy and low-accuracy learners' CF beliefs from a cohort of CSL learners. The research attempts to examine the relationship between CSL learners' CF beliefs and oral accuracy, by adopting a questionnaire survey and an oral test with 76 CSL learners from a Chinese university. The results highlight that high- and low-accuracy learners of CSL share many CF beliefs like the efficacy of CF and CF strategies, but also differ in timing of CF, error types and choice of correctors. Learners also show different CF beliefs in terms of vocabulary, grammar and pronunciation. Those results provide direct implications for correcting learner errors in teaching CSL.

In addition, the current study also investigates if and why CF beliefs of CSL and EFL/ESL learners differ. Our findings suggest that common CF beliefs are the mainstream while minor differences in the timing and provider of CF exist. We attribute those differences to research design rather than different mechanism in learning Chinese and English. Further investigations should control CSL and EFL/ESL learners' course type and language background in order to confirm our speculations.

It must be noted that our investigation was only conducted with CSL learners in China, and any generalization of the findings to all CSL learners worldwide should be undertaken with caution. This study was based on self-reported questionnaire. It would be helpful to carry out interviews to understand the reasons behind learner's CF beliefs in future research. There are also several potential topics to be explored in future research. For example, another possible study could investigate how the unique CF beliefs held by the high-accuracy group affect their achievement of high accuracy in language performance. Additionally, a future study might recruit more participants to its sample to examine whether participants' origin countries and mother tongues influence their CF beliefs, although they studied Chinese in the same environment. Lastly, future research could also investigate, besides accuracy, whether the other two core dimensions of second language acquisition, i.e., fluency and complexity, interact with CF beliefs.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Institute for International Students, Nanjing University. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

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Word Knowledge in L2 Chinese Lexical Inference: A Moderated Path Analysis of Language Proficiency Level and Heritage Status

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This study explored the effect of word knowledge facets (word-general and word-specific knowledge) on second language (L2) Chinese lexical inference by highlighting the moderating effect of language proficiency level and learners' heritage status. L2 Chinese learners with a mixture of linguistic (low-intermediate and high-intermediate) and cultural (heritage and non-heritage) backgrounds completed a series of word-knowledge measurements as well as a lexical inferencing task. Through a moderated path model, the study demonstrated that word-general knowledge (morphological awareness) and word-specific knowledge (vocabulary knowledge) contributed to L2 Chinese lexical inference. In addition, the study underlined the moderating effect of heritage status on the correlation between word knowledge and lexical inference. Given the distinct patterns between heritage and non-heritage learners, morphological awareness may define the characteristics of reading profiles in the Chinese heritage learner population.

Keywords: morpheme recognition, morpheme discrimination, heritage language, structural sensitivity, Chinese L2 acquisition

INTRODUCTION

Word Knowledge and L2 Lexical Inference

Word learning is a process to establish form, meaning and sound connections to understand definitional knowledge (Nagy and Scott, 2000), during which learners explicitly abstract graphic and phonological representations and map semantic information onto these representations. However, knowing a word involves different categories of information, including form, meaning and use (Nation, 2001). Kieffer and Lesaux (2012) investigated the dimensionality of word knowledge and finalized with the distinction of general-specific knowledge, in which word specific knowledge includes breadth and depth of vocabulary knowledge and word-general knowledge involves metalinguistic knowledge about words and their meanings. Learners with sufficient word knowledge tend to better grasp different vocabulary items and understand structural and semantic relationships in complex compound words in word learning. During this process, inference at the lexical level is essential to vocabulary acquisition and subsequently reading comprehension.

Lexical inference, or deriving the meaning of an unknown word, is conceptualized as "making informed guesses as to the meaning of a word, in light of all available linguistic cues in combination

with the learner's general knowledge of the world, her awareness of context and her relevant linguistic knowledge" (Haastrup, 1991, p. 13). Unlike other types of inference relevant to reading comprehension, learners are supposed to extract word-internal information and then activate contextual information in the same sentence containing the given word. Furthermore, various cognitive decisions are made in the process of inferencing. To date, extant studies have investigated different contributing factors in the inferencing process. First, L2 learners do not always make the guesswork on unfamiliar words, especially if they consider that the word does not hinder their comprehension (Bensoussan and Laufer, 1984; Parry, 1993). A few researchers have also indicated that even when learners make attempts, the ability to achieve a successful inference appears to be different (Haastrup, 1991; Paribakht and Wesche, 1999). Furthermore, although L2 vocabulary learning may take place incidentally in reading (Gass, 1999; Hulstijn et al., 1996; Hulstijn, 2003), it deserves further exploration as to how to achieve vocabulary learning and develop inferencing capacities in reading (Huckin and Coady, 1999; Paribakht and Wesche, 2009). In addition, great variability exists in studies on L2 learners' ability to understand unfamiliar words, even when the surrounding context is conducive to the inference (Bensoussan and Laufer, 1984; Knight, 1994; Pulido, 2004).

An important factor of L2 inferencing capacity is L2 word knowledge. Numerous studies suggest that there is a positive correlation between word knowledge and L2 lexical inference (e.g., Haastrup, 1991; Wang and Wan, 2011). Wang and Wan (2011) found that word knowledge level was positively correlated with inferencing outcomes. However, they further pointed out that when learners read specific types of passages, there was a threshold at the word-knowledge level. If learners reached a certain level of word knowledge, lexical inference would not be confined; otherwise, word knowledge may impose limitations on inferencing. In addition, specific facets of word knowledge, including vocabulary breadth and depth, were also studied extensively (e.g., Nassaji, 2006; Xun and Sun, 2006; Albrechtsen et al., 2008; Marzban and Hadipour, 2012). For example, Nassaji (2006) investigated the relationship between vocabulary depth, inferencing strategy use (e.g., identifying, evaluating, and monitoring strategies) and word-meaning retrieval from context among English learners. The results indicated that those with stronger depth of vocabulary knowledge used certain strategies more frequently and effectively than their weaker counterparts. Marzban and Hadipour (2012) reported that vocabulary breadth and depth both facilitated successful inferencing, and depth knowledge had a greater influence on lexical inferencing.

In addition, researchers also explored the relationship between word-general knowledge and lexical inference in the L2 context. Park (2004) made a systematic attempt to investigate this relationship among Korean-speaking English language learners. In her findings, a salient correlation was found between morphological awareness and inferencing outcomes. More recently, Zhang and Koda (2012) examined the contributions of morphological awareness and lexical inference to reading comprehension among advanced English learners. They discovered that morphological awareness did not make a direct contribution to reading comprehension, instead it influenced

comprehension indirectly. However, in L2 Chinese, Chen (2018) focused on L2 learner-related factors and investigated morphological awareness and lexical inference. He further verified that for proficient learners, morphological awareness was related to inferencing capacity while no significant contribution was found among less-skilled learners. Morphological awareness, as a facet of metalinguistic understanding about words and word meanings, entails word meaning inference. Koda (2000) states that morphological awareness includes the ability to segment morphological structures as well as the ability to understand morphemic meanings. Zhang and Koda (2018b) redefined morphological awareness as a combination of structural awareness and functional awareness. Structural awareness refers to the understanding of structural regularity in morphologically complex words while functional awareness represents the ability to retrieve graphosemantic meanings from complex words. Both facets of morphological awareness may be activated in processing unknown words because structural segmentation and semantic retrieval can facilitate inferencing processes.

To summarize, a number of L2 studies have suggested that word knowledge, including vocabulary knowledge and word processing skills, is essential to inferencing capacity. However, few studies have examined both word-general and word-specific knowledge and the distinction between them is underexplored in the extant literature. A few researchers demonstrated that L2 specific semantic knowledge and general metalinguistic awareness can collectively contribute to L2 inferencing capacities as well as comprehension ability across different languages (Kieffer and Lesaux, 2012; Li and Kirby, 2015; Zhang and Koda, 2018a). However, additional empirical studies are needed to unpack the complexity of word knowledge in L2 Chinese lexical inference.

Learner Attributes in L2 Lexical Inference and Reading

Individual differences of learner attributes largely contribute to success in adult second language attainment (Dörnyei, 2006). Research on learner attributes has examined psychological variables (e.g., motivation, language attitudes) as well as biographical factors (e.g., generation, years of formal study, bilingual status) (Torres et al., 2019). Given the heterogeneity and complexity of L2 Chinese learners (He, 2008; Zhang, 2016), it is critical to disentangle how linguistic and cultural backgrounds affect L2 Chinese reading acquisition. In the present study, we focus on learners' linguistic competence (proficiency level) and cultural background (heritage status) and investigate how these two factors impact L2 Chinese reading skills.

Proficiency Level

Previous research has established that learners with high language proficiency are better at deriving the meanings of new words than the weaker counterparts (e.g., Haastrup, 1991; Morrison, 1996; Fraser, 1999; Bengeleil and Paribakht, 2004; Alavi and Kaivanpanah, 2009). Morrison (1996) claimed that for proficient learners, their vocabulary knowledge accounted for the good performance, while Fraser (1999) attributed the better performance to their advanced processing ability and L2

knowledge. Other studies also verified that language proficiency correlated with the use of contextual clues. Haastrup (1991); Chern (1993), and Haynes (1993) examined lexical inferencing in learners with different proficiency and concluded that high-proficiency students were better at using global clues (i.e., those found beyond the sentence that contains the target word), while low-proficiency ones tended to be confined to local contextual cues (i.e., those found in the same sentence). Furthermore, Haastrup (1991) and Haynes (1993) pinpointed that if L2 learners did not arrive at certain language proficiency, the limited vocabulary knowledge would prevent them from using various linguistic cues to derive the meaning of words. Interestingly, Bensoussan and Laufer (1984) investigated whether proficient students could draw on the context more effectively than less proficient students did in lexical inference. They concluded that proficiency level did not influence inferencing ability, and learners all appeared to employ the same strategy: To ignore the unfamiliar words and make wild guess.

In addition to contextual cues, a number of studies focused on the knowledge sources that learners use in their lexical inference. Soria (2001) examined the use of different sources, and found that advanced learners who might succeed in lexical inference preferred contextual cues; by contrast, learners with low proficiency would resort to interlingual knowledge. Kaivanpanah and Alavi (2008) investigated the contribution of grammatical information to lexical inferencing and found that more proficient learners would extensively use L2 linguistic knowledge sources and would further integrate information from other sources, whereas less proficient learners appeared to emphasize the word-to-word translation in comprehension. Tavakoli and Hayati (2011) explored the knowledge sources that Iranian EFL learners used, and found that low-intermediate level students largely resorted to sentence-level grammatical knowledge, while those at the high-intermediate level seemed to use discourse knowledge to make inference, and that high-intermediate learners achieved successful lexical inference with stronger probabilities. Hamada (2014) found that beginning-level L2 English learners tended to use word-internal morphological cues to derive meanings even the morphological clues were not correct. Interestingly, Chen (2018) found that lexical inference was not directly affected by morphological awareness among low-proficiency L2 Chinese learners, thus arguing that the relation between morphological awareness and L2 Chinese lexical inference varied across proficiency groups.

Overall, learners' language proficiency can influence learners' use of contextual information and knowledge sources, and indeed has effect on lexical inference. High proficient learners may have stronger lexical inferencing ability, and therefore made more successful inferencing attempts. Previous studies have also confirmed that if learners do not reach a certain level, their limited word knowledge would hinder their utilizing contextual information to understanding unfamiliar words. More recently, Zhang et al. (2019) further consolidated that specific knowledge and general metalinguistic awareness collectively facilitate inferencing capacities in L2 Chinese. However, it still remains unclear as to whether the contributions of word-specific and word-general knowledge vary in word learning and reading

abilities according to different language proficiency levels. In addition, given the disparities in language proficiency, the extent to which learning and instruction can be conducted needs further exploration.

Heritage Status

In addition to language proficiency level, heritage status is an additional factor of learner attributes that may influence literacy learning. Heritage language (HL) is an immigrant language that a speaker has personal relevance and the desire to (re)connect with Wiley (2005). In the U.S context, Valdés (2000) refers to HL speakers as individuals raised in homes where a language other than English (dominant language) is spoken and who are to some degree bilingual in English and the heritage language. They develop HL literacy mainly in the home environment, and receive English literacy instruction when entering school.

In research on alphabetic languages, oral-based phonological awareness and morphological awareness shape early language and literacy acquisition (e.g., Carlisle, 1995; Nagy et al., 2006; Wolter et al., 2009; Kirby et al., 2012; Parshina et al., 2021). Kremin et al. (2019) compared Spanish-English bilingual and English monolingual children to disentangle how various kinds of knowledge influenced bilingual children's literacy. They found that there were stronger associations between phonological and orthographic representations in bilingual children than that in monolingual children, and that Spanish-English bilinguals seemed to be heavily reliant on English phonological awareness for learning to read in English. These findings suggest that bilingual children can also benefit from their heritage language with additional learning opportunities, as Spanish and English are alphabetic languages, and both emphasize sound-to-print associations in the learning-to-read process.

Different from literacy development in alphabetic languages, Chinese orthography is phonologically opaque, and its graphemes and pronunciations are not directly mapped, which compounds the difficulty of literacy development. Therefore, it is important to scrutinize how language background can impact literacy development in Chinese as a heritage language (CHL) learners. Ke (1998) examined the home background in Chinese in relation to character recognition and production by comparing collegiate CHL learners and non-CHL learners. He found that there were no significant differences in these two tasks, suggesting that heritage language background did not facilitate Chinese character learning. Similarly, Xiao (2006) conducted two consecutive studies among college-level CHL and non-CHL learners, and investigated the differential associations of literacy skills, i.e., oral language skills, grammar, vocabulary knowledge, character production and reading comprehension. The findings indicated that heritage language background was not the facilitative factor in Chinese vocabulary learning and reading comprehension. In a more recent CHL study, Zhang and Koda (2018a) investigated the associations among vocabulary knowledge, morphological awareness and reading comprehension ability in college-level CHL students. The two constructs both facilitated reading comprehension, and more specifically, morphological awareness strengthened the relationship between vocabulary knowledge and reading.

Zhang and Koda (2021) further examined cross-linguistic effects and found that dominant-language morphological awareness was closely correlated with lexical inferencing skills in both dominant language (English) and heritage language (Chinese), and these literacy skills can be transferred across languages. These studies suggest that heritage language background does not necessarily contribute to literacy skills development among HL learners, and more refined theoretical and applied justifications should be provided to the heritage language population.

As of now, a lack of studies has added the covariate of heritage status in understanding L2 Chinese higher-order reading development (e.g., inferencing and comprehension). A few studies have reviewed research on teaching Chinese as a second or a foreign language (Ma et al., 2017; Gong et al., 2018). They argued that despite the growing attention to Chinese language education worldwide, more efforts should be undertaken to delve into HL students' Chinese language learning, and further to explore the similarities and differences between HL learners and non-HL learners. Therefore, the current study aims to scrutinize the moderation of heritage status in L2 Chinese reading acquisition.

Given the theoretical framing and the review of literature, two research questions are formulated: (1) Do word-knowledge facets (word-general and word-specific knowledge) contribute to L2 Chinese lexical inference? (2) Do L2 language proficiency level and heritage status moderate the relationship between word-knowledge and lexical inference in L2 Chinese?

METHODOLOGY

Participants

A total of 419 Chinese learners (including 133 low-intermediate students and 386 high-intermediate students; 138 non-heritage students and 281 heritage students) participated in this study and they were from three college-level study-abroad programs in Beijing, Shanghai and Guangzhou. The learners' age ranged from 18 to 32 with a mean age of 22.13. CHL learners had early exposure to spoken Chinese to varying degrees, however, their literacy skills were constrained because of limited access to print material during their childhood. During data collection, they were all placed into the courses of intermediate level by the placement tests at their institutions or standardized proficiency tests. We recruited intermediate learners in the classrooms after obtaining the consent of the study-abroad program coordinators. They were required to have acquired basic linguistic competence in print Chinese, since we tapped into various dimensions of print knowledge. The study-abroad programs were established to provide students with an enriched environment of language and cultural learning. The participants had received intensive training in language skills and taken culture-related courses to develop linguistic competence in context. Data were collected in a class session and approximately 20 students participated in each session. All tasks were randomized in different sessions to eliminate carry-over effects from prior tasks. The total time allotment was 60 min.

Instruments
Word-General Knowledge
Morpheme Recognition

The morpheme recognition task was adopted from Ku and Anderson (2003). To eliminate confusion, some adjustments had been made to ensure that all the vocabulary items were within students' existing print vocabulary knowledge (lower-level vocabulary in the standardized Chinese Proficiency Test /HSK test). This task aimed to investigate whether learners can understand the semantic relation of a disyllabic word to its subcomponent morpheme. For instance, one disyllable word 可怕 (it literally meant "can" and "afraid" in English, but meant "horrible" in Chinese) and one of its segmental morphemes "可" were both demonstrated to the participants through visual stimuli. They were required to determine whether the meaning of "可怕 (horrible)" was related to the meaning of "可." The morpheme recognition task involved 20 items and the reliability coefficient (α) for this measure was 0.750.

Morpheme Discrimination

The morpheme discrimination task was also modeled after Ku and Anderson (2003). This task was to measure learners' ability to extract part of word information and distinguish the functional components of morphologically complex words. In this section, three compound words were presented to the participants, for example, 海鱼 "sea fish," 海边 "seaside," 海报 "poster." It is obvious that these words share the same morpheme "海," but the word "海报 (poster)" does not bear the meaning "sea." The participants were expected to circle the word whose morphemic meaning differs from the other two words. 20 items were involved in the morpheme discrimination task, and the reliability coefficient (α) for this part was 0.770.

Word-Specific Knowledge
Character Knowledge

The character knowledge task probed into learners' ability to extract the graphic representations (Chinese characters) of visually presented stimuli. The participants were expected to choose the most appropriate Chinese character combinations. For example, an English stimulus "friendship" was presented at first, and then followed with four options: (A) 友情 (friendship), (B) 朋友 (friend), (C) 客人 (guest), (D) 好客 (hospitality). The participants were supposed to select the correct word with an appropriate combination. There were 30 items in the character knowledge task, and the reliability coefficient (α) was 0.763.

Definitional Knowledge

The definitional task aimed to investigate learners' ability to match semantic meanings with visually presented words. The participants were expected to choose the correct meaning for each word. For instance, a word "职员" was demonstrated to the participants at first, and then they were supposed to select the appropriate explanation from the following items: (A) assistant, (B) account, (C) bank, (D) employee. This task included 30 items with ascending difficulty, and its reliability coefficient (α) was 0.816.

Lexical Inferencing Ability

The lexical inferencing task was designed to assess learners' ability to use word-internal and word-external information when they attempted to understand unknown words. Specifically, this task was to explore the utilization of partial word information and contextual cues in deriving word meanings. All the given words were disyllabic compound words and each word involved two elementary level characters from HSK 1 and 2, which was the lowest bands in HSK. However, the participating intermediate learners were unfamiliar with those compound words because all the words combined were beyond the highest level of the HSK. A pilot testing was conducted among 14 English-speaking intermediate learners before the test. They were required to assess the familiarity of the initially selected words, and 16 compound words were finalized for the present research. In this task, each compound word was placed into a sentence and learners are expected to infer the meaning with the given information, including partial word/morphological information and contextual cues. For example, a sentence "我们坐高铁去北京" (we will go to Beijing by ___) with four choices was demonstrated to the participants: 1. Maglev (morphology–, context+); 2. high-speed train (morphology+, context+, correct); 3. tall building (morphology–, context-); 4. high iron (morphology+, context–). The second option should be selected if learners accurately utilize the word-internal and word-external information in the sentence. Sixteen items were included in this task, and the reliability coefficient (α) for this task was 0.747.

RESULTS

Descriptive Statistics and Correlational Analysis

The descriptive analysis (**Table 1**) showed that all measurements had adequate spread and normality based on standard deviations, skewness and kurtosis. The accuracy rate ranged from 74.2% (definitional knowledge) to 80.7% (morpheme recognition). The correlational patterns among the variables are also presented in **Table 1**. All measurements had significant correlations with each other. Word-general facets had moderate correlations with lexical inference ($r = 0.340$, $p < 0.001$; $r = 0.587$, $p < 0.001$) and

word-specific facets had moderate to strong correlations with lexical inference ($r = 0.525$, $p < 0.001$; $r = 0.624$, $p < 0.001$).

Path Analysis With Moderation

We first conducted an unmoderated general path analysis to examine the relative contributions of word-knowledge facets to L2 Chinese lexical inference. To further test the hypothesis that the two learner attributes, language proficiency level and heritage status of learners, moderate the relationship between word knowledge facets and lexical inference in L2 Chinese, a moderated path model was proposed to examine the correlations between word knowledge facets and lexical inference among different groups learners. Four grouping variables were entered into the model and the learner subgroups were analyzed based on four different models (c.f. **Figure 1**). Given that no additional constraints were imposed on each well-defined conceptual model, the overall model was just-identified with saturated model indices (CFI = 1.00, RMSEA = 0.00).

Table 2 displays the results of standardized regression weights between the path routes in different groups. Unmoderated correlations and regression weights are directly attached to the path routes in **Figure 2**. In general, morpheme discrimination and definitional knowledge contributed to lexical inference ($\beta = 0.32$, $p < 0.001$; $\beta = 0.38$, $p < 0.001$) whereas morpheme recognition and character knowledge have no significant effect on lexical inference. Taking the moderating effects into consideration, the results indicated that the contribution of morpheme recognition to lexical inference was only salient in the heritage group ($\beta = 0.10$, $p < 0.05$) and that no groups showed a significant pattern between character knowledge and lexical inference. More specifically, heritage status yielded different relational patterns among the learner groups, however, proficiency level did not generate significant differences of the relation between word knowledge and lexical inference.

DISCUSSION

The current study generated two interpretable findings. First, word-knowledge facets in general contributed to L2 Chinese lexical inference. More strikingly, the moderator analysis showed that the heritage language learner population benefited relatively more from word-general morphological awareness.

TABLE 1 | Descriptive statistics and correlations of word-knowledge facets and lexical inference.

	Descriptive statistics						Correlation matrix				
Variable	*M*	*SD*	Min	Max	Skewness	Kurtosis	1	2	3	4	5
1. Morpheme recognition (20)	16.14	2.95	2	20	−1.85	5.85	–				
2. Morpheme discrimination (20)	15.73	3.44	3	20	−1.24	1.68	0.490***	–			
3. Character knowledge (30)	23.80	4.37	4	30	−0.99	1.44	0.364***	0.564***	–		
4. Definitional knowledge (30)	22.25	5.17	4	30	−0.73	0.09	0.395***	0.634***	0.777***	–	
5. Lexical inference (16)	12.13	2.74	3	16	−0.87	0.32	0.340***	0.587***	0.525***	0.624***	–

*Numbers in parentheses represent the maximum scores of all measurements. Word-general knowledge: morpheme recognition and discrimination; word-specific knowledge: character knowledge and definitional knowledge ***p < 0.001.*

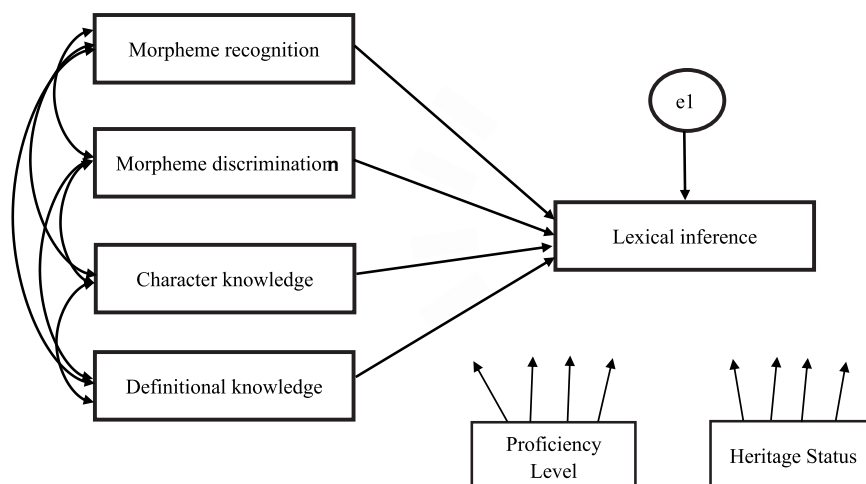**FIGURE 1 |** Hypothesized path model.

Vocabulary Knowledge and Morphological Awareness in L2 Chinese Lexical Inference

The findings demonstrated that general cognitive ability (metalinguistic awareness) and specific word knowledge collectively contributed to lexical inference. Vocabulary knowledge has been found to predict L2 lexical inference (Nassaji, 2006). Sufficient text coverage enhances the functionality of inferencing in context because the surrounding context has built surface-level semantic propositions. Additionally, morphological awareness entails the abstraction of morphological structures and morphemic meanings. In line with the prior study (Chen, 2018),

TABLE 2 | Standardized regression weights for measures of moderated path analysis.

Group	Paths			$\hat{\beta}$	S.E.	C.R.(z)	p
Non-heritage	LEXI	< —	MORR	−0.028	0.054	−0.379	0.704
	LEXI	< —	MORD	0.391	0.059	4.618	0.000
	LEXI	< —	CHAK	0.062	0.056	0.671	0.502
	LEXI	< —	DEFK	0.331	0.055	3.268	0.001
Heritage	LEXI	< —	MORR	0.095	0.057	1.974	0.048
	LEXI	< —	MORD	0.278	0.052	4.854	0.000
	LEXI	< —	CHAK	0.077	0.047	1.156	0.248
	LEXI	< —	DEFK	0.352	0.040	4.854	0.000
Low	LEXI	< —	MORR	−0.024	0.078	−0.272	0.785
	LEXI	< —	MORD	0.328	0.065	3.848	0.000
	LEXI	< —	CHAK	0.070	0.068	0.695	0.487
	LEXI	< —	DEFK	0.282	0.066	2.889	0.004
High	LEXI	< —	MORR	0.060	0.044	1.173	0.241
	LEXI	< —	MORD	0.289	0.051	4.940	0.000
	LEXI	< —	CHAK	0.042	0.042	0.736	0.462
	LEXI	< —	DEFK	0.341	0.042	5.479	0.000

MORR, Morpheme recognition; MORD, Morpheme discrimination; CHAK, Character knowledge; DEFK, Definitional knowledge; LEXI, Lexical inference.
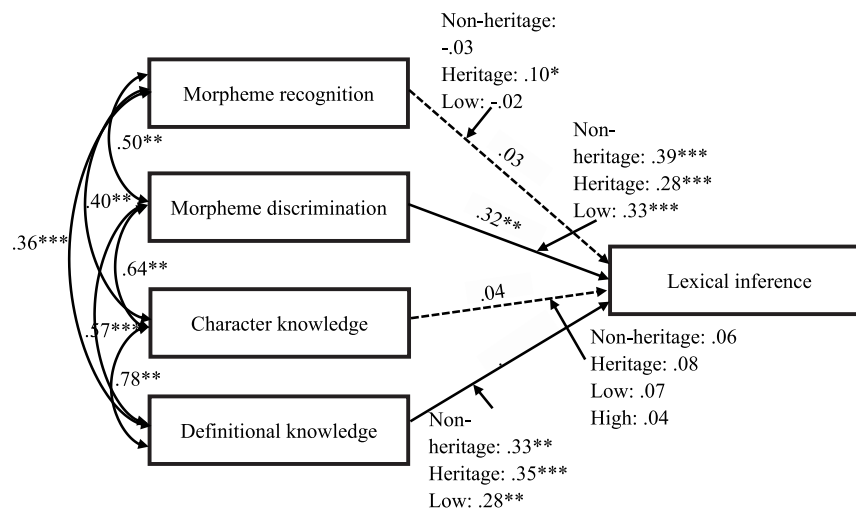
the study underscores the utility of morphological awareness in the meaning retrieval of unknown words in L2 Chinese. If we focus on the individual components of word knowledge facets, morpheme discrimination and definitional knowledge yielded significant contributions to L2 Chinese lexical inference. Under a relatively smaller sample size, Zhang et al. (2019) endorsed the positive role of the two components in L2 Chinese inference. Similarly, the current study indicated that morpheme discrimination and definitional knowledge had more salient effects on L2 Chinese inference. Both components highlight the extraction of graphosemantic information. Given the distinctiveness of the Chinese orthography that each character represents one morpheme, graphosemantic understandings of morphemes and words jointly contribute to word learning in context. However, measured character knowledge builds upon the recognition of visual symbols mapped onto meanings and morpheme recognition primarily entails the ability to extract morphemic structures (Zhang et al., 2019). The general insignificance of morpheme recognition and character knowledge indicates that graphic or structural understandings of words may not directly enhance meaning inference.

Uniqueness of Heritage Learner Population in L2 Chinese Reading

The moderator analysis showed that language proficiency level was not a factor differentiating the correlational patterns while the heritage status presented an interpretable pattern between morphological awareness and lexical inference. First, the non-significant moderation of language proficiency level may be due to the nuanced categorization of the programs. Learners recruited from low-intermediate and high-intermediate classes did not generate a salient difference in their proficiency level, thus justifying the insignificant difference of the correlational strength. Additionally, language proficiency may not affect inferencing strategies (Bensoussan and Laufer, 1984). In the current study, successful lexical inference seemed to rely more

FIGURE 2 | Path diagram of the moderation effect. $*p < 0.05$, $**p < 0.01$, $***p < 0.001$.

upon local semantic cues given that morpheme discrimination and definitional knowledge capitalize on character-level and word-level semantic activation. Furthermore, it is important to highlight that heritage learners benefited more from morphological awareness. Prior comparative studies have found that CHL learners performed differently from non-heritage foreign language learners on language and literacy outcomes (Ke, 1998; Xiao, 2006; Zhang and Koda, 2018b). Home language background provides foundations for early literacy skills including oral language capacity and metalinguistic awareness. Given their expanded oral language repertoire at home and in other situations, HL learners develop their initial morphological recognition ability through oral vocabulary. Constant encounter of high-frequent and morphologically transparent words in oral communication can facilitate their morpheme recognition ability. The current study suggests that both structural recognition and graphosemantic activation enhance lexical inference in the heritage group. Understanding of structural (ir)regularity is also critical to heritage language reading development.

CONCLUSION AND IMPLICATIONS

The study showed that both word knowledge facets contributed to L2 Chinese lexical inference. Additionally, the findings underscored the moderating effect of heritage status on the correlation between word knowledge and lexical inference. There are a few pedagogical implications for L2 Chinese teaching and learning. First, graphosemantic (character) learning enhances L2 Chinese reading subskill. Given the logographic nature of Chinese, it is highly suggested that students consolidate initial foundational character knowledge and understand graphic representations within multiple-character words. Activities like written character solitaire can be encouraged inside and outside of the classroom, because these gamified

activities could stimulate students' engagement, provide ample opportunities to practice reading skill, and further facilitate their understanding and mastery of Chinese characters (e.g., Huang et al., 2019; Li and O'Rourke, 2022), especially with frequent utilization of character knowledge (Hao, 2018). For example, students can be presented with a written word/character and they need to make words with the antecedent character (今天->天气->气球->球员->员工->工人->人群). Their character knowledge can be further refined and expanded through similar activities.

In addition, the study indicates that heritage students differ from non-heritage students on reading subskill development and that morphological awareness facets provide facilitation to lexical inference among heritage learners. Furthermore, recent studies have also underscored the need to uncover and bridge the differences between HL learners and non-HL learners in word recognition and reading acquisition (e.g., Ma et al., 2017; Gong et al., 2018). Therefore, given their early exposure to spoken language, heritage learners can be explicitly taught to segment bimorphemic and multi-morphemic words through oral-based familiar words. For instance, 机 (machine)-derived words (电视机 TV, 洗衣机 washer, 相机 camera) can be recognized and retrieved efficiently and HL learners would be able to learn new words based on similar morphological structures. Once the extraction ability develops, reading subskill (lexical inference) can be facilitated.

A few limitations also need further exploration. First, the categorization between intermediate low and intermediate high students did not generate significant patterns. Future studies can include elementary-level and high-level students to further examine the moderating effect of proficiency. Second, lexical inference can be coded as a latent variable with indicators of morphological cues and contextual cues. Graded responses in the lexical inference task can be further coded and multidimensional item analysis can produce the pattern of contextual and morphological factors in predicting lexical inference.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the IRB Committee of Carnegie Mellon University. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

HZ, XZ, CW, JS, and ZP contributed to the conception and design of the study. JS and ZP organized the database. HZ and CW performed the statistical analysis. HZ and XZ wrote the first draft of the manuscript. All authors contributed to the manuscript revision, read, and approved the submitted version.

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Teacher cognition in teaching intercultural communicative competence: A qualitative study on preservice Chinese language teachers in Hong Kong SAR, China

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The purpose of this study is to examine preservice Chinese language teachers' cognition in teaching intercultural communicative competence. In the study we collected data through in-depth interviews with seven preservice teachers in a Master of Education program (Teaching Chinese as a Second Language, TCSL) at a university in Hong Kong SAR, China. The findings indicated that the participants had a relatively positive attitude and inclination toward the development of students' intercultural communicative competence, while their conceptualizations of culture tended to be static and ambiguous. In addition, the participants' objectives in teaching intercultural communicative competence were found to be more attitude- than knowledge- or skill-oriented. The study offers valuable insights that preservice language teachers' cognition plays a crucial role in their future professional development and calls for curricular innovations with intercultural aims in teacher education programs.

KEYWORDS

preservice teachers, teacher cognition, intercultural communicative competence, Chinese as an additional language, teacher education

Introduction

Over the last 20 years the main orientation of language education has expanded from communicative competence to intercultural communicative competence, and language teachers are now expected to enable learners to become interculturally competent (Bennett, 2004; Feng et al., 2009; Tolosa et al., 2018). Intercultural communicative competence is related to the capability to communicate appropriately and effectively

with people from other linguistic and cultural backgrounds (Deardorff, 2006; Byram, 2014). While there is no single definition of intercultural communicative competence, it is generally considered to include four dimensions: attitudes, knowledge, skills, and behaviors (Perry and Southwell, 2011). For example, Byram's definition (Byram, 1997, p. 34) identifies five elements that affect intercultural communication, namely attitudes of openness and curiosity (*savoir-être*), knowledge of one's own as well as other social groups' cultural settings, norms, and interaction processes (*savoirs*), skills of interpreting and relating (*savoir-comprendre*), skills of discovery and interaction (*savoir-faire*), and critical cultural awareness (*savoir s'engager*). These elements are in line with analyses of linguistic, sociocultural, and discourse competence in intercultural encounters (Porto, 2019).

An intercultural orientation to language teaching and learning can help learners to foster the ability to interact successfully with others across language and cultural differences and prepare them for global citizenship. However, the development of students' intercultural communicative competence represents a significant challenge for many language teachers in a variety of educational contexts (e.g., Baker and Fang, 2021: the United Kingdom and China; Gandana and Parr, 2013: Indonesia; Fernández-Agüero and Chancay-Cedeño, 2019: Ecuador; Poehner and Pasterick, 2021: the United States). At the same time, it also raises a new professional need to prepare preservice (student) teachers for the challenge of developing learners' intercultural communicative competence in their future teaching (Romijn et al., 2021). In particular, preservice teachers need to develop the ability to conduct effective pedagogical design for intercultural education in language classrooms. Because teacher cognition is "expected to significantly influence the ways in which teachers interpret and engage with the problems of practice" (Skott, 2014, p. 9), investigating language teachers' "unobservable cognitive dimension of teaching" (Borg, 2003, p. 81) has been identified as a crucial means to address this challenge. In addition, it is vital to obtain more insights into the dimensional structure of intercultural teaching cognition if we want to address specific cognitive systems as part of preservice teachers' pedagogical development.

Understanding what teachers understand is assumed to underlie teacher education, development, and instructional behaviors. Extensive research has been conducted over the past two decades to explore the relationship between teacher cognition and instructional practices, and the influence of these factors on student learning achievement in language teaching (Borg, 2003; Burns et al., 2015; Kubanyiova and Feryok, 2015). These studies consistently report that language teachers' cognition links their teaching practices and students' learning experiences. However, preservice teachers' cognition has remained under-examined to date, and relatively limited attention has been paid to their "inner

lives" (Kubanyiova and Feryok, 2015, p. 436) in terms of their teaching intercultural communicative competence, although it is recognized that the preservice years are characterized by processes of confronting complicated conceptions about cultural diversity and an active construction of what it means to teach.

The majority of the existing studies have focused on teacher cognition in developing students' intercultural communicative competence where English is taught and learnt as a second or foreign language, predominantly in Europe and the United States (Ghavamnia, 2020). Studies have also explored the intercultural teaching of language teachers teaching other Western European languages such as French (Marshall and Bokhorst-Heng, 2018), German (Feryok and Oranje, 2015), and Spanish (Belpoliti and Pérez, 2016). Most of these studies have examined language teachers' attitudes and beliefs concerning what they think about intercultural communicative competence and how they might integrate it into their daily teaching practices. Studies have also investigated factors influencing language teachers' cognition in teaching intercultural communicative competence, generating insights for teacher educators and trainers to enhance language teachers' intercultural teaching.

However, few studies on the issue of language teacher cognition have explored teachers of non-English courses or in non-European language countries (Gong et al., 2018a; Ghavamnia, 2020). Specifically, little attention has been focused on teachers who help students to develop intercultural communicative competence in the context of learning Chinese as an additional language. These teachers may demonstrate different features in their teaching of intercultural education compared with their English-teaching counterparts. Hence, the present study aims to examine how preservice Chinese language teachers perceive teaching intercultural communicative competence.

Literature review

Language teachers' cognition in teaching intercultural communicative competence

Teacher cognition has been defined as "what teachers know, believe, and think" (Borg, 2003, p. 81). Language teacher cognition relates to "the complex, practically oriented, personalized, and context-sensitive networks of knowledge, thoughts and beliefs that language teachers draw on in this work" (Borg, 2006, p. 272), and the last fifty years have witnessed a continuously growing interest in this issue to provide insight into their instructional behaviors and further influence students' learning experiences (Cathcart and Olsen, 1976; Guo et al., 2019). Specifically in terms of language teachers'

intercultural teaching, the volume of research on their cognition has increased over the past 20 years. Because of the status of English as a global lingua franca and its considerable influence on the language education landscape, most studies on language teachers' cognition in teaching intercultural communicative competence have been conducted in the context of teaching and learning English as a second/foreign language (ESL/EFL) (Liddicoat and Scarino, 2013; Gong et al., 2018a). For example, in a qualitative study Larzén-Östermark (2008) interviewed 13 Finland-Swedish teachers of English in grades 7–9, and reported that most participants tended to define culture as "factual knowledge" (p. 527) and perceived that intercultural teaching was mainly aimed at promoting students' cultural knowledge. At the same time, few participants showed an orientation toward improving students' intercultural attitudes, such as openness and tolerance toward other different cultures. Young and Sachdev (2011) investigated experienced teachers' beliefs and practices related to developing students' intercultural communicative competence in English language programs in the United Kingdom, the United States, and France and revealed that while the teachers believed in the relevance of interculturality to their teaching, they "seemed unable or unwilling to put it into practice" (p. 95). Similarly, a recent study conducted by Safa and Tofighi (2022) with 100 preservice and 100 in-service EFL teachers in Iran found that both preservice and in-service participants shared a positive attitude and inclination toward incorporating intercultural communicative competence into their classroom instructional practices. However, this study also indicated a disparity between the participants' stated beliefs and their actual practices through classroom observations.

In summary, most scholars consider that language teachers' cognition plays a crucial role in shaping their instructional decisions and practices in terms of developing students' intercultural communicative competence (Sercu, 2002; Oranje and Smith, 2018). Even though there is no single agreed definition of language teacher cognition in research on teaching intercultural communicative competence, the existing studies on this issue have mostly focused on second or foreign language (SL/FL) teachers' pedagogical knowledge about, and their objectives in, developing students' intercultural communicative competence. On the one hand, a SL/FL teacher needs to possess adequate cultural knowledge of her/his own community and the target language community, and it is an essential precondition to be able to display, relate, and interpret the similarities and differences between cultures to students. On the other hand, a SL/FL teacher is often expected to not only improve students' intercultural knowledge, but also develop their intercultural attitudes, skills, and behaviors to address issues in practical intercultural encounters. Current studies have unanimously indicated that most language teachers have only a vague conceptualization of intercultural communicative competence theoretically, and they take little pedagogical

account of students' holistic intercultural development (e.g., Gong et al., 2018a; Agostinetto and Bugno, 2020). Moreover, there is little empirical investigation of teacher cognition in developing students' intercultural communicative competence in education contexts involving languages other than English, especially Chinese as an additional language.

Chinese language teachers' cognition in teaching intercultural communicative competence

Over the past decade Chinese has emerged as an increasingly important language that is taught and learnt as an additional language worldwide (Ma et al., 2017; Gong et al., 2018b, 2020). Teaching intercultural communicative competence has become an integral part and a core goal of curriculum design and implementation in the teaching of Chinese as an additional language. For instance, teachers and schools have been reported to use different strategies to enhance the integration of international mindedness into the subject of Chinese language in Hong Kong SAR, China's International Baccalaureate diploma programs (IBDP) (Lai et al., 2014). The "*Standards for Teachers of Chinese to Speakers of Other Languages*" published by Hanban (2007) (now referred to as the Center for Language Education and Cooperation), the official guidebook for Chinese as an additional language teachers, also lists knowing "culture and communication" as one of the five important modules in Chinese language teaching.

Despite this emphasis on student intercultural development in the context of teaching Chinese as an additional language, few studies have explored Chinese language teachers' cognition in relation to developing students' intercultural communicative competence, especially concerning preservice teachers. Previous research has mainly focused on in-service Chinese teachers' cognition and practices in developing students' intercultural communicative competence; for instance, Gong et al. (2018a) investigated 43 Chinese as a second language teachers' intercultural teaching cognition and the contextual factors (e.g., academic atmosphere) that influenced it. Their findings suggested that the participants had more pedagogical cultural knowledge about Chinese people's daily lives, traditions, folklore, and pop culture, than about their values, ethical and social groups, literature, international relations, and arts. In terms of their objectives in teaching intercultural communicative competence, the teachers highlighted the enhancement of students' intercultural skills more their intercultural knowledge and attitudes. Meanwhile, through interviews and classroom observations with 16 Chinese language teachers from Hong Kong SAR, China's international schools, Gong et al. (2022) found that the teachers' different professional and sociocultural identities interacted with their

intercultural teaching perceptions and practices. In particular, while broadly defined encompassing identities such as "cultural bridge" could mediate the teachers' intercultural teaching with a primary focus on improving students' attitudes toward different cultures, relatively narrow and ethnocentrically positioned identities such as "Chinese culture bearer" tended to shape the one-way pedagogy of literally transmitting Chinese cultural knowledge in teaching intercultural communicative competence.

Overall, although there have been some attempts to explore language teachers' cognition in teaching intercultural communicative competence, few studies have concentrated on preservice teachers' cognition related to promoting students' intercultural development in language education, especially in the context of languages other than English. Additionally, it has been argued that teachers' preservice development profoundly influences their pedagogical beliefs and practices (Friesen and Besley, 2013). More specifically, preservice teachers' cognition regarding the nature of intercultural education is generally seen as a relevant precondition to becoming effective practitioners of teaching intercultural communicative competence (Senyshyn, 2018). Hence, the present study aims to examine the cognitions of preservice Chinese as an additional language teachers regarding teaching intercultural communicative competence. Specifically, the study addresses the following question:

> Research Question: What are preservice Chinese language teachers' cognitions related to teaching intercultural communicative competence, including their knowledge about and their objectives in teaching?

Methodology

Research context

This research was conducted in Hong Kong SAR, China, which had been a British colony for more than 150 years before the transfer of sovereignty from the United Kingdom to the People's Republic of China (PRC) in 1997. This historical background has created a multilingual and multicultural *status quo* in Hong Kong SAR, China. In terms of language use, while Cantonese is the dominant daily language used by almost 90% of the population in Hong Kong SAR, China, English is also an official language widely used in government, business, education, and legal matters. Additionally, immigrants and expatriates from Western and Asian nations/regions also enhance the role of English in daily communication. Putonghua (also referred to as Mandarin outside the Chinese mainland), the national lingua franca of the PRC, has become more and more important in the past 15 years because socio-economically advantaged Hong Kong SAR, China parents expect to "develop

their children as elite bilinguals able to transcend linguistic and cultural boundaries" (Davison and Lai, 2007, p. 125).

Because of the increasing influence of Putonghua in Hong Kong SAR, China, the majority of international schools have started to offer their students courses in Putonghua as an additional language or as a compulsory second language up to secondary school age (Lai et al., 2016). Specifically, the Hong Kong SAR, China Government defines international schools as schools that "follow a full non-local curriculum designed for the needs of a particular cultural or linguistic group and/or for students who do not sit for local examinations" (EDB, 2021). These international schools are primarily self-financing and usually offer non-local curricula from places such as the United Kingdom, the United States, Singapore, or Australia, as well as the International Baccalaureate (IB) curriculum. This study focuses on prospective teachers who had pursued their Master of Education degrees and internship experiences in international schools in Hong Kong SAR, China, which usually pay significant attention to developing their students' global citizenship and intercultural development, and which require teachers to concentrate on promoting these aspects through their instructional approaches and curriculum design.

Participants

The participants in the present research were recruited from a Master of Education program (Teaching Chinese as a Second Language, TCSL) at a university in Hong Kong SAR, China. Seven out of 24 prospective teachers in this program voluntarily took part in the research, including six females and one male. The participants were all ethnic Chinese who had received their K-12 and undergraduate education in mainland Chinese universities, and most did not speak Cantonese as their first or mother language. Table 1 summarizes the profiles of the seven participating prospective teachers. The names used are all pseudonyms.

These prospective teachers came to Hong Kong SAR, China to study in the one-year full-time teacher education program, which is designed to prepare teachers for teaching Chinese as an additional language at schools in Hong Kong SAR, China. In the program all the prospective teachers need to complete six compulsory courses and three elective ones, such as Teaching the Chinese Language in International Contexts. At the same time the course also includes a heavy teaching practicum component, with all the prospective teachers taking part in this study being assigned to different international schools adopting the IB curriculum. Each prospective teacher worked with a school mentor from the Chinese language panel designated by each international school. The practicums lasted about 3 months, during which time the participants were involved first in in-class observations and then in daytime teaching practice at the schools.

Data collection and analysis

The study was based on individual interviews with the participants carried out in their native language, Putonghua, so that they could express themselves more freely. Each participant took part in one face-to-face interview at the end of their teaching practicum. Overall, the interviews were aimed at eliciting the participants' knowledge about and objectives in developing their students' intercultural communicative competence in Chinese as an additional language classrooms. Each interview lasted about 1 h. Elaboration and clarification questions were asked during the interviews to gain in-depth understanding and confirm the interviewees' intended meaning.

All the interviews were audio-taped, transcribed verbatim in Chinese, and double-checked for accuracy. The researchers read through the interview transcripts five times to familiarize themselves with the data, and meaningful parts of the text that struck the researchers as interesting or important to the research were highlighted and coded. Thematic analysis was adopted to analyze the interview data, carried out in deductive and inductive phases (Braun and Clarke, 2012). The data were first analyzed into predetermined themes to examine different aspects of intercultural teaching, informed by both the current literature and the data. These themes included: (1) teachers' knowledge about developing students' intercultural communicative competence, and (2) teachers' objectives in developing students' intercultural communicative competence. The interview data were then analyzed inductively to generate concrete categorizations under each predetermined theme. For instance, under the predetermined theme *teachers' objectives in developing students' intercultural communicative competence*, codes like "knowing about Chinese festivals or Chinese folk customs" and "understanding Chinese people's thinking styles" were aggregated into the category *intercultural knowledge-oriented objective*. The initial codings of the overarching categories were also compared across the seven participants to identify similar or repeated responses and contrasting instances (Charmaz, 1990). Two experienced researchers were invited to conduct peer-debriefing sessions during the interview data analysis to minimize bias (Onwuegbuzie and Leech, 2007).

We were aware that the researchers' own understandings and views can interfere with the "objectivity, reflexivity and authenticity of [the] research project" (Kanuha, 2000, p. 444), and thus we conducted participant checking after the data collection and the write-up in order to enhance the rigor of the research and the credibility of the research findings. In order to ensure the accuracy of the data and the trustworthiness of the subsequent analysis, all interview transcriptions were sent back to the participants to see whether there was anything they would like to correct, clarify, or add to inform the analysis and help us develop new ideas and interpretations (Birt et al., 2016). One participant made minor annotations, and the other six participants returned the documents without additional comment.

Findings

Overall, the data analysis suggested that while the preservice Chinese language teachers in this study considered themselves sufficiently familiar with intercultural communicative competence, their conceptualization of culture tended to be ambiguous and static, mostly focusing on traditional cultural knowledge (e.g., customs, routines, folklore). The participants' accounts revealed that all of them believed it was crucial to accommodate a curriculum orientation toward students' intercultural communicative competence. In particular, most participants paid more attention to developing students' intercultural attitudes than their intercultural knowledge and skills.

Chinese as an additional language teachers' knowledge about teaching intercultural communicative competence

Reflecting the assumption that "[c]ulture has always been at the centre of discussions in intercultural education" (Dervin, 2016, p. 9), the interview data revealed that all the participants (7/7) showed a conceptual understanding of

TABLE 1 Study participants.

No.	Name	Gender	Native language(s)	Curriculum's origin	Teaching experience
1	Xiao	Female	Putonghua	IB	2 years
2	Meng	Female	Putonghua	IB	No
3	Ying	Female	Minnan Dialect, Putonghua	IB	No
4	Lan	Female	Putonghua	IB	1 year
5	Zeng	Female	Cantonese, Putonghua	IB	No
6	Min	Female	Putonghua	IB	No
7	Lu	Male	Putonghua	IB	No

interculturality, treating culture as a concept that was too broad to be precisely defined. In particular, they believed that culture embraced or was related to almost all aspects of human society. Min, who had majored in Chinese Language and Literature and had no comparable work experience before her practicum in Hong Kong SAR, China, believed in the inherent complexity of conceptualizing "culture" itself:

[1] If you want to define culture, um, it is a really broad term, including innumerable things. It may contain history, geography, human spirit, and so on. Oh, a lot of things, and it is an abstract concept! (Min)

Her view of culture tended to be static. Although Lan shared the same view that it was not clear what actually constituted culture, Lan regarded culture as a dynamic concept and said, "From tangible to intangible, culture is a huge system and comprises various dimensions."

Despite their understanding that the concept of culture was ambiguous, most participants (6/7) reported that cultural knowledge in language education should be concrete and should include specific things, mainly Chinese historical stories, customs and habits, and geographical knowledge. For instance, Xiao, the only participant with 2 years of teaching experience at a secondary school in mainland China, talked about different ways of integrating culture into Chinese language classes and stated that a Chinese language teacher should be familiar with Chinese traditions and folk customs. Likewise, Min explicitly stated that "historical stories are mostly used" in her teaching. However, in Lan's mind commonly used cultural words were also an essential part of a FL/SL learners' linguistic repertoire in intercultural communication situations:

[2] I think, first of all, I need to teach the cultural words related to Chinese social contexts, such as some terms of respect, self-depreciatory expressions, and polite expressions. These are connected with the moral values in Chinese culture. (Lan)

The participants' accounts suggested that they prioritized traditional cultural knowledge when teaching Chinese in the international school context. Specifically, they preferred to teach or transmit Chinese customs and habits, because they knew more about Chinese culture than about the cultures of other languages.

In addition, the majority of the participants were able to demonstrate their conceptual understanding of intercultural communication. They thought that issues concerning intercultural communication could arise for people with different cultural or language backgrounds, and even for people from different sub-cultures (Perry and Southwell, 2011). Xiao

had obtained her Bachelor's degree in Teaching Chinese as an International Language at a mainland Chinese university; she perceived that intercultural communicative competence was necessary when people experienced cultural differences:

[3] Language is the bridge of communication and is used to communicate among people. If two persons have different cultures, they may have intercultural issues when communicating with each other. This is true even for two persons from the same country if they come from different places and have different cultural norms. (Xiao)

Although the participants expected to benefit learners' intercultural development through their teaching, most of them approached intercultural communicative competence from a cultural knowing viewpoint (Moran, 2001) and focused on the intercultural knowledge dimension.

Chinese as an additional language teachers' objectives in teaching intercultural communicative competence

This research also found that all the participants were consistently aware of the significance of developing students' intercultural communicative competence in the Chinese language classroom. While different interviewees allocated different instruction time to intercultural teaching, they all held positive views of the need to improve students' intercultural communicative competence. Intercultural knowledge refers to understanding "one's own and other social groups' cultural settings, norms, and interaction processes" (Gong et al., 2022, p. 134), and almost half of the participants (3/7) regarded this as an important objective in intercultural education, especially with regard to raising students' interest in or motivation for Chinese language learning (Schmidtke-Bode and Kachel, 2020). For instance, Zeng advocated helping her students to concentrate on clear differences between their own and traditional Chinese cultures. She saw intercultural knowledge as a useful tool in the Chinese language classroom:

[4] In my mind, especially for foreign students, culture is a very good starting point in language education. This can help them like your class and can help them learn something different. Chinese traditional culture is very new to them because they do not have Chinese festivals or Chinese folk customs. They are interested in these things because they did not see them before. (Zeng)

In addition, all the participants' responses (7/7) indicated that they believed that the aim in teaching intercultural

communicative competence was not only to increase students' intercultural knowledge, but also to improve their intercultural attitudes. For instance, Min took into account her students' openness and tolerance toward other cultures, and she also encouraged them to learn to be more inclusive and open-minded:

> [5] In my view, the ultimate aim of all cultural teaching is to help people with various cultural backgrounds interact more effectively. They can understand and be tolerant with each other, and differences in culture or values will cause no communication problems. (Min)

Similarly, Lu, the only male teacher among the seven participants, also perceived that students needed to improve their intercultural awareness with the ultimate goal of enhancing their intercultural communicative competence:

> [6] You may find the (target) language they speak sounds awkward, but if they can learn some cultural content, they can use the target language more effectively and appropriately. In this process, they can also learn and absorb various cultures. This can help them acquire multicultural understanding and international mindedness. (Lu)

The participants' accounts showed that "intercultural understanding" was frequently defined as the objective of intercultural education (e.g., Meng, Xiao). Moreover, Xiao favored promoting students' critical thinking through her intercultural teaching, and argued:

> [7] Through learning culture and intercultural content, students can broaden their horizons and will observe things more profoundly. This can improve their critical thinking, and at the same time, students can obtain the skills to learn other things and subjects. (Xiao)

Intercultural communicative competence considers the knowledge, attitudes, skills, and behaviors needed to take part in intercultural encounters. Byram (1997) identifies two factors of the skill dimension that affect intercultural communication, namely *savoir-comprendre* (skills of interpreting and relating) and *savoir-faire* (skills of discovery and interaction). The skills of interpreting and relating represent the balance between how people perceive their culture and how they can link local events with others from a different culture by interpreting and comparing (Fernández-Agüero and Chancay-Cedeño, 2019).

Our analysis indicated that three participants (3/7) concentrated on enhancing their students' *savoir-comprendre* in Chinese language teaching. Specifically, they tended to use various cultural heritage forms to engage students in exploring

diverse cultural manifestations. Ying provides a representative example of teaching intercultural skills:

> [8] When I taught Chinese New Year culture, I showed them some videos or physical materials, like *Chunlian* (couplets). I wanted to provide multiple resources to construct a social scene, and let students be involved in it. If they (students) encounter some problems in communicating with Chinese people, teachers need to tell them about the cultural differences in this communication and compare different cultures. (Ying)

Moreover, Ying adopted an activity named "City DNA" to encourage students to "see a real scene outside the classroom." Such strategic teaching efforts, shaped by the broad cultural diversity in her working community and Hong Kong society and mediated by her identity as an "intercultural learner" (Gong et al., 2022, p. 141), was in line with her tangible aim of intercultural teaching. Similarly, Lu expected that "students can tell the differences between their own cultures and Chinese culture" by adopting a cross-cultural comparison approach in the classroom. While the participants defined their teaching goals toward the full attainment of intercultural attitudes, knowledge, and skills, in fact the data recorded very few references to the dimension skills of discovery and interaction in Chinese education.

Discussion

Teacher cognition concerning the general nature of intercultural communicative competence is considered an empirically relevant precondition for high quality intercultural education in language classrooms. There is a paucity of research examining preservice teacher cognition in developing students' intercultural communicative competence in the context of teaching Chinese as an additional language. To fill this research gap, the present study has examined knowledge about and objectives in developing students' intercultural communicative competence among a group of seven preservice teachers in a TCSL education program at Hong Kong SAR, China.

In terms of the participants' knowledge about intercultural teaching, this research has revealed that all of them believed that intercultural communicative competence should be taught in Chinese language classes. This finding reflects the results of studies by Young and Sachdev (2011), Czura (2016), and Safa and Tofighi (2022), which all verified teachers' positive inclinations toward a full attainment of intercultural communicative competence in EFL classrooms. In this regard, it seems that language teachers generally recognize the educational transition from a mainly linguistic focus to an intercultural development orientation (Tolosa et al., 2018; Gong et al., 2021).

Intercultural understanding and the development of student intercultural competence, which have recently been integrated

into some national curricula and other educational documents, may positively shape and improve language teachers' awareness to foster students' intercultural communicative competence through their instructional efforts. In line with previous literature (Sercu, 2005; Gong et al., 2018a), our participants tended to define the concept of culture as static and ambiguous, mostly concentrating on the ways in which Chinese people live and their customs and traditions. Therefore, there seems to be no significant difference between preservice and in-service teachers concerning their beliefs about intercultural teaching (Safa and Tofighi, 2022).

According to the participants' interview accounts, they benefitted considerably from the IB educational philosophy, their internship schools' international environment, and Hong Kong SAR, China's multilingual and multicultural context in terms of developing students' intercultural communicative competence in their Chinese as an additional language classes. The preservice teachers with cross-border experiences showed a stronger awareness of intercultural teaching goals in their educational practices; in other words, it seems that preservice teachers in cross-border contexts can develop new and different insights into how to teach intercultural communicative competence and how to interpret their existing and future intercultural teaching practices (Sercu, 2006; Lai et al., 2016). Hence, there is a pressing need for educational policymakers to create intercultural and international settings or to provide intercultural communication opportunities for preservice teachers. Cross-border teacher education programs must continue to play an irreplaceable role in improving language teachers' beliefs and practices in developing students' intercultural communicative competence.

Regarding the participants' objectives to develop their students' intercultural communicative competence, this research indicates that they tended to relate the aim of intercultural teaching to attitudes more than to knowledge or skills. This finding was different from the results reported by Sercu (2005), Oranje and Smith (2018), and Ghavamnia (2020), who found that foreign language teachers primarily defined intercultural teaching in terms of cultural-knowledge transmission and did not aim to facilitate students' development of intercultural attitudes or skills. It also differed from Gong et al.'s (2018a) investigation of Chinese as a second language teachers from universities in China, which found that the teachers rated promoting students' intercultural skills to be the most important objective in their teaching, followed by the enhancement of students' intercultural knowledge and promoting their ability to handle intercultural communications (the skill dimension). On the one hand, these inconsistent results show that the context of education and work may influence preservice and in-service teachers' cognitions and practices in terms of intercultural teaching, since every teacher education or training program places a different degree of focus on intercultural teaching. Therefore, a comprehensive and consistent standard for preparing interculturally competent

teachers is required, and it will be necessary to integrate intercultural development modules into SL/FL teachers' education programs to qualify them to perform their future roles as teachers of both language and intercultural communicative competence (Larzen, 2005; Tolosa et al., 2018).

At the same time, since language teachers' identity plays a crucial role in shaping their cognitions and practices in teaching intercultural communicative competence, an intercultural-identity-oriented approach also needs to be integrated into teacher education programs (Yang and Markauskaite, 2021). Further studies are also needed to indicate the interaction between preservice teachers' identities and their intercultural teaching practices. Specifically, longitudinal investigations tracking changed in intercultural cognition and instructional practices during the transition from student teachers to experienced teachers may provide fresh insights for teacher education and development programs aiming to build language teachers' intercultural identity (Nguyen and Yang, 2018).

Conclusion

This exploratory qualitative study examined preservice Chinese language teachers' cognitions related to developing their students' intercultural communicative competence in the context of a TCFL education program in Hong Kong SAR, China. It expands our knowledge of how preservice teachers of non-Western languages perceive intercultural teaching in a cross-border setting. Overall, the findings of this study indicate that the participants held relatively positive attitudes and inclinations toward their students' intercultural development, while understanding culture statically and ambiguously. Their intercultural pedagogical objective was more attitude-oriented than knowledge-oriented or skill-oriented. Their cross-border life, educational, and intern experiences may all have influenced their perceptions of the significance of facilitating students' intercultural development in the Chinese as an additional language classroom.

The empirical evidence presented here might be different for preservice language teachers in different education systems, a recognition that calls for further studies on curricular innovations with intercultural aims, as well as the adoption of an intercultural approach in preservice teacher education programs and in-service teachers' professional development courses. Also, in any qualitative inquiry researchers might impose their own beliefs about and interest in the discourses under study (Dervin, 2010; Gong et al., 2020). Our position as Chinese researchers means that to some extent our data interpretation might reflect our understanding of culture and intercultural communicative competence.

Despite these limitations, this study contributes new empirical evidence regarding preservice teachers' knowledge about and their objectives in intercultural teaching in the language classroom. It has highlighted the crucial role of

cognition in preservice teachers' future instructional practices, and the support that seems to be required in order to assist their professional development. A longitudinal research design would be helpful in future research aiming to inform teacher professional development trajectories and tap into the changes in their belief systems and practices related to teaching intercultural communicative competence.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by the University of Macau. The patients/participants provided their written informed consent to participate in this study.

Author contributions

YG designed the study, collected the data, analyzed the data, and wrote the manuscript. CL, XG, and GL reviewed the manuscript. YH collected the data. LL revised the manuscript.

All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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Chinese language teachers' dichotomous identities when teaching ingroup and outgroup students

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Research into second language teacher identity has experienced a shift in recent years from a cognitive perspective to social constructionist orientation. The existing research in Chinese language literature in relation to Foreign Language (CFL) teachers' identity shift is principally in relation to the change of social, cultural, and institutional contexts. Built on the current literature, this research asks: "How might teachers' self-images or self-conceptualizations be renegotiated when they are located within their own mainstream cultural and educational system, yet comprised of students from various cultural backgrounds?" The data were collected from a group of CFL teachers in a South China university. The research found that students' backgrounds largely impacted on, and led to, the teachers' dichotomous relational identities, but did not dramatically change the teachers' perception on what or how much subject knowledge to be possessed to make an ideal CFL teacher. This attribute of their identity was sustained even though the teaching content was modified at a practical level in response to groups' differences. Further, the CFL teachers' pedagogical identity remained stable with only minor modifications when teaching "ingroups" and "outgroups" of students.

KEYWORDS

language teacher identity, Chinese language teacher, contextualized social processes, multiculturalism, self-conceptualizations

Research background

The last two decades has witnessed a growing body of literature on the topic of language teacher identity due to a proliferation of diverse roles in (language) teaching. Researchers acknowledge that understanding language teachers' identities is vital for initial teacher education and teachers' further professional development

(Beauchamp and Thomas, 2009; Huang, 2019). Language teacher identity plays a foundational role in guiding teachers' recursive construction and reconstruction of knowledge and competence (Morgan and Clarke, 2011). It is essential in teachers' adaptation to the dynamic and evolving language education environments (Tao and Gao, 2018). Teacher identity helps language teachers to appreciate what constitutes a good teacher, teachers' subject knowledge, and pedagogical knowledge (Johnston et al., 2005). A professional self-image can optimize teachers' functionality within their working environment (Yuan and Burns, 2017), and eventually achieve quality language teaching (Wang and Du, 2016).

Nevertheless, research into second language teacher identity has experienced a shift in recent years from cognitive perspective to social constructionist orientation (Pennington and Richards, 2016; Yazan, 2018). This is a shift of focus to the examination of teachers' identity in contextualized social perspectives, in contrast to the earlier effort on psychological practices and influences (Miller, 2009). Theorists in the field hold the belief that teacher identity is not fixed nor is it imposed; it is a context-bound, fluid phenomenon (Varghese et al., 2005), and "negotiated through experience" (Sachs, 2005, p. 15). The contexts range from the macro-levels of social, cultural, and political milieu to immediate micro-spaces where teaching occurs. Teachers' "identity emerges as a dynamic construct that is shaped by the context in which the teacher works" (Pennington and Richards, 2016, p. 6). However, the mechanics of how teacher identity is shaped by contexts needs more attention.

The existing research in Chinese as Foreign Language (CFL) teachers' identity is principally focused on the changes in social and cultural contexts. Reports are around teachers moving within and between environments, such as social, cultural and institutional contexts. For example, an investigation on teachers' identity found pre-service teachers shaped their identity differently in macro-distinctive social structures of Hong Kong and Mainland China (Gu and Benson, 2015). Another research found Chinese language teachers' professional identities "co-existed" and overlapped with their social and cultural identities in mediating intercultural communicative competence in Hong Kong's international schools (Gong et al., 2021, p. 6). Studies conducted with expatriate Chinese teachers in the "new" social and cultural contexts such as the United States, the United Kingdom, and Australia, found their professional identities experienced a renegotiation process cognitively and emotionally in accordance with their social relations and cultural practices (Yang, 2019). Their adaptation also included a pedagogical shift to cope with the needs of local school systems and students (Zhang, 2015; Xiang, 2021). The studies detailed a linear relation between identity and context. They ascribed teachers' identity shifts to the change of macro contexts, but mostly left the contexts unspecified. This approach left the question unanswered: "Which particular context – social,

cultural or institutional – or all, had inevitable impact on which aspect of teacher identity?

Students as a key and immediate "context" have been studied extensively but how their ethnic and cultural background might be a distinguished variable in relating to teachers' identity development or shift is yet to attract similar attention. There is a plethora of studies focusing on how students in general impact on teachers' relational identity. One study found that teachers' emotions were related to the students' behavior and performance outcomes (Day and Kington, 2008). The authors posited that teachers' emotions were affected by their "immediate working context" and were "connected to (their) long-term identity" (Day and Kington, 2008, p. 1). One study explored the correlation between teachers' identity and students' learning (Ben-Peretz et al., 2003) and found that teachers' professional images of self were closely allied to their students' achievements. In this research, students were presumed to be one generic group, with only an implicit categorization as "good" and "bad" students based on their behavior and performance, impacting on teachers' emotional identity. Nevertheless, a few studies have given attention to teachers' identity and their cultural mismatch with their students'. For example, Zembylas (2010) centered on teachers' emotional experiences, claiming that they demonstrated discomforting emotions in ethnically diverse and multicultural schools. It reveals that teachers' emotional identity was impacted by the students' "diversity" and the schools' "multiculturalism" (p. 713). Johnson (2003) in her research confirmed that cross-cultural teacher-student interactions occasionally moved beyond the classroom walls, and teachers' personal selves sometimes had an influence on their professional relationships with students.

There are some insightful studies on students' impact on teachers' pedagogical identity which are enlightening for this research undertaken. For example, findings in Gao's (2012) study implied that CSL teachers in Hong Kong see themselves as "linguistic torchbearer" and "cultural transmitter" in relation to South Asian learners. Chinese teachers shifted pedagogy from an authoritative, parental "subject expert" to a plain and equal "culture worker and a learning facilitator" to cater for the language learners in Denmark (Wang and Du, 2014, p. 429). This research indicated that the cultural background of students played an agential role in crafting teacher identities. However, given the change of the physical environment where teachers were situated in teaching, it is not clear whether the pedagogical shift was completely due to the new students or because of other factors in the new macro teaching context. A more informative study conducted among CSL university teachers in China found that when teaching international students, CSL teachers were more skill-oriented than knowledge-oriented, and their perception of teaching was related to context factors (Gong et al., 2018). This research indicates that even when the social, cultural, and institutional context of teaching remained stable,

the pedagogical identity may still shift in some extent if their students' culture was mismatched with that of the teacher. This indicates that students' ethnic and cultural background may be more powerful in teacher identity development than the teachers' general social, cultural or institutional circumstance.

The gaps in current research in the area of dynamic CFL teacher identity are evident. Firstly, the student cohort as an immediate context that impacts on teacher identity was often not distinguished from other contextual factors (e.g., institutions). Mainstream studies on CFL teachers' identity typically occurred in a new country, a new school and with new students, and thus "what influences what" is less clear. Secondly, the impact on teachers' identity from the student groups that shared cultural similarities (ingroup) and culturally mismatches (outgroup) with the teachers were often not differentiated in a comparative manner. The literature revealed that students from other cultural backgrounds impacted on the teachers' emotional or pedagogical shift or adjustment, but how ingroup and outgroup students may differently influence teachers is yet to be extensively studied. Built on the current literature, this research asks: "How might teachers' self-images or self-conceptualizations be renegotiated when located within their own mainstream educational system and yet comprised of students from various cultural backgrounds?" It explores teachers' understanding of their subject knowledge in terms of what a CFL teacher should know and teach, and how their pedagogical and relational identity varies or shifts when engaging with different cultural groups. The comparative approach of this current research is based on the teaching of local and international cohorts within the overall stable cultural and institutional macro teaching context: that is, within the teachers' home environment.

Theoretical framework

This research draws on the analytical tools provided by Social Identity Theory (Hogg, 2018) from the perspective of modernism; and the post-modern notion of Multiple Identities Approach (Gee, 2000). The combination of these two theories targets an exploration of the dichotomy between an unremitting fluidity and temporary stability of identity. It investigates: the contextual community's impact on the construction and reconstruction of teachers' identities, the influences on the teachers' dynamic moments through their conceptualization of self and examines the impact of the cultural "ingroup" as distinct from the "others" – other cultural groups.

Social Identity Theory addresses "collective phenomena" that "cannot be adequately explained in terms of isolated individual processes or interpersonal interaction alone" (Hogg, 2018, p. 112). It addresses issues such as "intergroup conflict, conformity, normative behavior, group polarization, and crowd behavior" (Hogg, 2018, p. 112). Self-categorization is the

cognitive dimension of the theory informing the notion of "us". It describes how categorization of self and others underpins social identification and associated group and intergroup phenomena (Hogg, 2018). McLeod (2008) classifies this mental process into three stages: categorization, identification, and comparison. The first stage draws on social and cultural knowledge to categories people. These categories include gender, race and profession, such as black or white, Chinese or American, and student or teacher. These aspects are believed to have Psychological Salience and affect behavior, thus are valued and frequently employed in self-conceptualization (Hogg, 2018). The second stage is social identification, involving the allocation of the self into the stereotypical groups categorized at stage one. Categorized groups are identified with different sets of "attributes" or prototypes, such as perceptions, attitudes, feelings, and behaviors (Hogg, 2018, p. 119). Group members tend to share similarities within and across these aspects and act according to their imagined ingroup attributes. The final stage involves social comparison between ingroup and outgroups (McLeod, 2008). The comparisons are oriented toward similarity, assimilation, and uniformity as it is argued that "social comparisons between groups are focused on the establishment of distinctiveness between groups" (Tajfel, 1972, p. 296). Social Identity Theory in this research provides a framework to understand how the Chinese CFL teachers see themselves culturally or ethnically similar to their local students; or different from their students coming from other ethnic backgrounds. These perceptions then shape how they position and reposition themselves in teaching.

The limitation of Social Identity Theory is its dependence on an "individual's knowledge" of categorizing social groups (Tajfel, 1972, p. 292), drawn from their experiences with "readily accessible social categorizations" such as race, gender, and profession (Hogg, 2018, p. 121). This may not then take account of individuals' knowledge and functioning in different contexts. To supplement this, the Multiple Identity Approach is useful. This post-modern theory acknowledges "'core identity' that holds more uniformly, for ourselves and others, across contexts" (Gee, 2000, p. 100). Concurrently it posits that "all people have multiple identities" and they are "connected to their performances in society" (Gee, 2000, p. 100). It criticizes the "overly general and static trio of 'race, class, and gender'" of modernism, and endorses the idea that "when any human being acts and interacts in a given context, others recognize that person as acting and interacting as a certain 'kind of person' or even as several different 'kinds' at once" (Gee, 2000, p. 99). The Multiple Identity Approach heeds the dynamic side of identity especially in contextually specific situations. Thus, this theory provides a conceptual framework for examining the current research undertaken, in terms of how the teachers see themselves differently or behave differently in different contexts especially when in front of students of different cultural groups. It opens up consideration of whether the participant Chinese

teachers share teachers' attributes with others in the world despite stereotypical notions of race or nationality.

The research undertaken is geographically situated in a metropolitan Chinese university. Through the lens of Social Identity Theory, the participant teachers' self-imaging and self-conceptualization of their core identity as CFL teachers is expected to be captured through their narrated experiences. These teacher narratives highlight the attributes of self and/or their similar ingroup, and may originate from their accumulated prototypical, preconceived knowledge of teaching as a profession: potentially a static view of such sociocultural characteristics as the "linguistic, ethnic, racial, and gender" (Yazan, 2018, p. 27) of students and teachers. The teachers' understanding of self-identity is articulated through their individual and professional identities as "pre-context" (in that they are pre-determined by their linguistic, ethnic, racial, and gender status), and thus may be temporarily stable. From the perspective of a Multiple Identity Approach, the CFL teachers in this research interact with their local ingroup Chinese students, who were similar linguistically, culturally and possibly ethnically. At the same time, included in their classrooms are students from overseas, termed "outgroup" in this research. Contextually specific analysis of teachers' interview data captures the fluidity of teacher identities in response to the change responses in and across "mini-contexts". Through this lens the teachers' identity negotiations and switching in response to their active participation in various cultural groups of teaching and learning is apprehensible. In this way the use of the two conceptual frameworks of Social Identity Theory and Multiple Identity Approach enables a more complex and nuanced understanding of identity creation as being both stable and dynamic.

The research

In this research, a qualitative approach underpinned by an interpretivist paradigm is employed to seek teachers' views of themselves and their identity as teaching professionals. Interpretivism stresses the need to locate analysis in context, as individuals understand the external world from their subjective experiences (Reeves and Hedberg, 2003). The objective of this research is to explore the identity of Chinese background CFL teachers as they engage with students from various cultural groups within their daily practice. Adopting an interpretivist paradigm provides possibilities for understanding and theorizing the teachers' identity through their subjective conception of self (Pennington and Richards, 2016).

The research was conducted at a university in Southern China. Six Chinese background CFL teachers were recruited from its Chinese Language and Culture College. The University was selected as the research site due to its CFL courses offered to both Chinese local and international students. With the

assistance of the Academic Affairs Office recruiting documents were emailed to the faculty teachers who had had CFL teaching experiences with local and international students. Six teachers expressed interest and participated the interview (see Table 1).

Interviews were the primary source of data reported in this manuscript. A semi-structured interview protocol was employed to maintain the interview focus *via* a prepared set of guiding questions, whilst still permitting the expansion of the initial interview scope (Morse, 2012). The interview questions were designed to reveal the participants' self-conception as teachers, particularly their teacher's subject matter, relationships, and pedagogical identities when teaching students with the same, and different language and cultural backgrounds to their own. The interviews were conducted in Chinese language – the participants' first language (L1), considering they were more comfortable with the language when expressing themselves (see "Appendix A" for the interview protocol). Authors 2 and 3 conducted the semi-structured interviews and Authors 1 and 4 manually transcribed the data. Author 2 translated the data into English, and to ensure the accuracy authors 1 and 3 checked through the translated documents. To keep the participants' identity anonymous, pseudonyms were used in all the transcripts.

The data were scrutinized through thematic analysis, an umbrella term for a variety of approaches, rather than a singular method (Braun and Clarke, 2006; Guest et al., 2012). One of the traits of thematic analysis is its flexibility—flexibility with regards to framing theory, research questions, and research design (Clarke and Braun, 2017). As with most research methods, the process of data analysis in this research occurred in two primary ways—inductively and deductively (Braun and Clarke, 2006). Through an inductive process, the themes identified or generated were data driven. In applying deductive processes, the coding was directed or guided by the two reviewed theories. This process was more interpretative as the analysis was shaped and informed by reviewed and selected

TABLE 1 The participants' background.

Fictious name	Gender	Age	Teaching experience	Teaching areas
Jing Lin	Female	33	7 years	Chinese lexicology
Wei Le	Female	30	4 years	Chinese linguistics
Wei Wang	Female	37	10 years	Chinese linguistics
Xia Xiao	Female	41	11 years	Chinese lexicology
Xing Liu	Female	33	4 years	Chinese poetry appreciation
Yuan Wang	Female	27	1 year	Culture of Chinese characters

theories and concepts. Specifically, the process followed Braun and Clarke's (2006) protocol: familiarizing with the data, open coding, highlighting, and collating initial codes, categorizing the codes with reference to the research questions, identifying themes, refining and interpreting themes, and theory-directed synthesis and development of arguments.

Findings

Data reveal that the teachers' self-conceptualization of identity is a result of the complexities between their pre-existing notions of "local" and "international" groups of students and their interactive experiences with each. They labeled the local as "our own students" whereas international students were referred to as "overseas" and "they". This dichotomy resulted in an "ingroup" comprising the teachers and the local students and an "outgroup" encompassing the international "they" students, somewhat bundled together as a unified group regardless of their diversity across nationality, and ethnic and linguistic backgrounds. This division created the situation where the identity of the CFL teachers themselves operated across two junctures in relation to their understanding of CFL as a subject and its content knowledge, positioning self as a teacher when relating to students, and pedagogical adjustment when teaching the "ingroup" and the "outgroup". These switches in identity were exemplified in practice and revealed that this phenomenon was not just a matter of individual identity adjustments. Data indicates that the teachers as a group demonstrated some common tendencies in identity shifts.

Proud authoritative knowledge holders versus down-to-earth practical technicians

Based on the interview data, the teachers appeared to differentiate the two groups of students in terms of levels of expectations and responsibilities. Data reveal that for the student "ingroup", content was expanded from a language-only focus to teaching language, culture, and history, and from direct language skills to an approach valuing language and theoretical understanding. The curricular and pedagogical content was thus expanded from language practice to teaching a comprehensive knowledge of the language system (Table 2). Evidence of variation in expectation and responsibilities for "ingroup" and "outgroup" persisted across the teacher interviews even though both groups were being educated to be future CFL teachers. One participant teacher acknowledged that "local and international students enrolled in different programs . . . all will be CFL teachers after graduation" (Jing Lin).

The teachers' expectations of local students are substantively different from expectations of the international cohort. The teachers mostly believe that their local students need a curriculum inclusive of more advanced knowledge beyond a limited language focus, featuring classic and/or contemporary pieces of literature, and providing an historical and cultural infusion into the subject knowledge:

> For our own local students, my teaching is always linked to Chinese literature and history as we say language, literature and history are not separable. As a CFL teacher of Chinese background, they do need to have profound knowledge beyond the language itself (Xing Liu).
> I need to give them (local students) a complete knowledge system. I must cover this amount of content within the semester (Wei Le).
> I extended it (teaching and content) far more than the textbook. I use the textbook as a reference, but I like to add new theories and some advanced knowledge in the field (Xia Xiao).

Their understanding of suitable subject content for local students includes teaching "profound knowledge" (heritage knowledge) (Xing Liu), a "complete knowledge system" (Wei Le) and "advanced" knowledge (Xia Xiao). The teachers acknowledged that the selected content for the "ingroup" was broader and deeper. It should be beyond language and at knowledge level. Across this group of teachers, the international students received a tailored curriculum for their CFL course with a focus on language competence and skills, aiming at meaning making and communication at a practical level:

> For international students, we have prescribed textbooks, which are quite scientifically designed. I basically follow the textbook and add some exercises and activities for them to practice (Jing Lin).
> Since they are going to teach Chinese after graduation, I choose the words that they are more likely going to use

TABLE 2 Teacher as an academic knowledge holder or a down-to-earth practical technician.

Dichotomy	International – "outgroup"	Local – "ingroup"
Teacher's understanding of TCFL as subject knowledge and teaching content	Language only (Hanzi) with minimum culture	Extension to Hanzi culture and history
	Language skills with basic level theoretical explanation	Extension to theoretical understanding
	Language application with limited theoretical knowledge	Extension to theoretical knowledge
	Specific practical skills	Teaching a complete knowledge system

or teach when they become teachers. The content is more practical (Yuan Wang).

... You can have a look at my PPT. You will see the homework I gave them. They are all sorts of repetitive exercises. The program for international students is different. That focuses on students' language skills (Xia Xiao).

For international students, I focus on language skills. I train their listening, speaking, reading and writing skills. Nothing in-depth (Xing Liu).

In contrast to the curriculum implemented for the local "ingroup" students, the teachers collectively imagine a suitable subject content for international students as following the "prescribed textbook" (Jing Lin), focusing on "language skills" (Xia Xiao), choosing "practical" content (Yuan Wang), "repetitive" exercises (Xia Xiao), with an exclusion of profound subject knowledge. The students' background impacted on these teachers' decisions on the selection of subject knowledge and content in practice. When teaching the "outgroup" of international students, the teachers enacted a functional or practical "technician" approach. One argument might be that these teachers' passion for teaching content linked to Chinese heritage does not gain traction with their students in the "outgroup". Nevertheless, their understanding of self as a CFL teacher of Chinese background seemed certain. That is, the "ingroup" students should not only know the language, but more importantly, be exposed to the heritage of the nation's classic literature, history and culture and become part of that tradition. The "Chineseness" and the identity of a Chinese language teacher lies in these legacies. This is reflected from some excerpts from the data:

When I teach our own students (local Chinese students), I have the sense of achievement. I feel the things I did are more valuable. You know that the precious knowledge you have accumulated has been passed on to the students. I feel the pride and respectable status as a teacher – 传道授业解惑 (pass on the knowledge, prepare them for a career and solve their puzzles) (Jing Lin).

... (To international students) you feel like you are teaching children sometimes, and the content is very basic, shallow and unchallenging. You lost that kind of proud feeling of being a teacher—a job that is very important and respectable (Wei Le).

These data excerpts portray a shift in their feelings and identity as to what constitutes a successful fulfilling career, with their professional work defined by the need to renegotiate subject knowledge and teaching content in order to engage the "outgroup" students. In response to the necessary content changes, their sense of being a proud Chinese language teacher was lost. They valued the content they taught to local Chinese students as providing them a "sense of achievement" (Jing

Lin): pride, dignity and confirmation of the sanctity of their identity as authoritative knowledge holders. The content they chose to teach international students was "basic, shallow, and unchallenging" (Wei Le) due to this group's lack of foundational heritage knowledge. This finding is comparable with Gong et al.'s (2018) research in which CSL teachers' objective of teaching was more skill-oriented than knowledge-oriented when facing international students. Even though redefining the curriculum for the "outgroup", the language teachers maintained their original belief and image of an ideal CFL teacher. The changes they made at a practical level were to better cope with the new conditions or challenge their "outgroup" students had brought. However, their value system around the subject knowledge a CFL teacher should hold and should teach was not changed.

Hierarchical distant teacher–student relationship versus closely active mutual friendship

The teachers' relationships with their 'own' students (local Chinese students) were different to that established with the international students. Interview data reveals a tendency for the teachers to be serious and strict, showing distance when teaching local students, while engaging with the international students in an approachable, relaxed, and friendly manner:

It's easier to communicate with international students. Naturally, I feel closer to them and I know them better. A lot of interactions happened with them in my class, but with local students, I feel the distance. They seldom approached me with questions or chitchat (Wei Wang).

In class, interaction happened more with international students, and I was more familiar with them (Xia Xiao).

I personally feel that I have a closer relationship with the international students. It feels like there is an emotional connection and I feel like making friends with them. I am a bit serious with our local students and there is a distance there (Jing Lin).

I do not know why! I am the same teacher, but different when teaching different students. I behave in one way when teaching a class of Chinese students, and another when dealing with a class of international students (Jing Lin).

The participant teachers admitted that they are "the same" teachers but behave "differently" in front of the local and international students (Jing Lin). Through interaction and communication, they established close "emotional connection" with the international students (Jing Lin; Xia Xiao). This relationship came along "naturally" (Wei Wang). However, when with local students they were "serious" and felt "the distance" (Jing Lin; Wei Wang). Most of the teachers ascribed this divergent behavior to differing characteristics within the

student cohorts themselves. That is, they saw the change as an accommodating response to ingroup and outgroup differences.

> International students mostly actively participate in class activities. They are more willing to speak and interact with me. It does not matter if the content is easy or difficult. They tracked you closely. I can not say my own students are not interested but they normally do not show it on their face. They sometimes do what interests them in class instead of following me (Xia Xiao).

> International students comparatively show a more serious attitude and passion to learning. I feel closer with them because they like to share their thoughts with me and make me know better about them. That actually gives me passion to teach them (Wei Le).

> They (international students) are interested in the local culture here and they are curious about my daily life. They are keen to get to know me and my life. Some of them like to talk to me about their experience and invite me to join their on-campus activities (Yuan Wang).

> They (international students) respect me. They would take the initiative to say hello and goodbye, and they would tell me in advance if they had any needs such as going to the bathroom. When they see me on-campus, they would greet me with a warm hello (Wei Le).

> International students like to ask questions in class. They always want to know what this is and why it is so. Maybe this is because this language and culture is totally new and strange to them. They are more curious and eager to learn the knowledge. As for local students, since they have this cultural background, it seems much easier for them to accept the idea and they can understand it just at a glance (Xing Liu).

> Emotionally, I am keen on international students because they are always responsive in my class, but I can always expect to get more logic and in-depth answers from local students. We can talk about the latest research in this area and discuss more academic and professional issues. Maybe because of the language barriers, I think it is good to just tell international students the basics and make them clear (Jing Lin).

Data from the interviews indicates that international students as a group tended to show the characteristics of being active, initiative, passionate, willing to connect and express interests, whereas local students tended to be reticent, reserved, stony-faced and indifferent sometimes. The teachers described the international students as "more willing to speak and interact" (Xia Xiao), showing "more serious attitude and passion" about learning, willing "to share their thoughts" and "experience" (Wei Le; Yuan Wang), "curious about" the teacher's daily life. "take the initiative to greet the teacher" (Wei Le). "More curious and eager to learn the knowledge" (Xing Liu) and "always responsive" in class (Jing Lin). The passion the

international students showed for learning, and the explicit interest in and the respect for the teachers all contributed to the teachers' emotional engagement with this group. For local students, the teachers' descriptions include "They do not show it (interest in learning) on their face" and "They sometimes do what interests them in class" (Xia Xiao). Although sometimes teachers could "get more logic and in-depth answers" from them (Jing Lin), the teachers did not establish close emotional ties with the ingroup students due to their being less proactive and less expressive in or outside class.

In general, the being and doing of the two groups of students shaped the CFL teachers' relational identities. They were more rational with the local students and more emotional with their international student cohort. With the local students, they "acted" more as a teacher or an academic. They held tight with the teachers' "dignity" by being serious in speech and manner. When engaging with their international students, displaying a "natural" and "genuine" persona rather than a more emotionally distant professional figure. This seems comparable with Wang and Du's (2014) research findings which indicate that CFL teachers reframed their identity toward teacher-student relationship as "equal and plain" with students in the Danish contexts due to institutional impact and "overseas-born status as outsiders" (p. 450). The teachers participating in this study transformed their relational identity with international students. At face value this transformation was not due to the institutional or sociocultural factors but the students' ethnic and cultural differences only. The behavior of the teachers with the ingroup seems to be very much about being nested in a cultural context – the sociocultural rules implicit in Chinese culture, whereas teaching the outgroup of international students enable the teachers to operate outside of those cultural expectations and experience diverse ways of relating. So even though the teachers viewed the changes in their teaching as being due to the student differences, it was also due to their own (temporary) release from a hegemonic cultural context.

Sage on the stage versus guide on the side

The teachers described two different modes of teacher pedagogical identity, to some extent related to the two different groups of students Among the six participant teachers, there were four who implemented a teacher-centered or "sage on the stage" pedagogical style whereas the other two comfortably exercised a student-centered or "guide on the side" approach. Thus, the majority of the CFL teachers were expository advocates, as opposed to constructivist practitioners. For the four teachers who practiced expository teaching, they were the center of the teaching and learning, the knowledge holders, the transmitters, and leaders. This was the case especially with the local ingroup students:

The nature of this course is quite theoretical. They rely on my explanations a lot. It will not be effective for them (local Chinese) to learn in a self-directed way (Jing Lin).

For my local students, they prefer to listen to the lecturer's talk. Discussion in class is not their favorite way of learning. If I make my class a discussion type, most of the students would think: My God (哎呀)! This is a watered-down (很水) lesson (Wei Wang).

Local students in general are reserved. It is hard to make heated discussion happen in class. It often turns out to be the teacher's one way presentation (Xing Liu).

If I design this lesson as a discussion type (for local students), it means, they need to do a lot of preparation before they come to the class. The problem is they are not used to it. Also, they are under great pressure from their other subjects. I tried this, and it was a failure (Wei Le).

International students are probably used to the mode (teamwork), but for my locals, they might feel teamwork is too much extra work. If it is not allocated to individuals, they feel that it is not their work. Other team members can do it (Jing Lin).

The teachers provided various justifications for their teacher-centered pedagogy with local students. These include the theoretical nature of some subjects thus difficult for student-centered learning, the students' preference for teacher-directed presentations, students' views that student-facilitated sessions are "watered-down" teaching, students' lack of a collaborative learning spirit and increased preparation pressure on students for learner-centered classes. According to these teachers, the local students' "passive" learning style seemed to be the main factor that contributed to their teacher-centered pedagogical decision. They "rely on the teacher's explanations a lot" (Jing Lin). "Discussion is not their favorite way of learning" (Wei Wang). They preferred "the teacher's one way presentation" (Xing Liu). "Teamwork is too much extra work" for them and they were not used to it (Jing Lin). These quotes indicate that the "sage on the stage" approach is needed for the local students primarily. The student expectation of a "sage on the stage" seems to be a cultural construct they bring to the lessons (at least as it is perceived by the teachers).

With reference to the international groups, all four teachers maintained a similar teacher-centered role as a pedagogical approach, however, the evidence for this was based on different concerns:

I focus on training their (international students) language skills. A typical lesson includes my presentation of the content, followed with the exercises I prepared for them to practice. I make sure they master language skills and enhance their communicative competence through lots of repetitive exercises (Wei Wang).

I often ask them questions, but most are close-ended ones as open-ended questions are difficult for them. You saw the questions I left with them today? They can find answers in the textbook. For the final exam I prepared, they can also find ready answers in the textbook (Jing Lin).

This semester, the university combined all my international students into one big class. Ideally, as before I could organize more interaction in class, but now only the first two rows have a chance to be called on, to answer my questions. It is not realistic to look after everybody when the class size is big (Xing Liu).

I applied more teacher-student interaction for this group (international). I did not use much of student-student interaction, and as for student groupwork, there was even less. The interactions were mainly between me and them through close-ended questions (Wei Le).

In response to their "active" international students, the data reflect that the teachers endeavored to create more interactive opportunities in class. However, these so-called "interactions" were basically initiated by the teachers in the form of questions for students to answer. Most notably, the teachers relied on close-ended questions intended to assess students' content knowledge. There were no data revealing genuine student-student teamwork nor students' leading activities in the lectures and interviews with these four teachers. It can be argued that the teachers still played a dominant role in the "outgroup" classes. Their pedagogical identity had not changed in response to their more active international students. Those efforts to engage students in one-on-one interactions at most can be acknowledged as expository teaching with constructive characteristics. The necessity of a teacher-centered approach was also due to institutional constraints, in the form of class sizes.

In contrast the other two teachers exhibited a "guide on the side" teaching style across both local and international student groups. They chose not to lecture students but provided opportunities for the students to learn through experiences promoting teamwork. The teachers' role was to facilitate when needed:

One of my subjects is lexicology for local students. As I said earlier, I did not lecture or teach them. Instead, I uploaded the videos to the forum for them to view. In class, I let them share the information and spend time analyzing language phenomena. I did not give them the answer or solution. They could work out their own answer or draw their own conclusion (Xia Xiao).

I think it is useful to lecture them with knowledge, but this kind of knowledge can be obtained by students themselves. I think teaching them how to analyses and how to think critically is the key for university students (Xia Xiao).

The class for international students is topic-based. I always find out their interested topics. Like last week, I suggested ken lao zu (boomerang children), that did not interest them. I then tried pop music. The discussion was

good. Everybody seemed to have something to say or share (Yuan Wang).

When they are doing activities, I will walk around and see whether they need help. Like last time when they discussed about the topic of traffic, one team asked me the hotline service number, I checked and gave it to them. The classroom is their show place. I am just there to help (Yuan Wang).

Rather than positioning themselves as authoritative knowledge holders with a transmissive mission to pass on that knowledge directly to students, these two CFL teachers chose to divert from lecturing, focusing instead on their students' interests, high level thinking and problem solving. Xia Xiao let the students "share the information and spend time analyzing language phenomena", and "work out their own answer or draw their own conclusion". Yuan Wang conducted "topic-based" teaching for students to "have something to say or share" as she said "The classroom is their show place. I am just there to help". These teachers placed the students at the center of learning, and themselves as facilitators, which demonstrated their constructivist teaching ideology and practice.

Discussion

The findings from this research have generated some themes worthy of further discussion. Firstly, these Chinese language teachers demonstrated similar social identities or collective identities when engaging with different cross-cultural groups of students, that is, group-based identities. They unanimously felt local students were "their own", which implies that they belonged to the teachers' "ingroup", and international students as "outgroups" were treated differently. Using Hogg's (2018) argument promoting a social identity perspective, the teachers established "group-based identities" (p. 117). They, as a group of Chinese language teachers, had shared "self-defining attributes", and had engaged in teaching "to forge an image of what the group stands for and how it is represented and viewed by others" (Hogg, 2018, p. 117). The attributes of this shared identity for the "ingroup" students include their view of the importance of CFL teachers' subject knowledge, their relational identity when interacting with students, and the majority of the teachers' pedagogical identity – a teacher-centered expository approach. For the "outgroup" students, the attributes of their shared identities required similarly adjusted views on understandings of subject knowledge, interpersonal relationships, and pedagogical approaches, with simpler curricular values, more relaxed interpersonal relationships, but overlapping pedagogical approaches. These group-based social identities or collective identities, form what can be regarded as, the core identities of Chinese CFL teachers.

In terms of subject knowledge, the relationship between teachers' self-acknowledged expertise and their identity has

been documented (Bryan, 2003; Mulholland and Wallace, 2005; Brooks, 2016) as has the close connection between teachers' subject knowledge expertise and students' achievement (Muijs and Reynolds, 2003). In this research, the CFL teachers, as a group, tended to share similar ideas on what and/or how much subject knowledge was required to confirm their identity as successful language teachers. They perceived that a Chinese language teacher should not only be a language expert, but more importantly s/he should be conversant with the nation's classic literature, historical and cultural knowledge in order to achieve the status of a "dignified" teacher of local student cohorts. When teaching an enriched curriculum beyond language skills to the "ingroup" students, their identity as language teachers was fulfilling and embodied a positive self-image. These attributes were partially maintained during the teaching of the "outgroup" students, although the interview data confirmed the teachers did not have the same sense of fulfilment when presenting a basic, foundational language curriculum required by the international "outgroup" student cohort.

The CFL teachers displayed a dichotomy of identities with regards to their relationships and engagement with the local Chinese and international student groups. With international students, the teachers demonstrated warmth, closeness, and friendliness whereas with the local students they showed distance and strictness. As previous research found, teachers often negotiate their relational identity between "juggling their position as students' friend or ally" and at the same time "retaining ... authority" (Johnston, 2002, p. 103). This may lead to contradictory self-conceptualizations of "who they are" (Akkerman and Meijer, 2011). The co-existence of their contradictory or multiple identities further verifies the argument that "context is one of the significant determiners of the entangled processes of language teacher identity," and particularly the change to the immediate social context (such as a new group of learners) is very influential in developing teachers' relational identities (Yazan, 2018, p. 36; Gee, 2000). From the Social Identity Theory perspective, the embodiment of a dichotomous relational identity reflects the teachers' self-enhancement and attempts at reducing uncertainty (Hogg, 2018). Namely, when engaging with a group of students from unfamiliar cultures, the teachers took on the persona of a "nice" and "friendly" colleague to achieve "positive intergroup distinctiveness" (Hogg, 2018, p. 121). This self-enhancement process is an endeavor to reduce their subjective insecurities brought about by the inclusion of the student "outgroup". This makes it sound like the teachers were quite instrumentalist in being friendly to the international students. Their comments in the interviews seem to show that they genuinely enjoyed their interactions with the outgroup, and their own sense of relaxation and friendliness emerged as a response to the different cultural characteristics of the students rather than being "instrumentalist" in trying to bring about a sense of inclusion.

In terms of pedagogical identity, the Chinese CFL teachers demonstrated a minor shift within their preferred teaching

method. As a group of teachers, the majority maintained expository practice, as the differences in the learning styles or characteristics between the "ingroup" and "outgroup" students were not such that a pedagogical switch resulted. This finding aligns with Han's (2022) research, which supports the argument that expository teaching dominates China's higher education system due to historical, social, and cultural reasons. Gong et al. (2021) ascribed the one way transmission style of teaching to Chinese teachers' "relatively narrower and more ethnocentrically-positioned" identities (p. 13). It can be concluded that the teachers in this research did realize the need and endeavored to teach international students in a more co-constructive way. This finding differed from the results in Yang's (2019) research, which reported that CFL teachers in the United Kingdom strived to transit to a student-centered teaching approach to adapt English school context even though being hampered by the limited insights of the core values of English education system. This finding is also different from Wang and Du's (2014) investigation in which CFL teachers in Denmark transformed themselves from "knowledge authoritarian" to "learning facilitators" (p. 446). The inconsistent results indicate that compared to those CFL teachers in overseas contexts, the participant teachers in their own country were more insistent with their original pedagogical identity, with minor shifts to accommodate the two different student groups. The identified minor pedagogical shift when dealing with different groups reflected the teachers' negotiation between their institutional identity and individual agency. On the one hand, their governing institution may have acted as "laws, rules, traditions, or principles of various sorts" which enabled them to hold "the rights and responsibilities" aligning with their professional identity (Gee, 2000, p. 103). It ensured or even enforced that the teachers' pedagogical identity strove toward stability and continuity (Akkerman and Meijer, 2011). On the other hand, they mediated the relationship between the new social environment (international "outgroup" students) and their original self (Ruohotie-Lyhty, 2018, p. 25) enacting their "identity-agency" to ensure that any shift was in the range that did not decentralize their pedagogical identity.

Conclusion

This research examined the identities of a group of CFL teachers through their imagining and conceptualizing of self when teaching students from their own and from other language and cultural backgrounds. Based on teacher interviews, the research concluded that teachers saw student backgrounds and expectations as a determining factor in the development of teachers' relational identities. However, their value and belief in the importance of the subject knowledge a CFL teacher should possess, and the image of what makes an ideal CFL teacher were not substantially changed across the "ingroup" and "outgroup".

This attribute of their identity was sustained even though the teaching content was modified at a practical level in response to the challenges the new "outgroup" student groups brought. Similarly, when teaching "ingroups" and "outgroups", the CFL teachers' pedagogical identity remained stable with only minor modifications, indicating an identity construction that was both stable, and dynamic in response to contextual factors.

This research was conducted through a qualitative method, focusing on a small number of participants from one university. Future studies can consider applying a mixed method to enhance the trustworthiness of the data.

Data availability statement

Ethics statement

Author contributions

Conflict of interest

Publisher's note

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Appendix A: Interview protocol

Can you give some background information about yourself (e.g., age range, qualification, years of teaching etc.)?

Have you had experience of teaching local Chinese students and international students?

How did you feel about yourself as a teacher when facing culturally different cohorts of students?

Did you have to adjust teaching style or method when teaching local and international groups and how does that impact on your pedagogical identity?

Did you have to adjust the way you engage and interact with students when managing local and international groups and how does that impact on who you feel you are as a teacher?

What is your imagination or criteria of being an ideal CFL teacher in terms of the subject knowledge a teacher should be equipped?

How is this reflected when you face local and international groups?

![frontiers] Frontiers in Psychology

The roles of motivation, anxiety and learning strategies in online Chinese learning among Thai learners of Chinese as a foreign language

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The impact of motivation, anxiety and learning strategies on the achievement of foreign language proficiency has been widely acknowledged in the context of traditional offline classroom settings. However, this issue has not been extensively documented in relation to online learning, which has become the predominant form of language learning during the period of the COVID-19 pandemic. The current study was conducted to investigate the relative prediction of motivation, anxiety and learning strategies for second language achievement among 90 Thai adult learners of Chinese as a foreign language (CFL) who took online Chinese courses. The participants completed a questionnaire dealing with motivation, anxiety, learning strategies, and their Chinese proficiency was measured by self-report and a Chinese vocabulary size test. A series of hierarchical regression analyses revealed two major findings. First, anxiety emerged as the most stable factor for the participants' CFL achievement, followed by learning strategies and motivation. Second, motivation, anxiety and learning strategies only significantly predicted the participants' self-rated Chinese language proficiency, but not their performance on the Chinese vocabulary size test. The overall results indicate the relative importance of motivation, anxiety and learning strategies to Chinese language learning in the online environment and suggest different measures of CFL achievement may lead to different research findings. The general findings were of theoretical and pedagogical significance for understanding and addressing individual differences factors in online language learning.

KEYWORDS

online language learning, foreign language anxiety, learning motivation, learning strategies, Chinese as a foreign language

Introduction

An increase in online education has been accelerated by the COVID-19 pandemic. Traditionally, online learning was viewed as a complement to classroom instruction, but it has become increasingly common across the broad spectrum of education during the COVID-19 period, including second/foreign language learning at universities, and this trend is likely to continue in the near future (Klimova, 2021; Maican and Cocoradă, 2021). Compared with other languages, the demand for the learning of the Chinese language is in full swing globally due to Chinese economic and social importance (Zhong et al., 2021), given that China has maintained steady economic growth during this period. There may thus be a positive outlook regarding the increase of Chinese learners around the world, which calls for greater attention to research concerning Chinese learning (Ma et al., 2017; Gong et al., 2018, 2019).

The Socio-educational Model of second language acquisition (SLA), proposed by Gardner and MacIntyre (1993b) (Figure 1), suggests that second language (L2) learning outcomes are influenced by antecedent factors, individual differences variables and language acquisition context. Individual differences have been assumed to account for a great deal of the learners' L2 attainment variance and are found to be the most consistent predictors of L2 learning success (Dörnyei, 2005). According to Gardner and MacIntyre (1993b), individual difference variables include intelligence, language aptitude, learning strategies, attitudes, motivation and anxiety. It is important to note that measuring intelligence and language aptitude may encounter unique difficulties in accessing suitable measurement tools and pose some ethical problems (Reed and Stansfield, 2004), and that attitudes and motivation have been integrated with tools such as the Attitude/Motivation Test Battery (Gardner and Smyihe, 1981), therefore, motivation, anxiety and learning strategies could be considered as the three fundamental components of individual differences variables in SLA. In recent studies examining individual differences variables in SLA, motivation, anxiety, and learning strategies were ranked as the top three variables (Lei and Liu, 2018; Zhang, 2019b).

Furthermore, online learners may encounter new challenges in relation to motivation, anxiety and learning strategies. In comparison to the offline classroom settings, for example, online learners may feel less motivated and more anxious due to the lack of intermediate feedback and help from instructors or interaction with their classmates, therefore they are required to be more self-regulated (Ma, 2022; Zahradnikova, 2022; Zhang, 2022). Moreover, these variables (motivation, anxiety and learning strategies) might work differently in the online learning environment (e.g., Estrella, 2022; Mihai et al., 2022). Considering the significant gap between studies on individual differences variables in the two learning contexts (offline vs. online) (Table 1) and the unique features of online learning (Hampel and Stickler, 2015; Russell and Murphy, 2021), as

well as the popularity of online learning during the period of COVID-19 pandemic, it is imperative to investigate whether these three individual difference variables affect the achievement of online language learning.

Literature review

As is known, each of the constructs of motivation, anxiety and learning strategies could be decomposed into different components, which might exert different influences on SLA (Dörnyei, 2005). As a result of the limited space and the focus of the present study, the review section concentrated on the influence of the general constructs of motivation, anxiety and learning strategies, rather than the sub-dimensions of each construct, on L2 learning. Furthermore, according to the model proposed by Gardner and MacIntyre (1993b) (Figure 1), motivation influences anxiety, which in turn influences learning strategies. Thus, following such a path, this section reviewed studies about motivation, anxiety and learning strategies, respectively.

Motivation in foreign language learning and CFL learning

Motivation to learn a new language could be defined from a distinctly behavioral perspective as the effort individuals exert to learn due to a "desire" to and in seeking "satisfaction" from the experience (Gardner, 1985). Many researchers have explored how motivation works using various theoretical frameworks (Boo et al., 2015), including the instrumental and integrative orientations (Gardner, 1985), intrinsic and extrinsic motivations (Noels et al., 2000) and the ideal and ought-to L2 selves (Papi, 2010; Papi and Teimouri, 2012, 2014), and it has been widely acknowledged that motivated learners tend to outperform the less motivated ones in SLA (Dörnyei, 2005; Papi, 2018; de Burgh-Hirabe, 2019; Gong et al., 2020; Sudina, 2021).

In their meta-analysis of 75 studies, Masgoret and Gardner (2003) found that most studies showed a moderate correlation coefficient ($r = 0.39$) between motivation and L2 achievement, and this relationship did not differ significantly across the learning contexts (second vs. foreign language) and ages of the participants. However, it remains unclear whether this relationship applies to online education. As an example, Ushida (2005b) found that learners' motivation ratings were significantly correlated with their module test scores and their performance in online chat sessions at the end of the semester among L2 learners of French and Spanish. In contrast, Lin et al. (2017) observed that high-school students' final grades in an online course were not predicted by intrinsic or extrinsic motivation. These different findings may be attributable to factors such as the research contexts, recruited participants
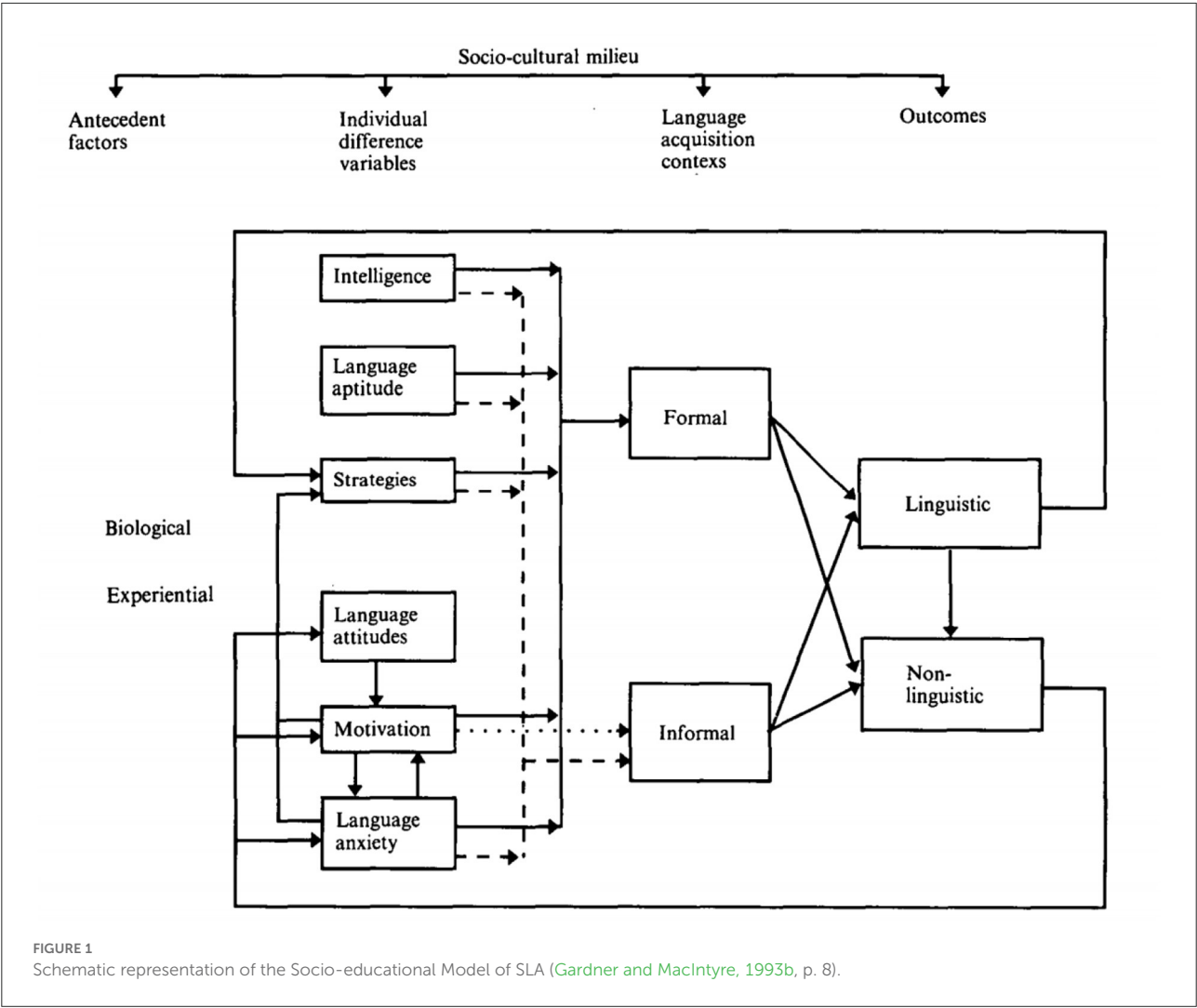
FIGURE 1
Schematic representation of the Socio-educational Model of SLA (Gardner and MacIntyre, 1993b, p. 8).

TABLE 1   Results of keyword search on *Web of Science* and *Scopus*.

	Web of science		Scopus	
Keywords	2018–2022	2020–2022	2018–2022	2020–2022
Foreign language learning motivation	1,199	421	991	592
Online foreign language learning motivation	115	59	93	67
Foreign language learning anxiety	427	173	348	215
Online foreign language learning anxiety	50	32	34	32
Foreign language learning strategies	1,119	638	2,298	590
Online foreign language learning strategies	122	50	97	72

The data indicates the numbers of articles that have been searched and was accessed on 16th March, 2022.

and the timing of the study, indicating that more research is necessary to investigate the role of motivation in online learning in different contexts.

Research on motivation to learn Chinese language has mainly concentrated on topics such as the construct of Chinese as a second language (CSL) or CFL learning motivation

(Cheng, 1993; Wen, 1997, 2011; Comanaru and Noels, 2009), the influencing factors of CSL/CFL learning motivation (Lu and Li, 2008; Chua et al., 2009; Cai and Zhu, 2012; Ruan et al., 2015; Ji et al., 2017; Gong et al., 2020), and the comparison between Chinese-as-heritage-language (CHL) and non-CHL learners' motivation in North America (Lu and Li, 2008; Comanaru and Noels, 2009; Wen, 2011). A limited number of studies have examined the relationship between motivation and Chinese language proficiency, but with inconsistent results. For instance, among the CFL learners in the U.S., Wen (1997) found that intrinsic motivation was a significant predictor of Chinese course achievement ($n = 77$), and Lu and Li (2008) reported a similar finding concerning integrative motivation and test scores ($n = 120$). However, it appears that research about the CFL learners in less developed countries produces different results from American CFL learners. As an example, Ter et al. (2020) reported a negative relationship between integrative motivation and self-rated Chinese competence and a positive relationship between instrumental motivation and self-rated Chinese competence among 205 undergraduate CFL learners in Malaysia, and Zheng and Richard (2021) observed a weak relationship between motivation and Chinese academic achievement among 164 Grade 6 students in Thailand.

Anxiety in foreign language learning and CFL learning

Anxiety is a critical aspect of effect in language learning and plays an imperative role in SLA (Horwitz, 2016, 2017; Oxford, 2017; Gregersen, 2020; Sudina, 2021; Jiang and Papi, 2022; Pan et al., 2022). In general, foreign language anxiety (FLA) is defined as "a distinct complex construct of self-perceptions, beliefs, feelings, and behaviors related to classroom language learning arising from the uniqueness of language learning process" (Horwitz et al., 1986, p. 128). It has been proposed that FLA exerts a negative influence on language learning performance through a variety of mechanisms, including Krashen's affective filter hypothesis (Krashen, 1981, 1982), the three analogies of FLA (communication apprehension, fear of negative evaluation, and test anxiety) put forward by Horwitz (2016, 2017), MacIntyre and Gardners' model of causality between anxiety and L2 learning (1989) and the dynamic nature of anxiety (Gregersen, 2020). Irrespective of these different theoretical frameworks, the negative influence of FLA on L2 learning performance has been widely documented (Botes et al., 2020; Russell, 2020; Dikmen, 2021; Sudina, 2021). A recent meta-analysis article based on 69 studies from 14 countries found that FLA showed a relatively strong yet negative correlation coefficient with EFL performance ($r = -0.61$),

and that this relationship did not vary significantly across the grade level or country (Dikmen, 2021). However, most of the previous studies were conducted in the traditional offline classrooms, and less attention has been paid to FLA in the context of online learning (Russell, 2020). In other studies, the components of online FLA (Wang and Zhang, 2021) and the resources for online FLA (Coryell and Clark, 2009) have been evaluated, as well as the comparison of FLA between classroom and distance learning (Pichette, 2009), but no studies have investigated whether the negative association between FLA and L2 learning performance holds true in an online context.

Gardner and MacIntyre (1993a) further found the impact of different measurements of L2 achievement on research findings related to this issue. Gardner and MacIntyre examined the associations between anxiety and various measures of language achievement in French, and reported a higher negative correlation coefficient between anxiety and self-rated proficiency than that between anxiety and objective measures such as cloze test and word production. Gardner and MacIntyre pointed out that measures of anxiety were linked to learners' concerns about their perceived inadequacy, as evidenced in the close relationship between low-levels of anxiety and different types of positive emotions such as self-confidence (Clément, 1986), hope, optimism and agency (Oxford, 2017), which would probably have a greater influence on subjective self-ratings than on objective tests. Thus, different measures were recommended by Gardner and MacIntyre to assess learners' L2 achievement in exploring the role anxiety plays in SLA.

A variety of approaches have been taken to explore Chinese learning anxiety. In terms of participants, researchers have examined the issue of Chinese learning anxiety among CHL learners (Xiao and Wong, 2014; Luo, 2015) and CFL learners (Luo, 2014a,b; Zhou, 2017; Sung and Li, 2019) in the U.S. and Thailand (Zheng and Richard, 2021), and CSL learners in China (Basith et al., 2019). Based on the scope of learning anxiety, some studies focused on Chinese learning anxiety (Luo, 2013, 2015; Basith et al., 2019; Sung and Li, 2019; Zheng and Richard, 2021), some focused on a specific language skill, such as reading anxiety (Zhao et al., 2013; Zhou, 2017), writing anxiety (Xiao and Wong, 2014) and speaking anxiety (Luo, 2014b). According to most studies, anxiety was negatively associated with Chinese language achievement across a variety of contexts, although several studies did not report such a significant relationship (Zhao et al., 2013; Zheng and Richard, 2021). Learners who have been learning Chinese for longer times and have higher proficiency levels tend to experience lower levels of anxiety, which has been consistently found among CSL learners in China (Basith et al., 2019), CHL learners (Luo, 2015) and CFL learners (Luo, 2012, 2014a,b; Zhao et al., 2013; Zhou, 2017) in the U.S.

Learning strategies in foreign language learning and CFL learning

The importance of language learning strategies for SLA has been widely acknowledged (e.g., Chu et al., 2015; Galti, 2016; Chou, 2018; Ngo, 2019; Gao, 2020; Gong et al., 2021a). Several articles have systematically reviewed research on language learning strategies since 2010 (Oxford et al., 2014; Rose et al., 2018; Plonsky, 2019; Zhang et al., 2019; Teng and Zhang, 2021). Previous research has explored language learning strategies from a variety of perspectives, including listening comprehension (e.g., Ross and Rost, 1991; Thompson and Rubin, 1996; Carrier, 2003; Santos et al., 2008; Ngo, 2019), oral communication or speaking (e.g., O'Malley and Chamot, 1990; Sun et al., 2016; Chou, 2018), reading comprehension (e.g., Kern, 1989; Anderson, 1991), vocabulary (Alemi and Tayebi, 2011; Gu, 2019), and writing (e.g., Yang and Plakans, 2012; De Silva, 2015). In general, both offline and online learning contexts found these different learning strategies to be useful and helpful for achieving learning objectives. In addition to the various theoretical frameworks pertaining to learning strategies, self-regulation has been gaining attention (Oxford, 2016; Rose et al., 2018; Teng and Zhang, 2021) and has been applied to online learning. Self-regulated learning has been commonly defined as the learners' efforts to regulate their learning process in order to achieve specific learning goals (Zimmerman and Schunk, 2001; Oxford, 2016). As an example, Barnard-Brak et al. (2010) developed the Online Self-Regulated Learning Questionnaire and observed that learners' academic achievement differed significantly depending on their learning strategies. An et al. (2021) further found that self-regulated strategy significantly predicted ESL learners' learning outcomes and enjoyment of English.

Chinese language learners have also been studied in relation to their learning strategies (Jiang and Cohen, 2012; Gong et al., 2021b). Some studies focused on learning strategies for Chinese characters (Liu and Jiang, 2003; Shen, 2005; Sung and Wu, 2011), vocabulary (Tam and Kim, 2021), speaking (Sun et al., 2016), communication (Wang et al., 2021a) and cultural adaption to study-abroad (Gong et al., 2020, 2021c). Furthermore, the relationship between strategy use and Chinese language performance has been well-established in previous studies. For instance, learners' metacognitive strategies, such as self-regulation through monitoring their progress, preserving tasks and setting realistic goals, were positively associated with learners' Chinese academic achievement among CFL learners in the U.K. (Wang et al., 2009), and compensation strategy was more commonly used in higher proficiency group than in less successful CSL learners in Taiwan area (Chu et al., 2015). In addition, this relationship has also been found in young CFL learners in Spain, whose affective strategies showed the strongest correlation with their Youth Chinese Test scores (Cáceres-Lorenzo, 2015). Similar findings were also

observed in research concerning Chinese characters (Shen, 2005) and speaking (Sun et al., 2016). However, whether these findings hold true in the online learning context is still unclear.

Combining motivation, anxiety and learning strategies in L2 learning

A limited number of studies examined the relative prediction of motivation, anxiety and learning strategies for SLA among English language learners, and reported similar findings to some extent (Brown et al., 2001; Hou, 2017). Brown et al. (2001) studied the relationships among five variables (personality, motivation, anxiety, learning strategies, and language proficiency) and found that motivation was one of the most reliable predictors for distinguishing between the low and middle/high proficiency groups among ESL learners. Similarly, Hou (2017) reported that EFL learners' English proficiency was only significantly linked with their motivation, as opposed to their strategy or anxiety. However, studies among CFL learners in the context of online learning have identified some different conclusions (Lin et al., 2017; Zheng and Richard, 2021). Lin et al. (2017) found, for instance, that online learning strategies operated at a moderate level in the process of foreign language learning and predicted the learners' perceived progress and final grades, but motivation was not a significant predictor of Chinese language learning performance. The study by Zheng and Richard (2021) revealed a weak relationship between motivation, anxiety and Chinese academic achievement among young Thai CFL learners. These different findings suggest the necessity of conducting more studies in different learning contexts.

Research on online CFL learning

With the development of computer technology in the 1970's, computer-assisted Chinese language learning emerged, following along the same development path as applications of computer-assisted language learning in other foreign languages education (Da and Zheng, 2018; Zhang, 2019a; Zhou, 2020). As a result of the COVID-19 pandemic, CFL researchers have made considerable efforts to explore the challenges and opportunities brought about by online Chinese learning. Some leading Chinese journals such as *Chinese Teaching in the World* (世界汉语教学, Shijie hanyu jiaoxue) and *Language Teaching and Linguistics Studies* (语言教学与研究, Yuyan jiaoxue yu yanjiu) have organized several forums focusing on the strategies for overcoming the challenges of online CFL learning and research (Li et al., 2020; Lu et al., 2020a,b; Ba et al., 2021).

CFL researchers from different countries outside China carried out various case studies about remote Chinese teaching (Zhang, 2021a; Liu, 2022). Several researchers further conducted empirical studies about online CFL learning. For instance, Qing and Diamantidaki (2020) explored the CFL learners' learning experience in the UK from the perspectives of cognitive presence, social presence and teaching presence and found that the online Mandarin courses were highly valued by the learners. Based on Positive Psychology, Wang and Jiang (2022) found that CFL learners showed a high level of foreign language enjoyment (FLE) in the online learning context, yet they did not find a significant relationship between FLE and the participants' Chinese language achievement, as measured by a 10-point self-report scale and an objective Chinese language test. Despite the fact that both studies explored learners' experience of online Chinese learning, they focused on a specific aspect (such as language test method or learning enjoyment), while neglecting the learners' motivation, anxiety and learning strategies, which are important to provide us with a clearer picture of the CFL online learning.

The context of online learning may present new challenges and difficulties for CSL/CFL learners compared to the traditional offline classroom (Gao, 2020). Online students, for example, were more likely to experience difficulties concentrating and to feel more stressed and anxious than offline students (Ba et al., 2021; Ma, 2022; Zahradnikova, 2022). Regarding motivation, studies have found a significant prediction of motivation in CFL learners' learning performance, such as online learning self-efficacy and learning progress (Ushida, 2005a; Hong et al., 2017). Despite some studies finding limited effects of online learning settings on the change of motivation (Cai and Zhu, 2012), many researchers have clearly observed that learners' motivation in the context of online learning might decrease or even disappear due to the reduced outside-class interaction, therefore maintaining self-motivation is particularly crucial for learners' success in online learning (Li et al., 2020; Lin, 2022; Ma, 2022; Zahradnikova, 2022; Zhang, 2022). In terms of learning strategies, CFL learners might need to develop new strategies for learning Chinese in the context of online learning, such as constant self-testing and self-regulated learning strategies (Qian et al., 2018; Lu et al., 2020a; Zhang, 2022). In sum, the online learning context might influence CFL learners' profile in their individual differences factors, thus a study that explores various factors is needed.

CFL research in less developed countries

In parallel with the rapid growth of CFL learners around the world, the number of studies pertaining to CFL learning has also been on the rise (Ma et al., 2017; Gong et al., 2018, 2019). In 2020, the number of CFL learners was expected to reach 25 million.[1] Nevertheless, the existing studies have focused mainly on Chinese language learners in mainland China and given relatively little attention to Chinese language learners in other countries (Gong et al., 2018), specifically in less developed countries. For instance, only two of the 14 chapters in a recently edited book entitled *Teaching the Chinese Language Remotely: Global Cases and Perspectives* (Liu, 2022), addressed less developed countries such as South Africa and Mauritius, while the other 10 chapters focused on China and developed countries. As far as the authors are aware, CFL learners from less developed countries are overlooked by researchers for a variety of reasons, such as the lack of CFL researchers or professional CFL research networks including journals and researcher associations.

Thailand has the largest number of Chinese language learners among less developed countries, which has been estimated to have exceeded 1 million in 2021 (Fu, 2021), owing to its close economic, cultural and political ties with China. Like the global trend during the COVID-19 pandemic, Chinese language learning has shifted to online platforms in Thailand. Thailand, however, lags behind other countries in the development of information and communication technologies,[2] which may pose particular difficulties to online language learning, which in turn may affect language learning performance. However, relevant research on the impact of individual differences factors on CFL learning in Thailand is lacking (Zheng and Richard, 2021). Therefore, investigating how Thai CFL learners learn Chinese online could have both theoretical and practical implications for online Chinese language education.

Finally, as discussed above in this section, some gaps remain in the exploration of motivation, anxiety and learning strategies for L2 learning performance in the online context. First of all, most previous research has concentrated on a particular aspect of motivation, anxiety and learning strategies, and there has not been a comprehensive study that integrates these factors. Secondly, most of the existing studies focused on English language learners and paid less attention to learners of other languages, such as Chinese learning in less developed countries. Therefore, an investigation into the role of motivation, anxiety and learning strategies in the online settings among CFL learners in the less developed countries outside China is necessary.

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1 https://news.cgtn.com/news/2020-12-16/Over-70-countries-incorporate-Chinese-into-national-education-systems-WgFixEeAMw/index.html

2 https://www.huawei.com/minisite/gci/en/country-profile-th.html; https://tcdata360.worldbank.org/indicators/h2f85e6e7?indicator=24721andviz=bar_chartandyears=2016

The current study

To fill these gaps, the current study aimed to examine the role of motivation, anxiety and learning strategies in L2 Chinese achievement among Thai CFL learners. The results of such a study could provide more empirical evidence for research on the role of individual differences factors in SLA in the online context, and could provide pedagogical implications for successful Chinese teaching and learning in the online settings in less developed countries. Specifically, the current study seeks to answer the following questions:

RQ1. How does language learning motivation predict CFL learning performance?

RQ2. How does foreign language anxiety predict CFL learning performance?

RQ3. How do learning strategies predict CFL learning performance?

RQ4. In what ways are motivation, anxiety and learning strategies different in the prediction of CFL learning performance?

Method

Participants

The participants were 90 local undergraduates of different grades majoring in Chinese language (Mean age = 19.21, SD = 1.19; 11 males and 79 females) from three universities in Thailand (Table 2). The average length of CFL learning (measured from the onset of their CFL learning to November 2021) was 3.76 years (SD = 3.19). Due to the interruption in sitting HSK tests during the COVID-19 pandemic, the participants were not able to report their Chinese language proficiency based on HSK scores. Self-assessment can be a good indicator in foreign language learning (Li et al., 2006). Therefore, they were required to self-assess their Chinese language proficiency on the basis of a 7-point Likert scale, with 1 representing elementary level, 4 for intermediate level and 7 for advanced level. As seen in Table 2, the results of the one-sample t-tests indicated that the participants' self-rated Chinese language proficiency and its four sub-skills were significantly below intermediate level (midscale 4), suggesting that the participants generally perceived their Chinese language proficiency as falling in between elementary and intermediate levels.

It is noteworthy that there was an imbalance between the percentage of males and females, and this may be due to the fact that females generally outnumbered their male counterparts when learning CFL, which may be common in other foreign languages as well. However, the impact of gender on age [$t(14.3)$ = 0.67, p = 0.51, Cohen's d = 0.20], length of CFL learning

[$t(12)$ = 1.05, p = 0.31, Cohen's d = 0.31] and self-rated Chinese language proficiency [$t(11.2)$ = 0.99, p = 0.34, Cohen's d = 0.36] was not significant and the effect sizes of gender were small (Cohen, 1988; Plonsky and Oswald, 2014), suggesting that the male and female participants were homogeneous in CFL learning experience and Chinese language proficiency.

Instruments

Four instruments were designed to collect the data on motivation, anxiety, learning strategies, and Chinese learning achievement among the CFL learners.

Motivation

Thai CFL learners' learning motivation was tested employing a widely used questionnaire with 18 items (Cronbach's α = 0.77) revised from Noels et al. (2000), which included two categories of motivation: intrinsic motivation (IM) and extrinsic motivation (EM). IM was divided into three categories, including knowledge, accomplishment, and stimulation; EM included external regulation, introjected regulation, and identified regulation. An example item was "I study Chinese for the pleasure that I experience in knowing more about the literature of the second language group" (see Appendix 1).

Anxiety

Learners' online learning anxiety was assessed by Online Chinese Learning Anxiety Scale (OCLAS, Cronbach's α = 0.79). The four-scaled questionnaire was revised from Luo (2015) and was designed to assess the learners' anxiety about Chinese language speaking, listening, reading, and writing during their online study. In the questionnaire, there were 16 items divided into four subscales. An example item was "During my online class, I feel very self-conscious about speaking Chinese in front of other students" (see Appendix 2).

Learning strategies

Participants' online learning strategies were assessed using a 24-item questionnaire (Cronbach's α = 0.84) revised from Barnard-Brak et al. (2010). It focused on six aspects: goal setting, environment structuring, task strategies, time management, help seeking, and self-evaluation. An example item was "I set standards for my assignments in online courses" (see Appendix 3).

The questionnaires on motivation, anxiety and learning strategies required the participants to respond on a 5-point Likert scale ranging from "1-strongly disagree" to "5-strongly agree." A double check was performed on the ratings of the

TABLE 2 Summary of the participants' self-rated Chinese language proficiency.

	Min	Max	Mean	SD	Mode	Median	Skewness	Kurtosis	t-test results
Speaking	1	7	3.27	1.15	3	3	0.43	0.17	$t(89) = 6, p < 0.001$, Cohen's d = 0.63
Listening	1	7	3.58	1.23	4	4	−0.05	−0.26	$t(89) = 3.24, p = 0.002$, Cohen's d = 0.34
Reading	1	7	3.52	1.13	3	3	0.18	0.16	$t(89) = 4, p < 0.001$, Cohen's d = 0.42
Writing	1	7	2.99	1.16	3	3	0.41	0.59	$t(89) = 8.23, p < 0.001$, Cohen's d = 0.87
Overall proficiency	1	7	3.47	1.15	4	4	0.04	0.19	$t(89) = 4.39, p < 0.001$, Cohen's d = 0.46

questionnaires, and any response that was in doubt was reviewed by two authors.

Chinese learning achievement

It is no doubt that learners' L2 proficiency could be best assessed using a comprehensive standardized test, such as HSK (Hanyu shuiping kaoshi, Chinese proficiency test) for Chinese. However, these tests are difficult to obtain and are time-consuming to administer, making them ineffective for research purposes (Zhang et al., 2020b). More importantly, the outbreak of COVID-19 pandemic has interrupted the administration of standardized language tests. In addition, the recruited participants came from different universities, thus relying on their course grades was not appropriate. Considering that a variety of measures of L2 proficiency could lead to different research findings (Gardner and MacIntyre, 1993a; Zhang et al., 2020b), in keeping with previous studies (Gardner and MacIntyre, 1993a; Wang and Jiang, 2022), the participants' Chinese learning achievement was assessed both objectively and subjectively.

Regarding the objective measurement, the participants' vocabulary size was used as an indicator of their Chinese language achievement for several reasons. First, the vocabulary size test has repeatedly been found to have a strong association with overall L2 proficiency (Nation and Anthony, 2017; Miralpeix and Muñoz, 2018) and specific sub-skills (Stæhr, 2008), thus being utilized as a reliable and valid independent measure of L2 proficiency assessment (Park et al., 2022) or a placement indicator (Zhang et al., 2020a). Second, CSL/CFL researchers have not reached a consensus on the optimal method for assessing Chinese language proficiency (Zhang, 2018, 2021b; Zhang et al., 2020b). Finally, it is not possible to offer standardized proficiency or placement tests or cloze tests to CFL learners in the context of online learning. As a result, an online vocabulary size test was developed and employed, considering that it is simple to design, administer and grade in terms of research purposes. A total of 127 items were included in the online Chinese vocabulary size test. These items were systematically selected from the *Chinese Proficiency Grading Standards for International Chinese Language Education* (2021), an official syllabus published by the Center for Language

Education and Cooperation in China. The target items in the test were well-balanced in terms of frequency, difficulty and word class. The participants were required to translate the displayed Chinese words into Thai. One point was assigned to a correct response and zero points to an incorrect response or an unanswered question. The raters were two Thai CSL learners who were graduate students in a Chinese university and passed the highest level of the HSK test. The inter-rater reliability was 0.95. The accuracy rate was calculated by dividing the number of accurate responses by 127. The Cronbach alpha reliability of this test was 0.90.

Considering a subjective measure of L2 achievement, as seen in the popular application of the Language History Questionnaire (Li et al., 2006) and Language Experience and Proficiency Questionnaire (Kaushanskaya et al., 2019) in research concerning SLA, self-assessment may be considered to be a reliable indicator of L2 proficiency level in both English (Brown and Hudson, 1998; Hulstijn, 2012; Park et al., 2022) and Chinese language learners (Zhang et al., 2020b). Consequently, in the present study, participants were asked to self-rate their overall Chinese language proficiency and their proficiency in subskills (e.g., listening, speaking, reading and writing) on a seven-point Likert scale, where one indicates an elementary level and seven indicates an advanced level.

Administration

The data were collected from August to September 2021, and the participants learned Chinese completely online due to the influence of the COVID-19 pandemic in Thailand since the beginning of 2020. Instructions in higher education have been redirected to online platforms as a result of the pandemic. The online courses were administered synchronically with formal instructions. The participants were asked to complete an online questionnaire about their motivation, anxiety and learning strategies for learning Chinese online, the 58 items of which were randomly ordered. The questionnaire was presented in Thai. The questionnaire was piloted among five CFL learners before it was formally administered in order to ensure that the items were understandable. The five participants in the pilot study were from Thai universities and represented a range of Chinese

language proficiency levels (2 beginners, 2 intermediates, and 1 advanced). Upon completing the questionnaire, the participants were required to complete an online Chinese vocabulary size test. They took an average of 31.07 min to complete both the questionnaire and the vocabulary size test. All the participants were informed and approved of the use of the collected data for this research, and were debriefed that the questionnaires would not affect their assessments or tests and that they could withdraw from the research at any time when necessary.

Results

Descriptive results

In Table 3, the scores of the participants in motivation, anxiety, learning strategies and vocabulary size test are presented. The participants displayed above-midscale (3) ratings in anxiety, intrinsic motivation, extrinsic motivation and learning strategies.

Results of regression analysis

A structural equation modeling (SEM) analysis would be the most appropriate method to address the four research questions. However, the data did not enable a model with good fit indicators, perhaps as a result of the relatively small sample size ($n = 90$) in the present study. Therefore, a series of hierarchical regression analyses were conducted to answer RQ1-4. In the first series of regression analyses, the dependent variable was self-rated Chinese language proficiency. In the 1st step, the participants' background variables including age, gender, ethnicity, grade and length of CFL learning were added to the base model as independent variables. The 2nd, 3rd and 4th steps involved entering the participants' ratings of motivation, anxiety and learning strategies in different orders into the model. In the second series of regression analyses, the dependent variable was the accuracy rate of the Chinese vocabulary size test and the independent variables were added in the same way as in the first series of regression analyses. The correlation matrix between the measured variables is displayed in Table 4. The results of the first series of regression analyses are presented in Tables 5–10 (see Appendices), and the results of the second series of regression analyses are displayed in Tables 11–16 (see Appendices).

The regression analysis utilized the participants' average scores in anxiety, intrinsic motivation, extrinsic motivation and learning strategies, rather than the scores in each subsection. This is due to the fact that there were 90 participants in the present study, which means that the maximum number of independent variables could be nine, based on a recommended ratio of 10:1 between sample size and the number of independent variables used in conducting regression analysis (Maxwell, 2000;

Knofczynski and Mundfrom, 2007). In addition, both intrinsic and extrinsic motivation were entered separately because the two types of motivation could lie on different ends of a continuum and exert influences on L2 learning in different ways (Noels et al., 2000).

In regard to RQ1 about the prediction of motivation, it accounted for 5% of the variance ($\Delta F = 3.21$, $p = 0.05$; $\beta_{IM} = 0.27$, $p = 0.02$; $\beta_{EM} = -0.09$, $p = 0.40$) of self-rated Chinese language proficiency when controlling the participants' background variables (i.e., gender, age, ethnic background, grade and the length of CFL learning) (Model 2 vs. Model 1 in Tables 5, 6). Motivation did not significantly predict the accuracy rates of the Chinese vocabulary size test (Tables 11–16).

As for RQ2 about the prediction of anxiety, it significantly accounted for 5% of the variance of self-rated Chinese language proficiency ($\beta = -0.22$, $p = 0.02$; $\Delta F = 5.54$, $p = 0.02$) when controlling the participants' background variables (Model 2 vs. Model 1 in Tables 7, 8), 4% of the variance ($\beta = -0.21$, $p = 0.04$; $\Delta F = 4.44$, $p = 0.02$) after controlling the participants' background variables and motivation (Model 3a vs. Model 2 in Tables 5, 6), 7% of the variance ($\beta = -0.28$, $p = 0.003$; $\Delta F = 9.16$, $p < 0.01$) when the participants' background variables and learning strategies were controlled for (Model 3a vs. Model 2 in Tables 9, 10), and 4% of the variance ($\beta = -0.24$, $p = 0.02$; $\Delta F = 5.88$, $p = 0.02$) after controlling the participants' background variables, motivation and learning strategies (Model 4b vs. Model 3b in Tables 5–10). However, anxiety was not a significant predictor of accuracy rates of the Chinese vocabulary size test (Tables 11–16).

With respect to RQ3 about the prediction of learning strategies, they accounted for 4% of the variance of self-rated Chinese proficiency ($\beta = 0.20$, $p = 0.04$; $\Delta F = 4.37$, $p = 0.04$) when controlling the participants' background variables (Model 2 vs. Model 1 in Tables 9, 10), and 6% of the variance ($\beta = 0.26$, $p = 0.01$; $\Delta F = 7.95$, $p = 0.01$) when the participants' background variables and anxiety were controlled for (Model 3b vs. Model 2 in Tables 7, 8). On the Chinese vocabulary size test, participants' learning strategies did not significantly predict their performance (Tables 11–16).

RQ4 relates to the relative predictive power of motivation, anxiety, and learning strategies on achievement in L2 Chinese. In terms of self-rated Chinese language proficiency, the full model (Model 4b in Tables 5, 7, 9) which includes the three measured variables as well as the background variables significantly accounted for 45% of the variance (adjusted $R^2 = 0.38$), $F(9, 72) = 6.55$, $p < 0.001$. Based on the three measured variables, anxiety significantly predicted self-rated Chinese language proficiency ($\beta = .-24$, $p = 0.02$, $R^2 = 0.06$), the significant prediction of learning strategies achieved a marginal level ($\beta = 0.22$, $p = 0.06$, $R^2 = 0.03$), but neither intrinsic motivation ($\beta = 0.14$, $p = 0.24$, $R^2 = 0.03$) nor extrinsic motivation ($\beta = -0.06$, $p = 0.60$, $R^2 = 0.01$) was a significant predictor. The regression equation of the model was

TABLE 3 Scores in motivation, anxiety, learning strategies and vocabulary size test.

Measured variable	Min	Max	Mean	SD	Mode	Skewness	Kurtosis
Anxiety	2.06	5	3.35	0.71	3.19	0.05	−0.05
Intrinsic motivation	3	5	4.21	0.60	4	−0.44	−0.49
Extrinsic motivation	2.78	5	3.67	0.62	3.44	0.41	0.03
Learning strategies	2.71	5	3.65	0.44	3.46	0.12	0.10
Accuracy rate in vocabulary size test	0.02	0.77	0.28	0.20	0.08	0.43	−0.98

TABLE 4 Correlation matrix between the measured variables.

	1	2	3	4	5	6	7	8	9	10	11
Self-rated Chinese proficiency	—										
Vocabulary size test accuracy rate	0.51***	—									
Gender	0.14	0.13	—								
Age	0.02	−0.06	−0.01	—							
Ethnic Chinese background	0.27*	0.17	0.12	−0.01	—						
Grade	0.04	−0.08	−0.06	0.72***	−0.13	—					
Length of CFL learning	0.53***	0.40***	0.13	0.06	0.11	0.02	—				
Anxiety	−0.24*	−0.10	−0.12	−0.17	−0.14	−0.12	−0.06	—			
Intrinsic motivation	0.25*	−0.08	−0.09	0.16	−0.01	0.16	0.06	−0.05	—		
Extrinsic motivation	0.10	0.04	−0.05	−0.18	−0.01	−0.06	0.08	0.32**	0.51***	—	
Learning strategies	0.17	−0.01	−0.12	0.03	−0.02	0.06	−0.05	0.24*	0.51***	0.53***	—

*p < 0.05, **p < 0.01, and ***p < 0.001.

Self-rated Chinese language proficiency=0.09gender -0.13age +0.43ethnic background+0.01grade+0.18length of CFL learning+0.32intrinsic motivation -0.17extrinsic motivation -0.49anxiety +0.56 learning strategies

As for the accuracy rates of Chinese vocabulary size test, the full model (Model 4b in Tables 11, 13, 15) significantly explained 24% of the variance (adjusted $R^2 = 0.14$), $F(9, 72) = 2.52$, $p = 0.01$. However, none of the three measured variables significantly predicted the accuracy rates of Chinese vocabulary size test: anxiety, β = −0.17, $p = 0.16$, $R^2 = 0.02$; learning strategies, β = 0.13, $p = 0.32$, $R^2 = 0.005$; intrinsic motivation, β = −0.21, $p = 0.13$, $R^2 = 0.01$; extrinsic motivation, β = 0.14, $p = 0.32$, $R^2 = 0.01$. The regression equation of the model was

Accuracy rates of Chinese vocabulary size test=0.06gender -0.01age +0.04ethnic background-0.02grade+0.02length of CFL learning-0.09intrinsic motivation +0.07extrinsic motivation -0.06anxiety +0.06 learning strategies

As seen above, each of the three measured variables explained 4% to 7% of the variance, which represents small effect sizes (Cohen, 1988). It was evident that anxiety was the most stable predictor, followed by learning strategies and motivation.

In terms of the participants' background variables, the length of Chinese language learning was consistently significant for predicting both self-rated Chinese language proficiency (β = 0.50~0.52, $p < 0.001$) and the accuracy rates of the

Chinese vocabulary size test (β = 0.36~0.38, $p < 0.001$). In the full models (Model 4b in Tables 5–16), the length of Chinese language learning accounted for the largest percentage of variance in self-rated Chinese language proficiency ($R^2 = 0.26$) and the accuracy rates of Chinese vocabulary size test ($R^2 = 0.15$) among all the independent variables.

Discussion

The present study explored the prediction of motivation, anxiety and learning strategies for learning achievement among Thai CFL learners in the context of online learning. The results of the hierarchical regression analysis revealed that, regarding the participants' self-rated Chinese language proficiency, anxiety (Model 2 in Table 7, Model 3a in Tables 5, 10, Model 4a and Model 4b in Tables 5–10) was the most stable yet negative predictor among the three individual differences variables, whereas learning strategies (Model 2 in Table 9, Model 3b in Table 7) and motivation (Model 2 in Table 5) were to some extent positive predictors. In spite of this, none of the three variables significantly predicted the participants' accuracy rates in the Chinese vocabulary size test. Furthermore, the significant prediction of the length of Chinese language learning in the two measures of L2 Chinese achievement was stable across different

models, which is reasonable considering that a longer period of language learning generally means greater input and output in various components of language and sub-skills.

Anxiety and CFL learning

In the current study, participants showed moderate anxiety in the context of online learning, and their anxiety had a negative correlation with and prediction for self-rated Chinese language proficiency, which is generally consistent with previous studies involving language learners of English (MacIntyre and Gardner, 1991; Horwitz, 2001; Dikmen, 2021), Japanese (Aida, 1994), Spanish (Coryell and Clark, 2009) and Chinese (Luo, 2013; Zhao et al., 2013; Luo, 2014a,b, 2015; Zhou, 2017; Basith et al., 2019; Zheng and Richard, 2021). Although some early research observed a positive influence of anxiety on L2 learning (Chastain, 1975; Kleinmann, 1977), and researchers have not reached a general consensus about the underlying mechanism for the negative impact of anxiety on SLA (Krashen, 1981, 1982; Horwitz et al., 1986; MacIntyre and Gardner, 1989, 1994; Gregersen, 2020), the negative impact of foreign language anxiety on L2 achievement has been widely recognized, such as reduction in cognitive performance (Gregersen, 2020), self-confidence (Chou, 2018), willingness to communicate (Basith et al., 2019), and this negative influence could be observed at different stages (e.g., input, processing and output) of second language learning (MacIntyre and Gardner, 1994).

CFL proficiency, and this correlation coefficient was as high as−0.61 among learners of EFL in several less developed countries (Dikmen, 2021). Similarly, Tanielian (2014) reported a weak and negative correlation ($r = -0.16$) between classroom anxiety and English performance in a study on Thai EFL learners. It is possible that the low correlation between anxiety and foreign language achievement in Thailand is due to cultural values within the country. There is a greater emphasis placed on fun and pleasure among Thai people than on achievement and ambition (Komin, 1991). The words *achievement* and *ambition* even have negative connotations in Thai language (Punyapiroje and Morrison, 2007). The country of Thailand is also a Buddhist country, and Buddhism has been found to positively influence happiness (Gray, 2012; Senasu and Singhapakdi, 2017). In 2020, Thailand ranked second in Southeast Asia according to the Global Happiness Levels report. The influence of anxiety on foreign language achievement might be diminished by a higher level of subjective happiness and a lower level of ambition/achievement orientation. Nonetheless, this explanation should be considered tentative and should be supported by additional empirical evidence in the future.

Compared to previous research, the present study found a relatively smaller effect size of anxiety on language achievement ($r = -0.21$). A noteworthy finding of the present study is that in comparison with the research on anxiety of CFL learners in the offline learning context in the U.S. (Luo, 2013), the Thai learners showed a relatively higher level of anxiety (M = 3.35). There may be two possible reasons for this. First, the present study was conducted during the COVID-19 pandemic, which may have increased the participants' anxiety about learning. A comparative study found that Thai university students showed the highest levels of anxiety during the pandemic, compared with participants from Indonesia and Taiwan (Pramukti et al., 2020). Second, it is possible that a higher level of anxiety is caused by the online learning environment. In contrast to anxiety experienced in traditional offline classrooms (Luo, 2012; Kasbi and Elahi Shirvan, 2017), anxiety in the context of online foreign language learning could be caused by factors related to teachers, learners, technology and family environment (Ushida, 2005a; Coryell and Clark, 2009; Pichette, 2009; Hampel and Stickler, 2015; Adedoyin and Soykan, 2020; Russell and Murphy, 2021). For instance, online learners may not have immediate interaction with instructors and peers when feedback or help is needed. In the context of online learning at home during the COVID-19 pandemic, those lacking motivation or self-discipline might become distracted by stimuli (e.g., video games, Internet surfing, etc.) not related to learning at home, which makes it challenging to keep up with learning. In addition, some online learners with low socioeconomic status may not have access to resources, such as Internet infrastructure, mobile data, electronic devices and isolated study spaces. All of these factors may lead to the emergence and persistence of anxiety in online language learning, which may further add emotional pressure and negatively influence the learners' learning performance.

Learning strategies and CFL learning

Using the strategy questionnaire, it was found that online Thai CFL learners were aware of their learning and could utilize various strategies actively to aid their CFL learning, as indicated by their above-midscale scores. Although learning strategies did not significantly correlate with L2 Chinese achievement (see the correlation matrix in Table 4), a significant prediction of learning strategies for self-rated Chinese language proficiency was observed after controlling for the participants' background variables and anxiety. These findings are consistent with those reported by learners of English (Ngo, 2019; An et al., 2021) and Chinese in the offline contexts (Shen, 2005; Wang et al., 2009; Cáceres-Lorenzo, 2015; Chu et al., 2015; Sun et al., 2016), as well as in the online learning context (Lin et al., 2017). It has been widely acknowledged that self-regulated learning strategies are multifaceted and could exert their influence on learning achievements *via* cognitive, metacognitive, behavioral and self-motivational channels (Zimmerman and Schunk, 2001). The presence of COVID-19 requires learners to be more self-regulatory at home than in an offline setting. This is due to the unique characteristics of online learning such as a lack of

supervision and lack of immediate peer interaction (Lin, 2022). This account aligns with the findings reported by Holcomb et al. (2004) who argued for self-regulation as a critical component of distance education success.

Motivation and CFL learning

As discussed in earlier sections, the participants were compelled to enroll in online learning under the influence of the COVID-19 pandemic, rather than of their own will, thus whether the participants' motivation is indicative of their actual level of inner psychological wellbeing could be questioned. Prior studies have shown that learners' language learning motivation can remain stable across offline and online settings, suggesting a limited effect of the learning context on the change of motivation (Cai and Zhu, 2012). This implies that the measurement tools used in the present study could tap into the participants' online Chinese learning motivation to some extent.

Participants in the current study showed that they had a strong intrinsic motivation and moderate extrinsic motivation to learn Chinese and that their intrinsic motivation levels significantly correlated with and further significantly predicted their self-rated Chinese language proficiency after controlling for their background variables. However, this significant predictive power of motivation disappeared after further controlling for anxiety and learning strategies in the regression model. In addition, motivation ratings did not significantly predict the participants' performances on the vocabulary size test. These findings are consistent with previous research that reported a weak or even null relationship between motivation and Chinese language learning among CFL learners in Thailand (Zheng and Richard, 2021) and the U.S. (Lin et al., 2017), however, they are inconsistent with findings reported among ESL learners (Brown et al., 2001; Hou, 2017). These four studies were conducted among learners in non-target-language contexts, such as Chinese language learners in Thailand (Zheng and Richard, 2021) the U.S. (Lin et al., 2017) and the English learners in Japan (Brown et al., 2001) and Taiwan (Hou, 2017). Thus, these inconsistent findings indicate the necessity of conducting further studies to explore this issue in the future.

According to the present study, intrinsic motivation is a stronger predictor of language proficiency than extrinsic motivation, which is consistent with findings reported in previous research (Noels et al., 2000; Noels, 2001; Hong et al., 2017; Sun and Gao, 2020). Intrinsic motivation "generally refers to motivation to engage in an activity because that activity is enjoyable and satisfying to do" (Noels et al., 2000, p. 61) and builds upon innate needs for competence and self-determination (Deci and Ryan, 1985). By contrast, extrinsic motivation closely relates to the motive to achieve some instrumental objectives. Online learning occurs during the COVID-19 pandemic without immediate supervision from

instructors or peer interaction, making self-regulation and self-determination more important than in offline settings (Holcomb et al., 2004; Lin, 2022). The significant prediction of intrinsic motivation in self-rated Chinese language proficiency aligns with the significant influence of self-regulated learning strategies, suggesting the importance of self-management for the performance in online learning.

Motivation plays a lesser role in second language achievement than anxiety or learning strategies, which may be explained by the following reasons. Firstly, as discussed in the section on anxiety and language learning, Thai cultural characteristics may be a contributing factor, such as a tendency to prefer fun and pleasure over achievement and ambition (Komin, 1991; Punyapiroje and Morrison, 2007). There may be some reduction in the contribution of motivation to language learning achievement as a result of this. The second reason may relate to the indirect influence of motivation on language learning. As Gardner and MacIntyre (1993b) and Gardner et al. (1997) proposed, motivation was assumed to play an indirect role in second language achievement *via* anxiety and strategy. To be more specific, motivation to learn a foreign language might be an initial psychological trait. Increased motivation may lead the learners to explore appropriate learning strategies and build stronger self-confidence, which in turn alleviate language learning anxiety and facilitate the development of second language abilities (Chu, 2008; Nishitani and Matsuda, 2011; Zarei, 2014; Galti, 2016; Hou, 2017). However, this account is tentative, studies with a larger sample size might offer more conclusive results.

Different measures of CFL learning achievement and different research results

The overall findings of the present study are consistent with those reported in previous research (Gardner and MacIntyre, 1993a; Zhang, 2018; Zhang et al., 2020b; Park et al., 2022). Among the participants in the present study, motivation, anxiety and learning strategies significantly predicted their self-rated Chinese language proficiency to some extent, yet none of these variables significantly predicted their performance on the Chinese vocabulary size test. Observations of different roles of anxiety across the two measures of Chinese language learning achievement were consistent with those described by Gardner and MacIntyre (1993a), who found a higher negative correlation coefficient between anxiety and self-rated proficiency than that between anxiety and objective measures such as cloze tests and word production. These findings are also in agreement with those of Zhang (2018) and Zhang et al. (2020b), who noted that a comprehensive measurement of second language achievement would be more informative than a measure

focusing on a single aspect, such as reading. It may be possible to explain the discrepancy between the two measures from the following perspectives.

First, based on the measurement approach taken in this study, motivation, anxiety, and learning strategies were not specific to vocabulary learning, so their effects may not be evident in a specific area of Chinese language achievement such as receptive vocabulary size. In general, vocabulary learning strategies focus on beliefs about vocabulary learning, inference, the use of dictionaries, taking notes, rehearsal, encoding, and active use (Gu, 2019); however, this study focused on general online learning strategies.

Second, Thai CFL learners recruited were at elementary and intermediate levels, and they possessed a limited vocabulary size, as evidenced by their relatively low accuracy rate on the vocabulary size test (mean = 0.28). Additionally, the participants studied Chinese for different lengths of time, which may have contributed to the variability in the accuracy rate of the vocabulary size test (SD = 0.20).

Third, there is also the possibility of the Dunning-Kruger effect (Dunning, 2011; Trofimovich et al., 2014; Saito et al., 2020), a phenomenon in which unskilled performers tend to overestimate their abilities. Further analysis revealed that the number of participants who scored in the first quartile in the vocabulary test and self-rated as 3, 4 and 5 was 10, 4 and 1, while the number of participants who scored in the second quartile in the vocabulary test and self-rated as 3, 4 and 5 was 9, 6 and 1. There was a clear overestimation of Chinese language proficiency among some participants with lower vocabulary size. There is a possibility that the Dunning-Kruger effect may have an impact on research findings concerning the role of individual differences factors in second language acquisition.

Theoretical and pedagogical implications

The overall findings of the present study provide theoretical implications for understanding the role of motivation, anxiety and learning strategies in SLA in the context of online learning. The general results partially support the importance of individual differences factors (such as anxiety and learning strategies) in L2 achievement in the Socio-educational Model of L2 learning (Gardner and MacIntyre, 1993b), as identified among CFL learners in their context of online learning. In addition, the overall findings suggest the different predictive powers of motivation, anxiety and learning strategies in second language achievement.

In terms of anxiety and learning strategies, the present study provides substantial evidence of the significance of these two individual differences factors in SLA from the perspective of CFL learners. The overall findings of the present study suggest that anxiety and learning strategies might override motivation, which could predict SLA indirectly through other variables such

as learning strategies or anxiety. The results of anxiety and motivation suggest the importance of considering cultural and situational background in researching language learning anxiety across different countries (Horwitz, 1999). The smaller effect size of anxiety and the lower contribution of motivation to CFL achievement may be due to the fun/pleasure-oriented cultural values in Thailand. Although it is widely acknowledged that most of the language learning theories originate from developed countries, whether these theories could be applied successfully in less developed countries is still unclear and more supporting evidence from an ecological perspective across different cultures and contexts is required (Larsen-Freeman, 2018).

The present study has practical implications for the instruction of Chinese language in less developed countries. A first recommendation is that instructors pay more attention to anxiety and learning strategies than to motivation. It was found that anxiety and learning strategies contributed more to CFL achievement than motivation. Therefore, instructional strategies could be tailored to ease learners' anxiety about CFL learning and train them to develop self-regulating strategies for learning a foreign language online. A supportive and positive instructional approach can reduce learners' language learning anxiety (Young, 1991; Vogely, 1998; Oxford, 2017; Jin et al., 2021). If instructors are working in less developed countries, they should consider the local culture when taking targeted measures to address anxiety. As an example, instructors in Thailand may utilize Buddhism tenets to ease learners' anxiety related to language learning. According to an instructor of the CFL learners in the present study, there was no formal instruction in language learning strategies provided to them. Learners are therefore encouraged to become familiar with the benefits of self-regulated learning strategies and to increase their online learning autonomy from the perspectives of motivation, affect, cognition, and social interaction (Oxford, 2016). Additionally, instructors in less developed countries should take into account the relatively poor internet infrastructure in order to address issues related to anxiety and learning strategies, and traditional communication strategies such as telephone or mail may be suitable for facilitating learner-instructor interactions.

A second recommendation is to use multiple measures of language proficiency when assessing learners. There may be a Dunning-Kruger effect in self-rated language proficiency based on the results of the study of the influence of different measurements on the research results. It is therefore necessary to pay more attention to the practice of reporting second language proficiency (Zhang, 2018; Zhang et al., 2020b; Park et al., 2022). As a result of these findings, it is imperative that both subjective as well as objective measures of achievement be included in studies of second languages (Gardner and MacIntyre, 1993a; Trofimovich et al., 2014). In order to measure Chinese language proficiency objectively, researchers may use the HSK test, the cloze test, the character recognition test, or the vocabulary size test (Zhang, 2018, 2021a; Zhang et al., 2020b, 2021, 2022).

Conclusions and limitations

The present study explored the predictions of motivation, anxiety and learning strategies for Chinese language achievement among Thai CFL learners during the COVID-19 pandemic. The current study was conducted during the COVID-19 pandemic and it was one of few attempts to examine motivation, anxiety, learning strategies and learning achievement from the perspective of online Chinese learning. The general results of the present study are consistent with the findings reported in previous studies, which furthered our understanding of the relationships between L2 learning achievement and individual differences factors in the contexts of offline and online language learning. Nevertheless, some limitations of the current study cannot be ignored.

The first limitation concerns the questionnaire and measurement. The questionnaire and the vocabulary size test in the present study consisted of 58 and 127 items, respectively. These lengthy tasks, as well as the online data collection method, may result in some loss of accuracy (Gosling et al., 2004; Chetverikov and Upravitelev, 2016). Due to a lack of face-to-face interaction between the teacher and the learner, some participants may have used online dictionaries in the vocabulary test or did not take the questionnaire seriously. Further, there was a limitation in the questionnaire for measuring motivation and learning strategies, as they did not examine the two constructs specific to the online context or Chinese language. Also, the vocabulary size test and self-rated Chinese language proficiency may not reflect the participants' real achievement in online language learning, which could be determined using grade scores or teachers' ratings alternatively. Additionally, the present study employed a softer approach limited by the online learning environment during the pandemic to rate the participants' responses to the vocabulary size test, and this practice might affect the research results (Webb, 2008).

The second limitation concerns the participants. Five participants were piloted and a total of 90 participants were recruited due to various difficulties encountered during the period of the COVID-19 pandemic. As the majority of participants were below the intermediate level, the results may not be generalized to those at the advanced level. In addition, a larger sample size will be desirable in future studies to explore the roles of different sub-dimensions of motivation, anxiety and learning strategies in SLA. Moreover, a large sample including participants from different countries or cultural backgrounds would facilitate the analysis of the differences and similarities in anxiety, motivation, and learning strategies across different contexts.

Thirdly, while the present study focused on three individual differences factors, it is known that online learning achievement could be influenced by a wide range of factors related to students (e.g., information literacy), teachers (e.g., instructional strategies), online platform (e.g., technical convenience and user-friendliness). Consequently, future studies could explore the interaction effect of these different variables on L2 achievement to depict a clearer picture of online learning, or explore from the perspective of positive psychology, whose significance for foreign language learning has been widely documented (e.g., Mercer and MacIntyre, 2014; Dewaele et al., 2019; Wang, 2021; Wang et al., 2021b; Baatouche et al., 2022). To triangulate the results in the future, it is suggested that a mixed method of research that includes both quantitative and qualitative data such as interviews or open-ended comments be used (Riazi and Candlin, 2014; Mackey and Bryfonski, 2018).

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author/s.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent from the participants' legal guardian/next of kin was not required to participate in this study in accordance with the national legislation and the institutional requirements.

Author contributions

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2022.962492/full#supplementary-material

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Perspectives of transformative learning and professional agency: A native Chinese language teacher's story of teacher identity transformation in Australia

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The notion of teacher identity has gained momentum in second language (L2) teacher education in the past decade. However, the research into Chinese as a Foreign Language (CFL) teacher identity has yet to receive more attention. The study employed a narrative inquiry to explore a native Chinese CFL in-service teacher's identity negotiation and transformation within an international teacher education program. Self-reported narrative accounts, including multiple in-depth interviews and once-a-term reflective journals, were complemented by field notes and program documents. This data captured how the participant teacher negotiated internally with self and externally with the new environment to pursue professional growth. Mezirow's transformative learning theory was used to reveal the cognitive trajectory of the participant's teacher identity transformation with critical reflection as the central stage. Further, guided by Eteläpelto et al.'s framework of professional agency, the study also unraveled multiple external and internal influences on the transformational trajectory. The findings confirmed the value of integrating these two theoretical perspectives to explore language teacher identity development and offer insights into L2 teacher education practices focusing on teacher identity development.

KEYWORDS

native CFL teachers, teacher identity, professional agency, Mezirow's transformative learning theory, narrative inquiry

Introduction

Language teacher identity has been an ever-growing research focus in the field of L2 teacher education in the past decade (Fairley, 2020). Teacher identity development is acknowledged by some researchers as central to or even synonymous with language teacher education itself (Varghese et al., 2016; De Costa and Norton, 2017; Yazan, 2018;

Fairley, 2020). The justifications for such arguments are that teacher learning involves cultivating a new identity rather than just learning new skills and knowledge of teaching (Clarke, 2008), and the acquisition of teacher self-knowledge is conceptualized as part of teacher identity development (Kanno and Stuart, 2011).

The significance of researching language teacher identity is also due to its analytical capacity. As a "research frame" (Olsen, 2008, p. 5) language teacher identity has been widely used in theorizing and examining L2 teacher learning and professional development in various contexts. It has also started to gain attention as a central construct used to examine the implementation of teacher identity as a "pedagogical tool" (Olsen, 2008, p. 5) and "pedagogical intervention" (Morgan and Clarke, 2011, p. 825) in language teacher education practices. For example, teacher educators have been reported examining a wide array of developed learning tools or pedagogical approaches by TESOL teachers in the development of student teachers' identity such as digital storytelling, Reflective Teaching Model, strength-based mentoring (Yazan and Lindahl, 2020) and critical auto-ethnographic narrative (Yazan, 2018). From a conceptual perspective, Fairley (2020) proposed a model of 'identity-centered' language teacher education. Within this model, she argued that the goal of language teacher education is developing a language teacher identity that is "transformative, agentive, advocacy (TAA)-oriented" (p. 1040). Fairley (2020) further proposed a competencies-based approach as the foundation of the language teacher education model. The development of this model was based on the existing literature. This model has offered a conceptual direction for identity-oriented language teacher education practices within the field of L2.

Despite the significance of researching language teacher identity and the burgeoning of teacher identity literature in L2 over the past decade, studies of CFL teachers' identity development have been scant (Moloney and Xu, 2015; Ballantyne, 2018). This is especially so in the context of Mainland China (Gong et al., 2020). The limited research body of CFL teacher identity has been mainly confined in cross-cultural settings to immigrant native CFL teachers (Wang and Du, 2014; Zhang, 2015); Confucius Institute assigned CFL teachers working in overseas countries (Ye, 2017; Zhang, 2018; Xiang, 2021); and native Chinese student teachers in international education programs (Ballantyne, 2018; Wang, 2022; Han and Ji, 2021). Amongst this research, one recurring theme is the negotiation of cultural values and cultural identity as an overall blanket factor for CFL teachers' identity shift. Examining teacher identity through the lens of cultural values and cultural identity as such belied the complexity of the issue and failed to capture the much more dynamic and multilayered identity negotiation and transformation process.

For example, Wang and Du (2014) studied some immigrant CFL teachers in Denmark and revealed that these teachers experienced identity shifts from a parental and moralistic approach to that of learning facilitator and culture worker. This shift was found due to the teachers' experiences of the differences between Chinese and Danish social and educational culture. Similarly, Li (2016) investigated CFL immigrant teachers' experience in Western-based schools. That research found that the immigrant CFL teachers constructed successful professional identities through involving "an effective blend of Eastern and Western cultural values and pedagogical practices" (p. 177). In Zhang's (2015) study, the construction of CFL teacher identity was found influenced by teachers' mediation of values among varied cultural discourses and between their culture and other cultures. Whilst the above studies examined immigrant native CFL teachers' experiences, Han and Ji (2021) concentrated on CFL student teachers' professional identity construction through a Sino-Australian teacher education program. This research revealed that most of the participants chose to adapt to the Australian culture by moving away from their cultural self in the new teaching and learning environment. However, the role played by the teacher education program in this identity shift was not considered. These studies did not attempt to disclose the nuanced internal processes of identity shift.

Studies of CFL teachers' experiences in cross-cultural contexts also attended to teacher agency in the process of teacher identity development. However, the literature tended to be more focused on CFL teachers' internal resources, leaving unaddressed those external forces interacting with internal conditions, that impact on teacher agency. For example, in a study of Confucius Institute teachers' identity, Xiang (2021) studied old-timer and newcomer teacher identities finding that the old-timer teachers negotiated their own meanings for teaching, whereas peripheral identity of the newcomers was likely to constrain their agency in making their own voices. In a very similar way, Ballantyne (2018) studied a group of CFL student teachers' process of becoming a teacher, suggesting that this group's professional agency developed from the interplay between the development of teaching skills, engagement in a professional learning network and self-confidence. This study indicates that the enactment of agency enabled teacher candidates to continue in their trajectory of learning and identity construction. The shaping power of external forces on teacher agency was to an extent diminished.

This present study is intended to enrich the research areas indicated above. It is a narrative inquiry aimed to examine how an in-service native CFL teacher, Qing by pseudonym, negotiated and transformed her teacher identity in a Sino-Australian teacher education program. Conducting this study is meaningful in two respects, theoretical and empirical. Theoretically it builds on perspectives of Mezirow's (2000) transformative learning theory and professional agency (Eteläpelto et al., 2013). This study, framed under these two conceptual lenses, will extend the existing research of CFL teacher identity by providing deeper and more nuanced interpretations in terms of the cognitive processes of teacher identity transformation, as well as the achievement of teacher

agency and the interplay between teacher agency and teacher identity transformation. Secondly, through exploring a native CFL teacher's lived experience, the present study aims to contribute to the broad L2 research landscape of teacher identity and identity-oriented language teacher education practices.

To achieve the research aims of the study, the following research questions will be answered:

(1) How did the participant teacher negotiate and transform her teacher identity from the perspective of transformative learning?
(2) What individual and sociocultural factors constrained and/or resourced the participant teacher's agency in teaching?
(3) How was the agency connected with the participant teacher's transformative learning and teacher identity development?

The theoretical framework

Conceptualizing teacher identity

Teacher identity[1] is defined as one's self-understandings in relation to other people and wider social structures, which shift across time and space and concern one's considerations of future possibilities (Norton, 2013; Barkhuizen, 2016). It is not a fixed product, but a continuum developed through social contacts (Burns and Bell, 2011). The development of a teacher's professional identity is always dependent on employment that is shaped by institutional and political contexts (Burns and Bell, 2011). These definitions suggest a postmodern view of identity, articulating teacher identity as social, discontinuous and multiple (Gergen, 1991). Whilst the present study acknowledges the postmodern characterizations, it also concurs with Akkerman and Meijer (2011) that a totally de-centralized view of identity is not possible and there is a need to account for unity, continuity and individuality in identity as well. This is why this study adopts a narrative approach to conceptualize teacher identity as "self-as-teacher stories" (Ruohotie-Lyhty, 2013, p. 122).

This narrative definition of teacher identity understands teachers as active agents in striving to sustain a coherent and continuous understanding of self-experiences over time through shifting educational and social landscapes (Ruohotie-Lyhty, 2013). A life-story is an individual construction and the one who lives the life inevitably carries the responsibility of sustaining its narrative coherence of multiple meaningful experiences

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[1] Teacher identity in this article refers to a teacher's teaching self, a facet of a teacher's professional self.

(Carr, 1986). Teachers reflect on and selectively integrate new experience into their self-stories (Beijaard et al., 2004). It is a "subjective achievement," a process that necessitates some striving and choosing (Coldron and Smith, 1999, p. 715). In other words, they shape their histories and "restory" themselves with reference to personal intentions and abilities (McAlpine and Amundsen, 2009).

This study thus takes a multi-focus lens to conceptualize teacher identity: seeing teacher identity as individual, unified and continuous whilst still acknowledging the social, multiple and discontinuous characterizations. To capture the participant teacher's lived experience of teacher identity transformation that reflects these multiple aspects, this study draws on Mezirow's (1996, 2000) transformative learning theory and a subject-centered socio-cultural approach to professional agency (Eteläpelto et al., 2013). Mezirow's theory, as a "broadly humanistic theory" (Hodge, 2014, p. 165), frames identity as an individual, unified and continuous construction (Kirschenbaum and Henderson, 1989, p. 14; Anderson, 2001; Kellner, 2003; Dirkx, 2007) and construction of identity as a rational process located in the individual (Clark and Wilson, 1991). Thus, Mezirow's theory offers a lens to examine the cognitive and developmental trajectory of a teacher's identity negotiation and transformation. However, Mezirow's theoretical framework does not adequately address the role of social influences on the process of transformation (Erichsen, 2011). This also suggests that Mezirow does not offer conceptual tools to illuminate the way in which multiple selves interact in this process as "multiplicity arises from the interplay of . . . powerful social forces on the individual" (Clark and Dirkx, 2000, p. 115). For this reason, this study employs a subject-centered socio-cultural approach to professional agency (Eteläpelto et al., 2013) to interpret the participant teacher's narrative accounts Mezirow's theory fails to capture. This lens of agency sees the achievement of teacher agency as resulting from the interplay between individual and contextual resources and constraints (Tao and Gao, 2021). Further, as also argued, "the exercise of agency forms professional identity and establishes its maintenance and transformation" (Vähäsantanen, 2015, p. 10). It thus can be assumed that this lens will enable the exploration of how the multiple facets of the participant teacher's professional self and socio-cultural contexts within which she was situated interact to inform her teacher identity transformation. The following section will illustrate these two theories and how they will be used in this study.

Mezirow's transformative learning theory

Mezirow (1996, 2000) describes transformative learning as a process that generates significant and irreversible changes in one's meaning perspectives. A meaning perspective (also

referred to as a frame of reference) is defined as "a personal paradigm for understanding ourselves and our relationships" (Mezirow, 1978, p. 101) and is "the results of ways of interpreting experience" (Mezirow, 2000, p. 16). As prior meanings constructed out of past experiences become problematic in construing and guiding how we feel, think, or act about new experiences, they become a catalyst for us to revise our ways of relating to the world and make them more true, inclusive and justifiable for guiding future actions (Mezirow, 1978, 1996). This thus means that transformative learning indicates a fundamental change in one's sense of self (Dirkx, 2007).

The present study will utilize the five fundamental stages that make up Mezirow's (2000) transformation model. The process of transformation, as theorized by Mezirow (2000), often starts with a "disorienting dilemma" where individuals are aware of a mismatch between their prior assumptions and the expectations and demands from new experiences. A disorienting dilemma is often a significant personal event (Taylor, 2000) that represents a seed of new awareness, and exploring this awareness indicates a possibility of transformation (Poutiatine and Conners, 2012). Overseas teaching experience, such as that of the participant teacher in this study, is often seen as giving rise to disorienting dilemmas (Jacobs and Haberlin, 2022). As a consequence of the disorienting dilemma, individuals are triggered to engage in critical reflection on their prior assumptions about themselves and the world as well as those of others. This means that a process of critically assessing one's own assumptions is often accompanied by critically reflecting on those of others (Mezirow, 2000). For instance, in the present study, the participant teacher's critical insight into her own teacher identity was inextricably intertwined with her critical reflection on the new educational context. Critical reflection can lead to the construction of a new framework that transforms individual ways of making meaning of experience in the world and is considered essential for transformative learning to occur (Mezirow, 1990; Taylor, 2017). Moreover, transformative learning involves individuals' participation in "reflective discourse" (Mezirow, 2000, p. 11). They talk with others to achieve a better interpretation of an experience and search a common understanding. This then leads to the validation of new interpretations. Reflective discourse may include interactions within a group or between two persons (Mezirow, 2000). Action follows to live the new perspective, which is an imperative part of transformative learning (Baumgartner, 2001). Mezirow (2000) suggests that behavioral change may start with individuals trying to live out their emerging new perspectives through which they build competence and self-confidence in the perspectives. He also indicates that living the new perspective by integrating it into life is essential for transformative learning.

A subject-centered socio-cultural approach to professional agency

The construction and development of a teacher's professional identity requires considerations upon professional agency (also referred to as teacher agency) as identity development takes place through his or her activity (Beijaard et al., 2004; Ruohotie-Lyhty and Moate, 2016). When teachers consider why and how to act, they act on and sustain the negotiation of their professional identity (Duff, 2012). This has the potential to lead to identity development and transformation (Chaaban et al., 2021). Lai et al. (2016) argues that agency is required to drive the development of a teacher's professional identities. Thus, it can be assumed that agency is a means whereby the negotiation and transformation of a teacher's professional identity can be encountered and theorized.

The present study uses a subject-centered socio-cultural approach to begin to conceptualize professional agency. This approach is put forward by Eteläpelto et al. (2013). Within this framework, professional agency is "exercised when professional subjects and/or communities influence, make choices, and take stances on their work and professional identities" (p. 61). Professional agency is negotiated and achieved through a relational interaction between the individual and the social, thus, functioning as "a pathway between social determinism and highly individualistic accounts of cognition" (p. 56). This means, on the one hand, individuals' professional identities, work experiences, knowledge, and competencies function as developmental resources for their professional agency. On the other hand, professional agency is always exercised within specific contexts, locales or environments and these external conditions (e.g. power relations, work cultures and discourses) serve as constraints or resources. This framework entails a temporal dimension, emphasized by Priestley et al. (2015) in describing teacher agency as achieved within "a configuration of influences from the past, orientations toward the future and engagement with the present" (p. 23). This indicates that all the three dimensions are involved in teachers' concrete agentic choices and actions, but the degree to which they contribute varies in each and every instance of agency achieved (Priestley et al., 2015). This also suggests that the practice of agency is dynamic.

The conception of professional agency as discussed above is conceptualized as having two components: one being "identity-agency" (Eteläpelto et al., 2015, p. 665), and the other involving an individual's participation in one's work and the work community (Ruohotie-Lyhty and Moate, 2016). Identity-agency is enacted when teachers renegotiate the components of their professional identity such as ideals, interests and goals, in interaction with social suggestions (Eteläpelto et al., 2015). This study is interested in unraveling the participant teacher's participation in her work and the school community.

Specifically, this study's focus in terms of agency is on which areas of work and community the participant participated in and to what degree she participated. Agency in terms of teachers' participation in their work and work community does not directly relate to their professional identity, but it constitutes a resource for them to draw on as they practice identity-agency (Ruohotie-Lyhty and Moate, 2016). This suggests that this form of agency is also involved in identity development. To put it differently, as teachers enact agency at work through choosing problems to engage in and with different degrees of engagement, they are defining what is learned or changed through their engagement (Billett, 2006). In this way, participation and learning are related to teachers' subjectivities and identities (Eteläpelto et al., 2013).

A teacher's internal forces interact with external forces (e.g., power relations, work cultures, and discourses) in shaping his or her teacher agency (Eteläpelto et al., 2013). Regarding internal forces, this study pays attention to the participant's teacher identity and researcher identity. A university teacher's professional self can be seen as made up of these two identities as his or her work generally relates to teaching and research activities based on subjects (Clarke et al., 2013). The participant teacher was still affiliated with a Chinese university whilst pursuing a doctoral degree in Australia. Moreover, teacher identity can have multiple facets, or sub-identities (Akkerman and Meijer, 2011), as well as imagined identities (Kanno and Norton, 2003). This study assumes the interplay between external forces and the participant's multiple identities in the shaping of her teacher agency.

Teacher narratives and restorying

Methodologically, this study was approached through narrative inquiry, a means to capture lived experience. Bruner (1987) proposes the narrative mode of knowing, arguing that we live in a storied world and narrative is the central structure of making meaning of experience. Connelly and Clandinin (2006) see story as "a portal through which a person enters the world and by which their experience of the world is interpreted and made personally meaningful" (p. 479). Empirical studies on teachers' stories through the method of narrative inquiry has substantially enriched our understanding of teacher identity (Ottesen, 2014) and has also demonstrated its advantage in capturing teachers' personal stories for exploring their professional identity and agency (Chaaban et al., 2021).

In narrative inquiry, participants tell stories of their experiences and researchers describe such experiences, collecting and retelling participant stories for research purposes (Connelly and Clandinin, 1990). In this "restorying" process, researchers are agents as they endeavor to draw out stories from participants and analyze raw data to form new stories for particular audiences (Mulholland and Wallace, 2003; Beaven and Jerrard, 2012). It is a process in which the original narrative of the participant is shared with the researcher, and interpreted and re-interpreted during the collaboration between the researcher and the participant.

The context of the narrative inquiry and the participant

The narrative inquiry is situated in a Sino-Australian Language Teacher Education Program. Every year, volunteer-teachers from China with varying professional and educational experiences were recruited to engage in the school-based and workshop-facilitated professional learning, supporting or providing Chinese lessons in Australian classrooms. They were concurrently trained as researchers, enabling them to reflect on their professional learning. The program was aimed to prepare language teachers with international vision and inclusive pedagogical knowledge for language education. The participant teacher, Qing by pseudonym, joined the program as a volunteer-teacher and a doctoral student in September 2019. The first author of the article was also a volunteer-teacher and a doctoral student in the program. The study reported in this article is a part of the first author's doctoral research project.

Collecting narrative accounts

In this study, the primary sources of data include in-depth interviews and the participant's three termly reflective journals. The self-reported original narratives are complemented with the first author's field notes and the documents of the program. Methods employed for this study seem to be in line with those in other similar studies. For example, Kayi-Aydar (2019) conducted a single-case narrative study on a language teacher's agency in the development of her professional identities by including data sources of interviews and journal entries of a course. Firstly, data collection began with the participant teacher's three termly reflective journals. Qing, as a volunteer-teacher of the program, was required to write a reflective journal for each term in English as part of her course. The journals served as a powerful lens to enter Qing's inner world as she recorded and reflected on major events she had experienced and negotiated in Australia. Then, three in-depth interviews were conducted and audio-recorded. The first two interviews revolved around Qing's learning and teaching experiences both in China and in Australia. The focus was on her professional identity experiences in Australia. The third interview was conducted to capture more nuances on interesting points that had emerged in the prior interviews and reflective journals. The total length of interviews was 4 h. In addition, with Qing's permission, fragmented and informal communication between the first author and the participant were also collected in the form of field notes. As Chinese volunteer-teachers and doctoral candidates in the Sino-Australian program, they

often shared stories of teaching and learning in Australia both in person and *via* WeChat. The field notes also included ongoing member-checking conversations, which will be detailed later in this section. Finally, relevant documents of the Sino-Australian program's background and policies were collected. These documents provided valuable information for facilitating the interpreting of Qing's lived experiences.

Analyzing and re-organizing the story

Data analysis of the study included three stages. The first and second stages were coding for broad themes to form a thematic map (Braun and Clarke, 2006). In the third stage, following the thematic map, the raw data was reorganized into a story that highlighted the meanings of Qing's lived experiences.

The coding method employed in this study was similar to Braun and Clarke's (2006) "theoretical thematic analysis" in which coding is more "driven by the researcher's theoretical or analytic interest in the area" (p. 84). It was also informed by the assumption that theoretical perspectives enable narrative inquirers to gain further insights into narrative accounts (Clandinin and Connelly, 2000). The first stage was coding for identifying the salient meaning perspectives that built Qing's professional identity constructed in China. The second stage was guided by the five fundamental stages that make up Mezirow's (2000) transformation model and a subject-centered socio-cultural approach to professional agency (Eteläpelto et al., 2013). It was aimed at generating themes that, respectively, indicated: (1) the phases of the cognitive developmental trajectory of identity transformation; (2) the internal and external factors that interacted to shape Qing's participation in teaching work and the school community.

To obtain narrative interpretations, Clandinin and Connelly's (1994, 2000, 2006) "three dimensional" space was considered. The narrative structure consists of "temporality," "sociality," and "place." By "temporality," Qing's story was traced back to the past, situated in the present, and pointing to the anticipated future. By "Sociality," consideration was given to Qing's relations to self and other people. By "place," Qing's story unfolded in China and Australia, two different contexts. Thus, this narrative structure provides space for addressing the spatiotemporal, personal and social dimensions of the participant's lived experience.

The researcher's positionality and trustworthiness

This study falls into the category of "insider research" since the first author and the participant were both Chinese volunteer-teachers in the Sino-Australian program (Kanuha, 2000). Insider research is frequently subject to concerns of legitimation and trustworthiness. For example, researchers' familiarity with the research context and participants can result in loss of objectivity in data interpretation (Asselin, 2003; Unluer, 2012). Great familiarity can also lead researchers not to probe for deeper meanings of the phenomenon under study or ignore crucial data in data collection (Asselin, 2003; Tshuma, 2021). Due to these potential pitfalls, insider researchers run the risk of compromising the trustworthiness of the study.

In response to this concern, an exhaustive and ongoing member-checking technique (Poole, 2019) was applied. This means that the interview transcriptions and field notes were returned to the participant for checking, and the emerging story was also repeatedly shared with the participant. Follow-up conversations were organized to obtain new information from the participant and negotiate alternative insights and interpretations. Thus, the interpretations reported in this study were co-constructed between the first author and the participant throughout the development of the "restorying" process (Ollerenshaw and Creswell, 2002). This process lasted for over 2 years and involved nuanced and iterative renegotiations and reinterpretations of the stories between the two sides. It ensured collection of high-quality data and sufficient probing of the participant's meanings.

Results – Qing's story of teacher identity transformation

The results of this study are organized into a story of Qing's teacher identity transformation. This story consists of four sections that present the background of her story, the cognitive developmental trajectory of her teacher identity transformation, the individual and sociocultural influences that contributed to the achievement of her agency in teaching, and how the agency was connected with her teacher identity development.

The background of Qing's story

Prior to attending the teacher education program in Australia, Qing had taught CFL at a Chinese university for almost 7 years. She described herself as a "professional teacher of CFL" (Qing: interview, October 23, 2020) and this self-perception comprised two main themes: a language trainer who thought of systematic Chinese linguistic acquisition as central to CFL education, and an expert teacher in this field. She also identified herself as a confident and responsible teacher. As Qing entered the Sino-Australian program as a Chinese volunteer-teacher in 2019, her prior teacher identity – the way in which she saw and valued her contribution to education – as a language trainer was challenged. This caused her to reflect upon and reconsider

how she saw and valued herself as a consequence of both her past and present experience. This internalization of self-experience, however, was also not independent from the external influences of the new education landscape, one shaped by the teacher education program and the local school, nor was it free from influences of the multiple aspects of her professional self.

Qing's teacher identity transformation from Mezirow's theoretical lens

Qing experienced a five-stage transformative learning trajectory during which her prior teacher identity as a language trainer was challenged, negotiated and transformed: (1) a disorienting dilemma; (2) critical reflection on her prior assumptions in relation to the new context; (3) reflective discourse; (4) trialing and further validating the new meaning perspective; (5) living the new perspective—integrating it into work.

A disorienting dilemma

Qing was allocated to a public primary school in Western Sydney – R Public School. There, the Chinese language program was run through the teacher education program and the school itself did not employ full-time teachers for CFL education. Qing, as a new volunteer-teacher, was required to observe the lessons of her volunteer-teacher colleagues who had taught at the school for a period of time.

The observation threw Qing into a "disorienting dilemma" (Mezirow, 2000). Central to their lessons was engaging students instead of helping students acquire the language. This, in her view, was unprofessional and irresponsible. This experience challenged Qing's heretofore invisible and unquestioned assumption that a CFL teacher was a language trainer (Taylor and Elias, 2012). Initially, she rejected it altogether. She recalled:

> I despaired. . . . My professionalism did not allow me to accept such Chinese lessons, and my sense of responsibility as a professional teacher did not allow me to teach like that. I hated to see an entire Chinese lesson spent in drawing a picture or learning to sing a song, with students learning nothing [not learning any Chinese language]. (Qing: Interview, October 23, 2020).

Critical reflection — "A language trainer" or "a teacher of interesting classes"

The disorienting experience triggered Qing to critically reassess her "own orientation to perceiving, knowing, believing, feeling, and acting" (Mezirow, 1990, p. 13) about CFL education and what she could or should do as a CFL teacher in the new context.

Qing began to assess the curriculum of CFL education at R Public in relation to her prior experiences. She became aware that systematic language acquisition was not stipulated as central to the language education she was expected to provide. Each class had only one Chinese lesson every week and each lesson lasted for only 30 min. For her, this limited teaching time, plus the minimal previous exposure to Chinese language and culture of her students, made systematic grammatical teaching in class practically impossible. Moreover, the CFL program at the school did not include learning outcome and assessment. Qing recalled: "The criteria for a successful Chinese lesson was whether students could discern Chinese characters from other languages [Japanese, Korean] [and] whether students enjoyed the lesson or engaged in classroom activities" (Qing: Interview, October 23, 2020). Very soon during the observational period, critical reflection on her prior teacher identity in relation to the new context led Qing to become aware that in this school a Chinese volunteer-teacher was seen as needing to be a "teacher of interesting classes." She was expected to spark students' interest in the language and its culture through the construction of enjoyable activities.

However, a fundamental change in her approach to CFL education did not occur until she began to develop a deeper understanding of the Australian students and their learning needs and cognitive abilities, and this in turn deepened her critical reflection into what was suitable CFL education for them. This took place when she had engaged in this school for about half a year. She stated: "I gradually accepted the interest-oriented approach to CFL education in Australia. I stopped sticking to grammar in the later [stages]... of my teaching experience in Australia." (Qing: interview, August 22, 2021).

Reflective discourse — using professional dialogs to make sense of experience

Amid disorientation, Qing sought to have dialogs with her peer volunteer-teachers in the teacher education program and her friends teaching CFL in New Zealand and the United States. She also consulted with the coordinator and lecturer of the program. These dialogs revolved around the diverse contexts in which Chinese teaching took place. Through these discussions Qing compared and contrasted the contexts and critically reflected on the potential appropriate CFL pedagogies. This led her to learn more about her new experience and become surer that she had to renegotiate her prior teacher identity as a language trainer, "[so] I had to adapt and change [in response to the new environment]," in her own words. She narrated:

> They (My volunteer-teacher colleagues) said that the Chinese program was not aimed at helping students to acquire the language, but promoting students' interest in

the language. . . . They all advised me not to stick to teaching students linguistic knowledge. (Qing: Interview, October 23, 2020).

Thus, in Qing's story of transformative learning, rational discourse became an arena wherein her experience and critical reflection were played out (Taylor, 2000). Through these dialogs, she gained better understanding of the meaning of her new experience, sought for common understandings, and validated her changing interpretations of her new experience (Mezirow, 2000). In other words, Qing drew on collective experience to question her prior experience and promote her understanding of the new experience, and hence achieve a "tentative best judgment" (Mezirow, 2000, p. 11).

Trialing and further validating the new meaning perspective

Putting the new meaning perspective into practice is necessary for effecting transformative learning (Baumgartner, 2001). Qing's emerging new meaning perspective led to major changes in her teaching practice in Australia. She explored pedagogies to spark students' interest in learning Chinese. She said:

As a language trainer in China, my focus was on how to teach grammar effectively. . . . In the new context, however, I began to assess students' conditions, to consider their needs, the things that would engage them, and even what they were learning in other subjects. (Qing: interview, August 22, 2021).

In an interview, Qing mentioned about how she amended teaching to engage students during the third term of 2020. She taught lessons based on what her students were learning in their mathematics class. Such lessons not only engaged students but also aroused local classroom teachers' interest in Qing's teaching and won their support. This further validated the new meaning perspective. She wrote: "I gained confidence when I was delivering lessons that were relevant to their course [Mathematics]. Classroom teachers also showed their interest in my lesson." (Qing: Termly Reflective Journal, Term 3, 2020).

Living the new perspective — integrating it into work

Throughout almost a year's professional learning in Australia, Qing's conception of the nature of CFL education "expanded." She realized that her prior understanding was limited and that depending on contexts, interest-sparking pedagogy should be included in the teaching practice of CFL teachers. Thus, Qing's understanding of her teaching self became "more inclusive, discriminating, open," and "more

true or justified to guide action" (Mezirow, 2000, p. 7). It became more flexible and negotiable. She stated that she would utilize this new learning perspective in her future career, after she returned to her teaching position in China. After this occurred when the third interview was conducted, she said:

Now I am back in China and when I teach international students at university I strictly follow the principle of systematic linguistic acquisition. But when I need to provide Chinese lessons to students overseas, in particular if these students are young and the length of lessons is short, I think about what topics and what content would engage them and strengthen their interest in learning Chinese language and culture. (Qing: interview, August 22, 2021).

Individual and sociocultural factors shaping Qing's teacher agency

In Qing's story, sociocultural and individual factors interacted shaping the achievement of her teacher agency (Eteläpelto et al., 2013). The sociocultural factors included the structural conditions and school culture within which she was embedded in Australia. The individual factors primarily referred to her multiple professional selves that were linked with her prior work and life history. These internal and external forces were inextricably intertwined in Qing's attempts to navigate various conflicts and tensions and shaped her agentic choices and actions in terms of her participation in teaching and the school community.

Constraints of Qing's teacher agency

Qing's professional learning and teacher identity development in Australia was a story imbued by the constraints of structural power on her agentic choices and actions in relation to teaching and the school community. These structural factors included structural labeling that undervalued her expertise, a heavy teaching load and unequal power relations. In addition, tension between her teacher identity and researcher identity was also intertwined with these external forces.

Qing felt demotivated due to her being labeled a volunteer-teacher. Volunteer-teachers were identified as 'unqualified teachers' in the Sino-Australian program. They were, in the program coordinator's words, "not supposed to be teaching, but to be learning to teach from the Australian teachers in the Australian system." (Qing: Interview, December 19, 2020). This institutional discourse, in Qing's view, was "ridiculous" and suppressed her initial enthusiasm for teaching at the school. As a CFL teacher, she used Chinese as her first language, was trained and received qualified teaching degrees in China, and had years of teaching CFL experience to international students in China.

She acknowledged that she was learning from the local teachers. But, at the same time, she also thought that her expertise as a professional CFL teacher should be valued. However, the structural labeling of volunteer-teacher as 'unqualified' made her feel belittled and thus curtailed her engagement in her teaching work. In this regard, the interplay between her self-perception as a professional teacher constructed during her prior experience and the structural condition within which she was situated in this teacher education program informed the shaping of her teacher agency.

> I expected to be seen as a professional teacher. I had hoped to provide good service to the program, and to help build a more effective CFL program at the school where I volunteered. But it appeared they [the coordinator of the program and the school mentor] did not accept it. So I thought I shouldn't necessarily be as devoted as I had thought I should. . . . [I had those bad moments of telling myself:] just be there and finish the teaching duty. (Qing: Interview, December 19, 2020).

The heavy teaching load and unequal power relations involved also emerged as significant structural factors that constrained Qing's teacher agency. These negative themes recurred in her narrative accounts of her experience before the teaching load was reduced at the third term of 2020. After the observational period ended and her volunteer colleagues left the school, Qing was required to teach the entire school. This meant that she had to teach twenty-one lessons over two consecutive days weekly. This, for her, was a difficult mission. Each lesson lasted 30 min and she taught 10 or 11 lessons daily. Her teaching started at 9:00 in the morning and ended at 3:00 in the afternoon. Except for a brief lunchtime break, she kept "hopping" non-stop from one classroom to another. Such intensity seemed to be one reason for her to frequently feel exhausted at the end of the teaching day. Moreover, she was a responsible teacher and lesson preparation required a great deal of time and energy for the wide range of student population from kindergarten to grade six. She said, "lessons for different grades had to be prepared and taught differently given their varying cognitive capabilities." (Qing: Interview, October 23, 2020). Further, she was also a doctoral student constantly pressed for advancing research work. She frequently talked about suffering burnout after 2 days' teaching and had to sleep throughout the following day, which affected her doctoral studies.

Qing mentioned about her attempts to bring her concern to the School's management for adjustment of this unreasonable arrangement in interviews as well as in her reflective journal. She expected to be able to ensure teaching quality as well as research work with a more reasonable workload. She said, "I wanted to ensure teaching quality. I wouldn't possibly have the time to know the students well and prepare lessons well

enough when I had to take charge of so many classes." (Qing: Interview, October 23, 2020). However, to her disappointment, there was no adequate response to her concerns. Feeling herself to be burdened with an overly heavy teaching load, and lacking institutional support, Qing felt "powerless" and did not have "any autonomy." (Qing: Interview, December 19, 2020). This decreased her investment for teaching. She recalled: "Since they treated me like that, I got out there immediately after finishing teaching every time." (Qing: Interview, December 19, 2020). Qing's narration concerning the non-negotiable heavy teaching task displayed an inextricable interplay between structural forces and her individual conditions. Specifically, interacting with her ethical pursuit of responsibility, the heavy teaching load and unequal power relation together with her aspiration of doctoral degree appeared to be constraining her participation in teaching.

Qing's participation in teaching was also hindered by her individual condition—her pursuit of doctoral studies. As mentioned in the preceding narration, there was tension between her teaching and doctoral studies, and this tension became particularly intense when she had to conduct a heavy teaching load and meanwhile her supervisor did not support her research work well. In interviews, she repeatedly talked about how the struggle to balance between the two became particularly intense as she was burdened with an unreasonably heavy teaching load. She apparently prioritized research training rather than teaching as she stated, "I was here [in Australia] primarily to finish my doctoral degree." (Qing: Interview, October 23, 2020). It was essentially due to her strong aspiration for her future professional self—maintaining job security and earning a promotion in academia. As she said in one of the WeChat member-checking conversations: "As a university teacher, I have been facing ever-increasing pressure for not holding a doctoral degree. . . . A doctoral degree will certainly boost my capabilities and possibilities of achieving a higher professional title." (Qing: field notes, December 19, 2021). Thus, Qing chose to reduce her investment in teaching for ensuring her commitment to becoming an academic researcher. She chose to "just get through teaching duties, . . . focus on [my doctoral] studies, don't be concerned about teaching, don't let teaching interfere with [my] mood and affect [my] doctoral studies." (Qing: Interview, October 23, 2020). It was worth noting, however, that despite Qing valuing research training more than teaching and the priority seeming 'clear-cut,' the negotiation was visibly continuous.

Resources of Qing's teacher agency: Individual, cultural, and structural

Situated within the structural constraints and constantly negotiating the distractions around dedication to her doctoral studies, Qing felt that her identity as a responsible teacher enabled her to sustain a certain sense of teacher

agency. This individual resource of agency ensured her continuous search for suitable Chinese teaching for her Australian students. She ascribed this resource to her past professional experiences.

> My past professional experience made me feel the responsibility as a teacher. That was, completing the allocated teaching task at the school as well as maintaining the [basic] quality of my teaching. I tried my best to engage my students and increase their interest in learning Chinese in my lessons. ... I took providing good teaching as my duty. I did what a teacher should do ... [I set out] to ensure the effectiveness of my teaching, and [to] do it well, which was my duty. (Qing: Interview, October 23, 2020).

Moreover, school culture also acted as a resource of Qing's teacher agency (Eteläpelto et al., 2015). Local teachers were very friendly to her and this warm work climate and social relationship boosted a sense of belonging in her and thus motivated her to uphold a serious attitude to teaching at the school (Hökkä et al., 2017). She stated:

> Classroom teachers would express their concern about my family back in China. They were all very friendly to me. This made me feel I was a colleague of theirs, ... and I shouldn't treat teaching there in a slipshod manner. (Qing: Interview, October 23, 2020).

Notably, Qing's agency in teaching was also significantly enhanced due to a substantial cut in her teaching load. This occurred as a result of the school's policy shift at the third term of 2020 when she had been teaching there for approximately half a year. Because of shortened weekly teaching hours, she was able to distribute more of her time and energy to exploring suitable Chinese lessons for the benefit of her Australian students. The dramatic change in Qing's teacher agency due to a cut in the assigned teaching load demonstrated the power of institutional structuring in mediating a teacher's agentic choices and actions in teaching practice.

Connecting Qing's teacher agency with teacher identity development

Teacher agency is enacted when a teacher performs concrete agentic choices and actions that affect his or her teaching practice (Tao and Gao, 2021) and it can be viewed as "the performance of identity within the constraints of teachers' professional contexts" (Hiver and Whitehead, 2018, p. 3). Whilst the primary focus of the foregoing section is on how the internal and external factors shaped Qing's participation in teaching, this following section will illuminate how her enactment of

agency was associated with her professional learning and teacher identity development.

Prior to the third term of 2020, it appeared that Qing sustained a certain sense of teacher agency that was very similar to a "satisficing form of agency" (Chaaban et al., 2021, p. 6). This meant that she coped with the teaching duty in a way that she felt that her ethical standard as a responsible teacher was more or less maintained and the requirements of the teaching situation were met. This sense of agency was manifested in her agentic participation in classroom teaching. She would spend a whole day preparing her teaching every week and she made efforts in preparing differentiated instruction for different cohorts of students. Moreover, she said that "lifeless instruction [that might work for her adult students in China] was not for children," and she "mobilized her facial expressions, language and tones as well as organized different classroom activities to engage the students." Even though organizing and conducting classroom activities for children was "exhausting" and "different from that for her adult learners in China," and that she was "suffering a sore throat" as a result of continuous enthusiastic teaching, she still tried to do what would be good for students. (Qing: Interview, December 19, 2020). These agentic actions provided a resource for Qing's professional learning and teacher identity negotiation: she explored suitable ways of teaching for the Australian children and negotiating between her prior teacher identity and her emerging new teaching self in Australia.

Notably, at the third term of 2020 Qing's participation in teaching was distinctly enhanced due to this reduction of her teaching load. As a responsible teacher, she took as her duty the effort to provide effective teaching. When she had to teach only 4 lessons for one teaching day, she was able to spend more time and energy in exploring the children's needs and trialing an interest-oriented pedagogy. She narrated:

> I was assigned 8 lessons for two consecutive days every week [for the third term of 2020]. Thus, I had more time and energy to spend on lesson preparation and in knowing more about the students. When I was waiting for my next lesson, I would take advantage of the time to observe classroom teachers' lessons, ... [and I was interested in] the content of math lessons and the topics of writing course. (Qing: Interview, October 23, 2020).

In her reflective journal, she also talked about her interest in students' math class and used the content of the math lessons as her teaching material. She was motivated to "make the lessons creative, interesting, and future-focused" (Qing: Termly Reflective Journal, Term 3, 2020). These agentic choices and actions constituted a critical resource for her to achieve identity transformation: she attempted to live out her emerging new understanding of CFL education as "interest-oriented" and thus working toward developing an

expanded teacher identity. This was considered as an essential process—behavioral change in Qing's transformative learning and identity transformation, as illustrated in Section "Qing's teacher identity transformation from Mezirow's theoretical lens."
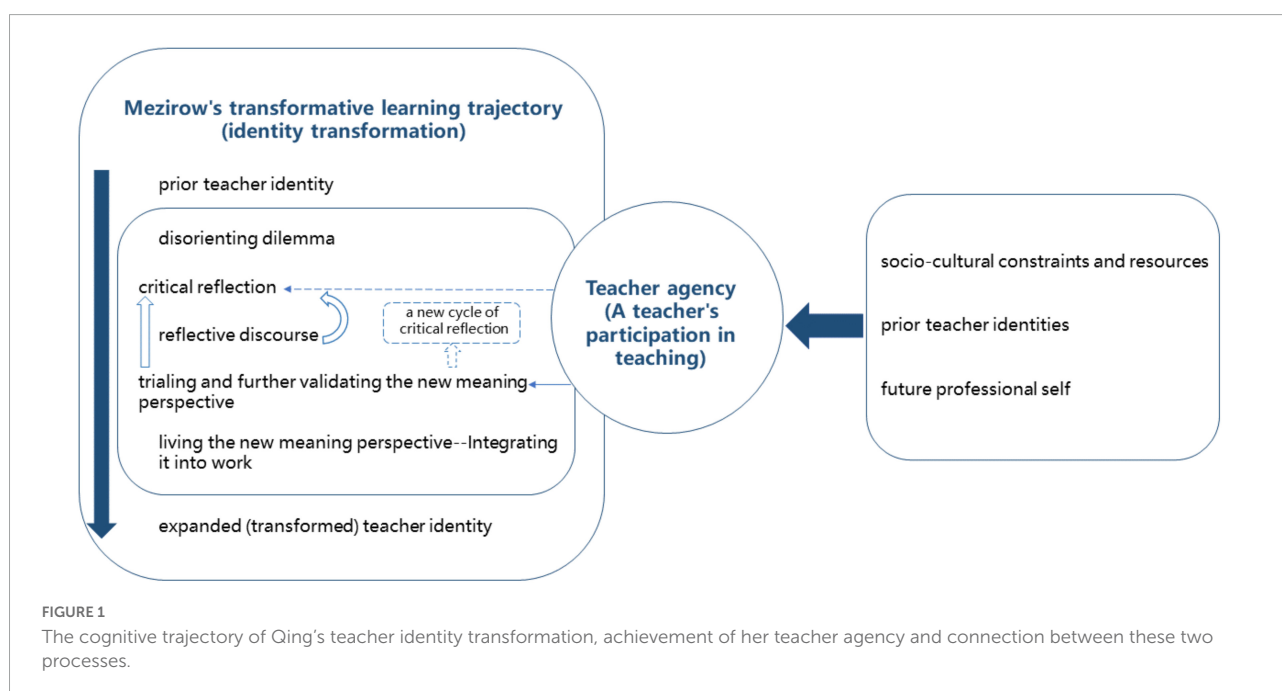
On the other hand, her initial passion for participation in the school community outside the classroom was significantly suppressed. An excellent example of this was that at the outset of her school engagement, she tried "to be more involved in the school, ... greet [local] teachers and try to find interesting topics with them" to know more about the school and students. (Qing: Termly Reflective Journal, Term 4, 2019). However, when talking about her experience during the first term of 2020, she described herself as a teacher who "only wanted to flee the school" and "left as soon as the teaching was done." (Qing: Interview, December 19, 2020). This seemed indicative of her withdrawal from the school community. In addition, as a professional CFL teacher, she initially intended to work out a systematic CFL syllabus for the school. This plan was also abandoned due to her restricted agency. Qing's non-participation suggested a loss of resources for her professional learning and teacher identity development (Vähäsantanen, 2015; Schutz et al., 2018).

Discussion

The teacher's story corroborates the attitude that international teaching experiences can be seen as a form of disorienting dilemma (Mezirow, 2000) that can function as a catalyst for teachers to achieve transformative insights into their professional self (Ye and Edwards, 2018; Jacobs and Haberlin, 2022). Building on the results of this study, the subsequent discussion will revolve around four aspects (also see Figure 1) that contribute to the scholarly literature on transformative learning, teacher agency and L2 teacher identity development.

First, the teacher's story demonstrated that critical reflection was the engine that drove her fundamental change and development. Mezirow (2011) argues: "Transformative learning may be understood as the epistemology of how adults learn to reason for themselves—advance and assess reasons for making a judgment" (p. 23). Through critical reflection, the teacher's prior perceptions of CFL education and mission as a CFL teacher was deconstructed and interrogated (Mezirow, 1990). This opened up new meaning perspectives that were more "inclusive, differentiating, permeable, critically reflective, and integrative of experience" (Mezirow, 1996, p. 163). Specifically, evaluating the local Chinese language curriculum and the students at the school prompted and advanced her critical reflection on her prior assumptions, and her increasingly expanded knowledge of the students was decisive in moving her toward fundamental changes in attitudes and practices. The teacher's critical self-reflection was also promoted through reflective dialogs (Mezirow, 2000) with other CFL teachers and the program's teacher educator. This meant that these people's experiences and ways of meaning-making were capitalized on as resources for facilitating her critical reflection and validating her new emerging insight (Mezirow, 2000). Further, based on her emerging meaning perspective, the teacher implemented a revised pedagogy for classroom teaching, reflected on and analyzed its effect on student learning. This consolidated

FIGURE 1
The cognitive trajectory of Qing's teacher identity transformation, achievement of her teacher agency and connection between these two processes.

her new insight due to positive feedback from students and classroom teachers. This seemed to be triggering a new round of critical reflection on "future-focused" pedagogy.

The teacher's experiences echoed Liu's (2020) argument that "critical reflection is a hermeneutic approach that involves repeated reexamination of one's assumptions about knowledge and understanding" (p. 131). Critical reflection leading to transformative learning involves behavioral change and reflection on this change, which may also result in a new cycle of critical reflection (Liu, 2015). This study adds to the conceptualization of the hermeneutic approach by demonstrating that this process may be extended, particularly for experienced in-service teachers. Also, previous studies have reported the facilitative role of reflective practice in the identity development of teacher educators (Song, 2021) and ESL teachers (Farrell, 2013) as well as the intertwined relationship between teacher candidates' reflective learning and identity construction (Yuan and Mak, 2018). Studies of CFL teachers have also had a mention of critical reflection as a way for negotiation of cultural values and cultural identity (Li, 2016). This study thus enriches the literature by revealing the dynamic and reciprocal relationship between critical reflection and behavioral change in the development of an in-service CFL teacher's identity transformation.

Secondly, the findings are broadly aligned with those of previous studies which have shown that teacher agency is the outcome of the inextricable and complex interplay between individual and sociocultural resources and constraints (Vähäsantanen, 2015; Lai et al., 2016; Tao and Gao, 2017, 2021; Wang et al., 2021; Sun and Cheng, 2022). Structural and cultural factors conditioned the extent to which the teacher was able to translate intentionality into practice (Hökkä et al., 2012; Priestley et al., 2015). These factors included teaching loads, institutional discourses, unequal power relations and school culture. The story indicates that structural changes may increase the degree to which a teacher is able to act on intentionality and thus create potentiality for enactment of enhanced agency (Hinostroza, 2020). Moreover, the different facets of the teacher's professional self emerged as individual resources and constraints in the achievement of teacher agency. The narrative presented an entanglement of teacher identity, researcher identity and structural issues. It showed how this tension informed the shaping of teacher agency. The complexity of interplay between a L2 teacher's multiple identities in the shaping of agency within structural constraints of a cross-border teacher education program has not captured scholars' attention, even though teacher-researcher identity tension is not new in studies of teacher educators' agency (Hökkä et al., 2012; Hinostroza, 2020) and university academics' identity conflicts (McCune, 2021). Further, the teacher's story lent empirical support to the temporal dimension of teacher agency, "the dynamic interplay between past experience, engagement with the present and orientations toward the future" (Eteläpelto et al., 2013). The

teacher's prior teacher identity and her aspired future self encountered in the shaping of her teacher agency within the cross-border program.

The third aspect of the findings worth being highlighted is that teacher agency appears to be a site where teacher identity is negotiated or transformed. The teacher's participation in classroom teaching (i.e., teacher agency) resourced her teacher identity development (Duff, 2012; Hökkä et al., 2012; Schutz et al., 2018; Chaaban et al., 2021). The findings indicate that a teacher's agency is a potential resource for the process of critical reflection, the main internal drive for teacher identity transformation. Critical reflection may occur when a teacher attempts to solve problems and reflects on her or his own beliefs (Jacobs and Haberlin, 2022). Agency might resource a teacher to question and negotiate the prior teaching self, thus facilitating identity re-negotiation. Moreover, an increased sense of teacher agency can facilitate a teacher's fundamental change in pedagogy. Previous research found that activities and practices teachers partake in and tools and resources they use are vital elements for teachers' learning community (Yazan, 2018, p. 30). In this case, the time and effort the teacher spent on knowing students and attending local teachers' lessons resourced her to implement an interest-oriented pedagogy, which further validated her emerging revised insight and was central to her transformation.

Finally, building on the discussion above, the teacher's story has exemplified a holistic conceptual framework for describing and interpreting L2 teachers' identity negotiation and transformation. The nuanced process of the teacher's critical reflection demonstrates the conceptual strength of Mezirow's theory in disclosing the internal rational process of teacher identity transformation. The power of Mezirow's theory is also manifested in the conceptual space it provides for describing both structural changes in awareness and enactment of the transformed awareness (Baumgartner, 2001) that are both considered essential for teacher growth at an identity level (Meijer et al., 2017). On the other hand, a subject-centered socio-culturally based perspective of professional agency (Eteläpelto et al., 2013) captures the teacher's narrative accounts concerning multiplicity of her professional self and the socio-cultural context where her personal transformation occurred, which Mezirow's theory lacks. This latter conceptual lens allows the examination of the dynamic interplay between one's individual conditions (e.g., multiple conceptions of one's professional self) and the external forces a teacher encounters in the achievement of teacher agency, which in turn resources one's identity development as demonstrated above in this section.

The socio-cultural approach has been seen as being narrow in understanding learning, as over-emphasizing social and contextual influences, thus minimizing individual processes (Eteläpelto et al., 2013; Hökkä and Etelapelto, 2014). This study has employed a broader view of the socio-cultural approach that acknowledges the importance of working subjects (e.g.,

teachers) and the role of individual agency as well as that of sociocultural forces (Eteläpelto et al., 2013). This subject-centered lens provides conceptual space for exploring the complexity of multiple facets of a teacher's professional self, as demonstrated in the teacher's story, which complements Mezirow's limitation in its humanistic view of seeing self as being unitary. This study thus argues that this holistic conceptual framework that integrates Mezirow's theory and the subject-centered socio-culturally based approach to professional agency provides a conceptual direction for the research of transformative learning and teacher identity transformation.

Conclusion

This study is a retrospective narrative case study based on a native CFL teacher's lived experience across Chinese and Australian educational landscapes through an international teacher education program. It found that experiences leading to a disorienting dilemma, such as cross-cultural teaching experience, can trigger teachers to practice critical reflection. This should be incorporated into the design of an identity-oriented L2 teacher education program. It is also found that enacting new critical insights may further validate these insights and initiate a new cycle of critical reflection. Reflective journals may work as a method to encourage teachers to keep track of their own trajectory of thinking and encourage them to enact the revised insights. Further, teachers' participation in teaching work and the school community may resource critical reflection and can advance teachers' action in implementing new insights. Thus, how to enhance teacher agency counts for the various sides of an identity-oriented L2 teacher education program.

Out of the findings of this study, teacher agency has emerged as another vital element for implementing identity-oriented L2 teacher education practices. External conditions such as workload, institutional discourses, power relations and school culture can either constrain or resource teachers' interest and enthusiasm for teaching. This constitutes critical knowledge for all parties involved in L2 teacher education programs to motivate teachers' participation. Moreover, the complexity of dynamic interplay between individual and socio-cultural forces in the shaping of teacher agency indicates that teacher educators and policy makers should treat L2 teachers as whole persons with varying individual conditions and undergoing unique experiences within the same program. This suggests the importance of considering the ingredient of individuation (e.g., recognizing individual teachers' prior knowledge) in the design of pedagogical practices focusing on teacher identity development.

For future investigation of teachers' identity transformation researchers may consider including more CFL teachers with varying educational backgrounds in different social and cultural settings. It is also advisable to undertake a longitudinal

approach in the future as it may provide more opportunities to capture more dynamic nuances. Further, teacher emotion has gained increasing recognition as a research lens in L2 teacher education (De Costa et al., 2018) and considering the dimension of emotion in future studies on CFL teacher identity transformation will generate new insights into L2 teacher education practices.

SY conceived and designed the study, collected and analyzed the data, and wrote the manuscript. JH contributed to the analysis of the data and offered suggestions for revision. Both authors contributed to the article and approved the submitted version.

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Processing and acquisition of temporality in L2 Mandarin Chinese: Effects of grammatical and lexical aspects

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This study investigated the second language (L2) processing and acquisition of Chinese temporality, specifically the interaction of grammatical and lexical aspects. An experimental group of 31 English-speaking learners of Chinese and a control group of 29 native speakers of Mandarin Chinese completed an online sentence-picture matching task and an offline translation task. Results from these experiments demonstrated the prototype effect: In aspectual development, perfective aspect started with telic verbs and progressive aspect started with activity verbs, in accordance with the Aspect Hypothesis, both for online processing and offline comprehension. The prototype effect of the grammatical aspect was evident for activity verbs but less so for accomplishment verbs in the L2 group across tasks, and this was explained through language-specific properties and L2 learners' instructional input. In addition, L2 proficiency and working memory capacity were found to modulate these processes.

KEYWORDS

processing, Mandarin Chinese, lexical aspect, grammatical aspect, second language acquisition

Introduction

Time is crucial in human experiences and temporality can be expressed through a variety of mechanisms in different languages including adverbs, semantic features, syntactic structures, and discourse-pragmatic markers. In acquiring tense-aspect at the level of morphosyntax, learners are expected to derive the temporal interpretation for a given aspectual morpheme and/or its association with aspectual information separately encoded in lexical items. In this realm, "tensed" languages such as English have traditionally received more attention than "tenseless" languages (e.g., Li et al., 2022), yet it would be especially informative to investigate "tenseless" languages such as Mandarin Chinese (henceforth Chinese) so that the effect of aspect can be teased apart from that of tense. It is also timely to investigate the universal existence of time in human languages through the lens of Chinese. As the recent two decades witnessed a growing field of Chinese as a second or foreign language both in teaching practice and in theoretical development, scholars have pointed out how Chinese as a Foreign Language (CFL) research approaches should be informed by studies of other languages and how findings in CFL inquiries can advance second language acquisition

and teaching by providing new evidence and testing the generalizability of existing theories (Gao et al., 2014; Gong et al., 2020a). In Gong et al.'s (2020a) review of CFL studies published in the most impactful journals in mainland China in 2014–2018, the authors pointed out that the learning of grammatical features is a key area in CFL teaching and research and they referred to studies on grammatical aspect learning as examples. The current article responds to this call for cross-linguistic perspectives in CFL research (e.g., Gong et al., 2020b) by supplementing the existing language acquisition theories regarding time expressions in human languages' event structures and by taking advantage of the unique typological features in Chinese.

Across different languages, grammatical aspects can be encoded through morphological markers and lexical aspects are realized lexically (Comrie, 1976; Smith, 1997). It has been posited that grammatical and lexical aspects are associated in some principled fashion, as formulated in the well-known Aspect Hypothesis (henceforth the AH; Shirai and Andersen, 1995; Bardovi-Harlig, 2000). This hypothesis has its origin in first language (L1) acquisition (Andersen and Shirai, 1996) and has been extensively tested across languages among children (e.g., Shirai, 1998; Stoll, 1998; Li and Shirai, 2000; Chen and Shirai, 2010). Although the acquisition of tense-aspect morphology has been the focus of inquiry in the field of second language acquisition (SLA) for decades, especially through the functional approach, existing research has devoted a disproportionate amount of attention to perfective aspect only (Bardovi-Harlig, 2012). Moreover, relative to L1 acquisition research, SLA studies so far have addressed to a lesser extent the influence of lexical aspect and its interaction with grammatical aspect (cf., Ryu et al., 2015; Zeng et al., 2021). In SLA studies of Chinese, there is a sizable body of literature on grammatical aspect, especially for learners' knowledge and usage of the perfective marker -le (e.g., Wen, 1995; Duff and Li, 2002; Xu, 2020), but only a few studies have focused on the interactive effects of grammatical and lexical aspects (e.g., Jin and Hendriks, 2005). General SLA studies addressing the AH also showed mixed results, arguably due to task effects, with existing research relying predominantly on offline production tasks (Bardovi-Harlig and Comajoan-Colomé, 2020, p. 1158).

With these research gaps in mind, the current study aimed to investigate the effects of grammatical and lexical aspects on the processing and acquisition of the temporal structures of events in sentences by English learners of Chinese through both online and offline measures. We also explored the influence of individual differences in language proficiency and working memory capacity on these processes.

Aspect hypothesis in relation to the current study

Grammatical aspect, also known as viewpoint aspect, reflects how a speaker views a situation/event. Perfective aspect (e.g., *have*

done in English) is used when a situation is conceived as being completed (e.g., *We have talked*) and imperfective aspect (e.g., −*ing*) is used when a situation is conceived as being ongoing (e.g., *We are talking*). Commonly seen Chinese grammatical aspect markers include -*le*, -*zhe*, -*guo*, and *zai*, which encode the perfective, durative, experiential, and progressive aspects, respectively. Lexical aspect, also known as situation aspect, refers to the inherent temporal properties of a situation. Typical categories of lexical aspects include states, activities (ACTs), achievements, and accomplishments (ACCs) (Vendler, 1967). Different classes of lexical aspects can be identified with reference to, among other things, telicity and punctuality (Comrie, 1976; Dowty, 1979; Smith, 1997). For instance, based on telicity, ACT verbs and ACC verbs can be distinguished: While both involve a duration ([−punctual]), the two are distinct in that atelic ACTs (e.g., *run, swim*) do not have a natural endpoint and telic ACCs (e.g., *draw a picture*, *run a mile*) have an endpoint.

The grammatical and lexical aspects under investigation are relevant to two generalizations made in the AH. Specifically, the AH states the following regarding perfective and progressive markings in associations with different lexical aspects (Andersen and Shirai, 1996, p. 533):

1. Learners first use past marking (e.g., English) or perfective marking (Chinese, Spanish, etc.) on achievement and accomplishment verbs, eventually extending its use to activity and stative verbs.
2. In languages that have a progressive aspect, progressive marking begins with activity verbs, then extends to accomplishment or achievement verbs.

Shirai (2004) explains that the AH has two components. One component concerns the prototypical association between grammatical and lexical aspects in that learners tend to associate the perfective aspect marker with telic verbs such as accomplishments and achievements and the progressive aspect marker with atelic verbs such as activities. The other component pertains to aspectual development in language acquisition, which predicts that beginning learners are more constrained by the prototypical association than proficient learners. In other words, as their proficiency increases, learners will spread the use of the perfective aspect marker from telic verbs to atelic verbs, as well as extend the use of the progressive aspect marker from activities to telic verbs. These tendencies were first observed in L1 acquisition and have then been applied to the SLA of different languages including English, Spanish, Russian, Japanese, etc. (Andersen and Shirai, 1996). There have been a few related accounts that explain these tendencies. Anderson (1993) proposed the Semantic Congruence Principle on which the prototypical combinations of certain aspects semantically operate. For example, progressive markers and activities are semantically congruent, so there may be a universal predisposition for humans to give a progressive marking to notions associated with the [+durative] [−telic] features (e.g., *John is running*). Perfective aspect markers and

accomplishments are also semantically congruent, as they are relevant to telic and bounded events. Shirai (2002) explains that if the prototypical semantic features (e.g., [+durative], [−telic]) are involved, the relevant form (e.g., progressive form) is easily activated and thus frequently produced in learners' speech. The non-prototypical forms do not easily reach the threshold of activation to be accessed and processed during language comprehension and are less likely to be produced by learners. Similarly, non-prototypical forms tend to be acquired later than the prototypes. According to Shirai (2010), the underlying motivations for this prototype effect may also be closely related to input frequency. For instance, if the progressive marking occurs more often in ACTs and ACCs and less frequently in achievement and state predicates (e.g.,?[1] *John is knowing*), then the distributional bias may affect acquisitional tendencies (Andersen and Shirai, 1994).

Although some existing studies, several of which reviewed below, show support for the hypotheses, divergent findings have also appeared, likely due to experimental designs. Whereas the AH predicts that the prototypical association between grammatical and lexical aspects would become less restrictive as learners' proficiency increases, manifesting in areas such as the extension of imperfective across ACTs and ACCs, Shirai (2004) posited that such a developmental prediction was borne out more often in close passages than in cross-sectional and longitudinal studies for narratives. Moreover, with only a few exceptions (e.g., Chan, 2012; Roberts and Liszka, 2013; Zeng et al., 2021), most studies rely heavily on offline measures for researching L2 acquisition of aspects. Relatively little is known about how learners deploy aspectual information online for temporality to be computed during processing.

Aspect in language processing

For the inquiry into the processing of aspects among monolinguals, the focus has been on the role of grammatical aspect in constructing the structural representation of an event (e.g., Altmann and Kamide, 2007) and more recently on the interplay between grammatical aspect and lexical aspect during sentence comprehension (e.g., Yap et al., 2009; Becker et al., 2013). A staple approach to tap into language processing on this topic is the use of online tasks, often with two contrasting visuals so that participants can match sentences with the visual information that depicts the situation. For example, Altmann and Kamide (2007) compared eye-movements for sentences such as *the man will drink* … or *the man has drunk* … in a visual scene either depicting a full glass of beer or an empty wine glass. They found more looks toward the full glass of beer in the future tense condition and more looks towards the empty wine glass in the past tense condition,

suggesting that English participants made use of tense information to predict upcoming materials.

Grammatical aspect has been shown to affect language comprehension and processing, and the effect may surface differently depending on tasks. For example, in Magliano and Schleich (2000), native speakers of English read stories in which a situation was described either as ongoing or completed, and then were asked to decide whether a target verb phrase occurred in the prior story sentence. Their results showed that imperfective aspect has an advantage to facilitate participants' correct decisions over perfective aspect: When participants had just read stories in imperfective situations, they responded faster to the target verb phrase than in conditions where they had read perfective situation stories. The authors attributed this imperfective facilitation to the slower decay rate associated with imperfective situations compared to perfective, arguing that an imperfective situation remains at a higher state of activation over subsequent context to be maintained and processed in working memory. Madden and Zwaan (2003), using a sentence-picture verification task, found that native speakers of English chose either pictures depicting ongoing events (e.g., *The man was making a fire*) or completed events (e.g., *The man made a fire*) when reading imperfective sentences, while they were more likely to choose pictures depicting completed events when reading perfective sentences. Of theoretical interest is the perfective facilitation effect found in Madden and Zwaan (2003) in contrast with the imperfective facilitation effect found in Magliano and Schleich (2000). How might we account for these two different effects? Apart from a potential effect from task variation, lexical aspect could also have been a confound, given that it had not been properly controlled for in either study, making the results of both studies more difficult to interpret and compare.

To examine if aspectual asymmetries would be modulated by lexical aspect, Yap et al. (2009) manipulated both grammatical and lexical aspect in a study of native speakers of Cantonese. In a sentence-picture matching task, participants decided which of the two pictures matched what they read. Crucially, perfective sentences were processed more quickly and accurately with ACC verbs than with ACT verbs, and imperfective sentences were processed more quickly and accurately with ACT verbs than with ACC verbs, demonstrating perfective facilitation for ACC verbs and imperfective facilitation for ACT verbs. Yap et al. (2009) argued that these patterns resulted from the more prototypical and frequent types of association between grammatical and lexical aspects and that such an association is mainly driven by the semantic congruity: Similar features reinforce each other, and dissimilar features result in slower processing. That is, the inherent telicity feature in ACCs is matched by the boundedness feature in perfective markers, and the inherent durativity feature of ACTs is matched by the ongoingness feature of the imperfective marker. Yap et al. (2009) further suggested that the interaction between different grammatical aspect markers and different verbs lead to differences in "neural activations" (p. 593). Thus, compatibility or congruity in features enables faster cognitive processing.

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1   "?" is used to indicate that the sentence may be marginally acceptable.

Aspect in second language acquisition

The L2 acquisition of tense-aspect has been an area of intensive investigation for decades based on both a generative approach (e.g., Montrul and Slabakova, 2003; Gabriele, 2009) and a functional approach (e.g., Bardovi-Harlig and Reynolds, 1995; McManus, 2013). Within the functional framework, testing the validity and generalizability of the AH has been a central issue (see Bardovi-Harlig and Comajoan-Colomé, 2020 for a comprehensive review). Despite much empirical evidence, the AH is far from being settled. One apparent reason is that the acquisition and development of tense-aspect is a complex task and process, constrained by multiple factors, including the prototype effect, L1 transfer, and L2 input (Shirai, 2004). The other reason might be that such studies used different methods and targeted different languages (e.g., Bardovi-Harlig and Reynolds, 1995; Collins, 2002; Comajoan, 2006; McManus, 2013; Ryu et al., 2015), leading to mixed results. For example, Sugaya and Shirai (2007) addressed whether acquisition of the imperfective marker -te i-ru in Japanese was influenced by the lexical aspect using the acceptability judgment experiment. Their result supported the AH, as learners of Japanese were more likely to use -te i-ru with ACTs than with ACCs. The association between an imperfective marker and progressive interpretation was also observed in learners of Korean (e.g., Lee, 2001; Lee and Kim, 2007; Ryu et al., 2015). However, another series of studies showed results that were inconsistent with the AH (e.g., Salaberry, 1999, 2000; Labeau, 2005; McManus, 2013). For example, McManus (2013) used a spoken narrative task and a sentence interpretation task to uncover the development of aspect by English and German learners of French. While their results showed that learners in general were biased towards the prototypical associations predicted by the AH, their advanced level learner group was shown to be affected by the prototypical association to a larger extent compared to the low proficiency learner group, a pattern contradictory to predictions of the AH. To explain the results, McManus argued that the effect of AH would not show up until learners had achieved stability in mapping the meanings of perfective/imperfective markers to their obligatory contexts and only advanced proficient learners in their study used these markers in their relative obligatory contexts consistently, in a way similar to their native speaker control group. In turn, the author suggested that their advanced learners' greater exposure to L1 naturalistic input may be responsible: If the prototypical associations are largely a result of frequency distribution bias, as suggested by Shirai (2010, pp. 184–186) and Hendriks (1999), then the advanced group, who declared more study abroad experience than the low-proficiency group, would be more affected by the distributional bias. McManus (2013) also suggested the possibility of a U-shaped development, claiming that the low proficiency group might already be too proficient to show stronger prototypical associations than the advanced group (p. 319).

From the language acquisition point of view, it is especially important to validate the generalizability of the AH by examining typologically different languages. Similar to the above-mentioned studies that show inconsistent developmental patterns regarding the agreement to the AH, both L1 and L2 acquisition studies testing Asian languages have yielded a picture of mixed results regarding the degree of support for the AH, with some demonstrating consistent results (e.g., L1 Chinese: Chen and Shirai, 2010; L1 Korean: Ryu and Shirai, 2022; L2 Japanese: Shirai, 1995; Shirai and Kurono, 1998; L2 Korean: Lee, 2001; Lee and Kim, 2007; Ryu et al., 2015; L2 Chinese: Jin and Hendriks, 2005) and others being not entirely consistent with the hypothesis (e.g., L2 Japanese: Sugaya and Shirai, 2007; L2 Chinese: Liu, 2012; Tong and Shirai, 2016).

There are a few areas where the current L2 literature on the AH predictions is particularly lacking. First, most previous studies used production tasks, with only a few that included comprehension (e.g., judgment) tasks. Task effect may be a factor that contributes to the variation in results (Shirai, 2004; Bardovi-Harlig and Comajoan-Colomé, 2020). For example, Sugaya and Shirai (2007) examined the L2 acquisition of Japanese imperfective aspect using an acceptability judgment task and an oral picture description task. They found that only the results from the judgment task but not from the oral production task supported the AH. One possible reason could be that their L2 participants were not yet ready to express a consistent sensitivity to aspectual asymmetries in production tasks yet, since production skills are often more delayed than judgment or comprehension skills. Second, most existing L2 studies that probed learners' comprehension used offline tasks only (e.g., Sugaya and Shirai, 2007; Liu, 2012) and online measures were rarely adopted. As learners may draw on different types of knowledge (online for implicit knowledge vs. offline for explicit knowledge) for a task depending on whether the task is timed or not (Loewen, 2009; Godfroid et al., 2015), the use of an online task will minimize learners' reliance on metalinguistic reasoning or prescriptive rules memorized through explicit instruction and enable us to better tap into L2 learners' mental representations and processing of temporality. Finally, Bardovi-Harlig and Comajoan-Colomé (2020) mentioned that individual differences in language proficiency on the L2 acquisition of aspect have been intensively investigated. However, to the best of our knowledge, the role of working memory capacity (WMC) as an additional factor in individual variation has never been explored on the L2 processing and acquisition of aspect, although it has been examined in the processing of English past tense (Rızaoğlu and Gürel, 2020). The influence of WMC on individual differences in L2 processing in general has been well-documented (Linck et al., 2014; Wen, 2015) and a thorough investigation of learners' performances should consider both their language proficiency and WMC effects. The present study seeks to fill the above methodological gaps. More specifically, we will examine the L2 processing and acquisition of Chinese in relation to the AH because the "tenseless" nature of Chinese enables us to reveal interactions between the grammatical and lexical aspects unconflated by tense.

Aspect in Mandarin Chinese

With the lack of linguistic mechanisms in tense, temporality in Chinese is expressed either through aspect and/or time adverbials or inferred from context. In this study, we are interested in the interaction of perfective aspect marker *-le* and progressive aspect marker *zai* with ACTs and ACCs. In Chinese, predicates such as *huahua* 'draw picture(s)' are ACTs (unbounded and with no natural endpoint) compatible with the imperfective aspect marker *zai*. By contrast, predicates such as *hua yi-fu hua* 'draw a picture' are telic ACCs compatible with the perfective marker *-le*. It is important to note that, despite the prototypical association, ACTs can go with *-le*, as *-le* indicates "completion" when it occurs with a verb encoding a telic situation (e.g., resultative verb compound such as *chi-wan* 'eat-finish') and it indicates "termination" when occurring with atelic situations (e.g., atelic verbs such as *chi* 'eat'; Li, 1990). Similarly, *zai* can be associated with most situation types except for (individual) states (? *zai zhidao* 'is knowing'; Xiao and McEnery, 2004, p. 209). Specifically, when it comes to ACCs, *zai* can occur with "non-completive" ACCs (e.g., *zai hua yi-fu hua* 'is painting a picture', *zai kan yi-ben shu* 'is reading a book'), but not ACCs with a goal, duration, or distance (? *zai zou yi-quan xiaoyuan* 'walk one round campus'; Liu, 2012, p. 160).

One of the earlier studies on the AH in Chinese SLA was conducted by Jin and Hendriks (2005), who employed a narrative story-telling task to explore learners' use of *-le*, *zai*, and *-zhe* (a durative marker denoting the imperfective aspect). They reported several pieces of evidence in support of the AH: Their L2 participants used perfective more than imperfective markers at the beginning and both their L2 participants and their control group (L1 adults) used perfective-*le* largely in associations with achievements. Further, an increase in L2 participants' proficiency level went hand in hand with the decrease of perfective-*le* with achievements, suggesting the spread of perfective to other situation types when learners' proficiencies increased. Meanwhile, all the tokens of L2 participants' perfective-*le* with ACT predicates were ungrammatical, suggesting continuous difficulty in non-prototypical associations. For the imperfective marker *zai*, both the native speakers and L2 learners mostly used it with ACT predicates, again conforming to the prototype predictions. Further, while the L1 control group also used *zai* occasionally with ACCs, the L2 group used *zai* with ACCs in ungrammatical ways, indicating challenges in acquiring non-prototypical associations.

A more recent study using production data was Yang (2016), who extracted 60 Chinese essays written by English native speakers across four different proficiency levels from the Chinese Interlanguage Corpus by the Beijing Language and Culture University. Examining learners' usage of *-le* and *-zhe*, Yang (2016) reported findings that were also generally consistent with the AH, in that perfective-*le* occurred most often with accomplishment and achievement predicates and much less so for activity and state predicates. While both Jin and Hendriks (2005) and Yang (2016) used production data only, Liu (2012) employed a judgment task

and a production task based on pictures with L2 participants with English L1 background and found patterns deviating from the AH. For instance, none of the L2 participant subgroups from low to high proficiency levels in Liu (2012) showed statistical differences from L1 Chinese adults' performance in *zai*'s association with non-completive ACCs (e.g., *kan yiben shu* 'read a book'); meanwhile, Liu's low-level (but not intermediate or high-level) participants showed significantly lower accuracies than native speakers in *zai*-ACT associations. The author interpreted this result as evidence that non-completive ACCs was acquired earlier than ACT predicates with *zai* associations by L2 participants. This pattern contradicted the prototypical associations predicted by the AH. While Liu (2012) discussed the role of L1 transfer to account for other findings in her study, transfer did not seem to account for this pattern of deviation from the AH. Another study reporting evidence inconsistent with the AH was Tong and Shirai (2016), who used a written editing judgment task. In their study, L2 learners (2nd and 3rd year learners of Chinese) had to judge whether the use of *-le* and *zai* are obligatory, forbidden, or optional in association with different lexical aspects in sentences and paragraphs. They found that although learners' use of *zai* conformed to the prototype associations (with *zai* associations with ACT predicates judged as obligatory most of the time), the developmental patterns in learners' judgment of *zai* and *-le* contradicted the AH: Whereas the AH predicts the acceptance of less-prototypical associations in higher proficiency levels, the higher-level L2 participants in their study showed stronger associations between *zai* and ACTs and stronger associations between *-le* and ACCs than lower-level participants. Whereas Tong and Shirai (2016) used the default past tense hypothesis (Salaberry, 1999) to explain their findings, their results may also be affected by their determination of lexical aspect categories: While their study mentioned the use of diagnostic test developed by Chen and Shirai (2010), some lexical aspect coding, such as *mai* 'buy' as an accomplishment verb and *zuo-che* 'ride-the-bus' and *wen* 'ask' as achievement verbs, may be questionable.

The present study

The above literature review section shows that task variations (i.e., online tasks that tap into implicit knowledge and offline tasks into explicit knowledge) and the role of individual differences especially in working memory capacity in the L2 processing and acquisition of temporality have often been overlooked in the past. In addition, when it comes to L2 Chinese research on this topic, studies have exhibited variations in their degree of support for the AH.

The goal of this study was to investigate the processing and acquisition of Chinese temporality in L2 learners of Chinese and the effects of grammatical and lexical aspects on these processes. We are interested in the extent to which these effects may be predicted by the AH. To this end, we employed a sentence-picture

matching task, which has been argued to be a suitable method for assessing implicit linguistic knowledge (Orfitelli and Polinsky, 2017), to collect data regarding how accurately and quickly learners process temporality online. We also included an offline written translation task, in which learners can draw on explicit knowledge (Loewen, 2009), to generate data regarding how learners comprehend a given linguistic input (Campbell, 2014). With the triangulation of online and offline tasks, and with considerations of potential individual differences in language proficiency and WMC, we aim to provide a more complete picture of L2 learners' processing and comprehension of temporality. Specifically, we seek to address the following research questions (RQs):

> RQ1: How do grammatical and lexical aspects influence the online comprehension of temporal event structures in L2 learners of Mandarin Chinese?

> RQ2: How do grammatical and lexical aspects influence the offline comprehension of temporal event structures in L2 learners of Mandarin Chinese?

> RQ3: Do learners' proficiency and working memory capacity modulate these processes? If so, how?

Materials and methods

Participants

Thirty-one L1-English students learning Chinese at a university in northeast U.S.A. participated in the experiments (age 18–35, mean age 20.7). They were all enrolled in or had completed second-year, third-year, or fourth-year Chinese courses at the institution. They have learned Chinese for 2.7 years on average ($SD = 0.8$, Range 2–4). For the exploratory analysis of influence from proficiency in this study, L2 proficiency was explored either as a continuous variable or as a categorical variable. The operationalization of proficiency as a continuous variable is detailed in the section on "Data treatment and analysis." The operationalization of proficiency as a categorical factor was based on participants' course enrollment or completion. Specifically, participants who were enrolled in or had completed Second Year Chinese II as their highest level Chinese course were considered the first group. As the study was conducted at the end of the semester, those participants had four semesters of classroom instruction; participants who were enrolled in or had completed Third Year Chinese II as their last Chinese course were considered the second group; participants who were enrolled in or had completed Fourth Year Chinese were considered the third group. Based on the annual in-house Oral Proficiency Interviews implemented at the institution, participants in the first group (with four semesters of Chinese learning) had

intermediate-mid to intermediate-high level proficiency based on ACTFL standards.[2] Participants in the second group had advanced-low level proficiency, and participants in the third group had advanced-mid or higher proficiency. For convenience and from here on, these three groups will be, respectively, referred to as the "intermediate" ($n = 15$), "advanced" ($n = 10$), and "advanced-plus" ($n = 6$) groups. In addition, while participants' language background surveys revealed that their exposure to Chinese was primarily through classroom instruction and English was the dominant language for all participants, fourteen of the L2 participants reported that they have one or two parent(s) who speaks at least one dialect of Chinese. Because those participants were possibly exposed to English and Chinese simultaneously in their home setting, we refer to those 14 participants as heritage language learners, in contrast to non-heritage learners who had no home exposure to Chinese. It should be noted that while 6 of those 14 participants reported both English and Chinese as the first languages that they learned, all 31 participants reported that their exposure to Chinese was primarily through classroom instruction and that English was their dominant language. In consideration of the potential influence of participants' heritage background in their performance patterns, heritage vs. non-heritage language experience was also probed as an exploratory analysis in this study.

Twenty-nine Chinese native speakers as the control group were recruited from two Chinese universities in Mainland China. They were undergraduate or graduate students at the time of the experiments (age 18–23, mean age: 20.2 years). All participants reported normal or corrected-to-normal vision.

Materials

Experimental items for the sentence-picture match task (SPMT) consisted of 40 critical items in four conditions constructed by crossing two factors: grammatical aspect (Imperfective vs. Perfective) and lexical aspect (ACT vs. ACC). These items were adapted from Yap et al. (2009), where the sentences were presented in Cantonese. In some cases, the lexical items and sentences were modified to suit the proficiency levels of our L2 participants.[3] After modification, two intermediate proficiency students who were from the same participant pool but did not take part in the experimental tasks checked all experimental materials to ensure that all the lexical items were familiar to participants. One set of example sentences are illustrated in (1).

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2 The in-house OPIs refer to American Council on the Teaching of Foreign Languages (ACTFL) OPIs, see ACTFL Proficiency Guidelines (2012).
3 The second author of the study is an experienced Chinese language instructor who is familiar with the participants' instructional materials.

1. a. Zhe-ge nanhai zai he niunai. (Imperfective-ACT)
      This-CL[4] boy ZAI-drink milk.
      'This boy was drinking milk.'
    b. Zhe-ge nanhai he le niunai. (Perfective-ACT).
      This-CL boy drink-LE milk.
      'This boy drank milk.'
    c. Zhe-ge nvren zai zuo yi-kuai dangao. (Imperfective-ACC).
      This-CL woman ZAI-make one-CL cake.
      'This woman was making a (piece of) cake.'
    d. Zhe-ge nvren zuo le yi-kuai dangao. (Perfective-ACC).
      This-CL woman make-LE one-CL cake.
      'This woman made a (piece of) cake.'

As illustrated, pairs of sentences, e.g., (1a) vs. (1b), differed minimally in grammatical aspects and the contrast between ACTs and ACCs was realized by using different lexical items.[5] These critical items were distributed into two lists based on a Latin Square design such that a participant would never encounter the pair of (1a) and (1b) or the pair of (1c) and (1d) at the same time, and each participant read 20 items (five items per condition) in the SPMT and 20 items in the translation task, explained in the "Procedure" section. For the SPMT, 18 distractors similar to the critical items in length and linguistic complexity but with unrelated syntactic structures (e.g., *ba*-, *bei*-structures) were created. The distractors helped to disguise the critical trials, making each list in the SPMT ultimately consist of 38 test sentences, counterbalanced across participants. All items in one list were also completely randomized for presentation order in the SPMT. To minimize participant fatigue, no distractor items were included in the translation task.

Procedure

The complete experiment included an online sentence-picture matching task, a working memory test, an offline Chinese-to-English translation task, and a language background questionnaire, in this order. This task order was deemed most effective to avoid a repetition effect: Despite a Latin Square design, some test sentences may still repeat across tasks. The sentence-picture matching task needed to precede the translation task because participants' exposure to each sentence in the online task was brief and they were unlikely to retain clear memories of the sentences read. Similarly, the working memory test was inserted between the two tasks to further minimize any potential repetition effects. A language background questionnaire

was administered at the end to minimize a possible fatigue effect in the main tasks. The complete experiment was administered *via* Gorilla Experimental Builder (Anwyl-Irvine et al., 2020).[6]

a. *Sentence-picture matching*: Each trial consists of a sentence and two pictures (see Figure 1 for an example).[7] Every sentence was inter-word spaced and presented with simplified Chinese characters along with *pinyin* (i.e., a Chinese phonetic transcription system) on top of each word.[8] This was done to facilitate text comprehension for learners of Chinese (Bassetti and Lu, 2016). On a given trial, a fixation cross appeared on the screen for 1 s indicating a sentence to come. The sentence then showed up for a maximum of 15 s for the participant to read through. Subsequently, two black-and-white line-drawn pictures appeared side by side for 8 s on a separate screen, and the participant's task was to choose the picture that goes with the sentence by pressing the "F" key on the keyboard of the computer if they thought the picture on the left was correct and pressing the "J" key if they thought the picture on the right was correct. The expected answer was counterbalanced for positions such that half of the trials had the answer on the left and the other half on the right. The position of the expected answer across the trials was also randomized to prevent participants from developing certain processing strategies. For both sentences and pictures, they could choose to proceed by pressing the spacebar within the time limit and did not have to wait until the end of the presentation. The presentation timing was determined based on a small pilot study ($n=3$). A block of five practice trials preceded the main task for participants to familiarize themselves with the task.

b. *Working memory test*: A backward digit span task was used to measure general working memory capacity (WMC; Wechsler, 1981). We employed the test because we were interested in the general influence of WMC rather than language-related WMC such as verbal/phonological WMC. Participants saw and recalled the digits (e.g., 2,5,3) presented at a 1 s rate in the reverse order (e.g., 3,5,2) by typing them down in a computerized text box. They were tested on digit sequences of two to seven digits. Two trials for each sequence length were provided, making up a total of 12 trials. The test does not stop until one fails in both trials within each given sequence length. A 2-digit practice trial was provided for participants to familiarize themselves with the task.

c. *Chinese-into-English translation task*: Participants were instructed to read and translate 20 critical Chinese

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4   CL is the abbreviation for classifier.

5   Admittedly, it would be ideal for the sentence length to be counterbalanced across conditions. However, sentences containing ACCs, with the addition of two characters for the numeral and the classifier (e.g., *yi-kuai* 'a piece of' as in *zuo yi-kuai dangao* 'make a piece of cake'), are inherently longer than those containing ACTs, as ACTs contain only the bare verb and the bare noun [e.g., *zuo dangao* 'make cake(s)']. This confound was properly handled in statistical modeling. See footnote 8.

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6   https://gorilla.sc/

7   We are very grateful to Foong Ha Yap for her kindness in sharing her materials with us.

8   For both the sentence-picture matching task and the translation task, only the sentences for the L2 group were complemented with *pinyin*; Chinese native speakers read plain Chinese texts.
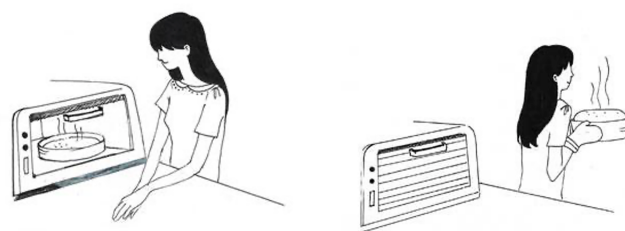
FIGURE 1
An example of visual stimuli for SPMT.

sentences into English by typing out the corresponding English sentences. The Chinese sentences were also complemented with *pinyin*. An example Chinese sentence for translation is illustrated in (2).

zhè gè nán hái zài hē niú nǎi
2. 这个 男孩 在 喝 牛奶。

d. *Background questionnaire*: The background questionnaire for the L2 participants asked for information regarding their age, their native language, onset age of learning Chinese, length of Chinese learning, Chinese courses enrolled, experience residing in a Chinese-speaking country or region, and self-reports on four of the language skills (listening, speaking, reading, and writing) on a 5-point Likert Scale. For Chinese L1 participants, the only biographical information collected was their age and native language.

Data treatment and analysis

All statistical analyses were conducted with the R programming language (R Core Team, 2021). The 'tidyverse' package version 1.3.1 was used for visualization (Wickham et al., 2019). The 'plot_model' function from the 'sjPlot' package version 2.8.9 was used to plot the model fit (Lüdecke, 2021). With the package 'lme4' version 1.1.27.1 (Bates et al., 2015), data collected from each task were analyzed following the mixed-effects modeling procedures to take into account the variation in participants and stimuli at the same time (Linck and Cunnings, 2015). Data and analysis code are publicly available on the OSF website.[9]

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9 https://osf.io/h2m5a/

In the spirit of the Bilingual Turn (Ortega, 2009),[10] we did not compare the performance of L2 learners and that of native speakers. Rather, taking learner grammar as a system of its own (Cook, 2008), we focus on the contrasts across within-subject conditions among learners (e.g., differences in RTs between perfectives and imperfectives). Data were analyzed and reported with a focus on the L2 group.

In general, three sets of data were analyzed: (1) Accuracy rates from the SPMT, (2) Response times (RTs) from SPMT, and (3) Accuracy rates from the translation task. We analyzed RTs from accurate trials only to rule out the potential influence of speed-accuracy trade-offs on RTs in the sense that participants were likely to respond more slowly when they responded more accurately. RTs from SPMT were log (natural logarithm) transformed to adjust for the skewness of the data distribution. Plots of model residuals against fitted values and Q-Q plots based on log RTs revealed no obvious deviations from normality and homoscedasticity. Participants' translations were coded in a binary fashion as either *correct* or *incorrect* for the grammatical aspect (GA-correct, GA-incorrect) and the lexical aspect (LA-correct vs. LA-incorrect) (where 'correct' means the correct use of perfective or imperfective aspect and the correct use of ACTs or ACCs in Chinese) in the sentence. Accuracy was not coded for linguistic features unrelated to key areas (i.e., GA and LA).

The coding task was done by two trained Chinese native speakers who are highly proficient in English. One speaker served as the primary coder and the other as the secondary coder. Cohen's Kappa was used to assess inter-rater reliability and was calculated for the coding of the grammatical aspect and the lexical aspect in each group. Cohen's Kappa indicated that participants' accuracy rates on the translation task were substantially agreed

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10 The Bilingual Turn advocates that scholars in the field should reconsider some approaches taken to the study of SLA (Ortega, 2009). One proposed approach is that L2 learners should be investigated in their own right, not as deficient or deviant replicas of native speakers.

TABLE 1 Response accuracy rates across conditions by group: mean (standard deviation: sd).

Group	ACC		ACT	
	Imperfective	Perfective	Imperfective	Perfective
L1 (n = 29)	0.99 (0.07)	0.98 (0.06)	0.97 (0.07)	0.90 (0.17)
L2 (n = 31)	0.87 (0.15)	0.93 (0.13)	0.95 (0.09)	0.75 (0.20)

upon across the board for coding between coders (Cohen's Kappa for L1-GA: 0.73, $p < 0.001$; L1-LA: 0.7, $p < 0.001$; L2-GA: 0.86, $p < 0.001$; L2-LA: 0.82, $p < 0.001$), as interpreted based on Cohen (1960). Data from the primary coder were submitted to statistical analysis. Working memory score was calculated out of 12 (1 point per trial * 12 trials in total). Data points for WMC were trimmed in a way that the times taken to respond to each trial beyond 2.5 standard deviations (SDs) from the mean by participant were removed, affecting less than 2% of the data for either group.

To operationalize proficiency as a continuous variable, the overall proficiency score was derived through a Principal Component Analysis over six different numerical measures (centered and scaled): total years of learning, semesters of college Chinese courses taken, self-rated proficiency in listening ($M = 3.5$, $SD = 1$, Range 2–5), speaking ($M = 3.4$, $SD = 0.88$, Range 2–5), reading ($M = 3.4$, $SD = 0.9$, Range 2–5), writing ($M = 2.7$, $SD = 1$, Range 2–5). The first component explains the largest amount of variation (36%) and was therefore used to approach the overall proficiency for participants. The factor loadings for the first component on each measure (rotated factor solution) were -0.01 for years of learning, 0.50 for semesters of learning, -0.53 for listening, -0.24 for speaking, 0.52 for reading, 0.38 for writing.

With respect to statistical modeling, continuous RTs data were fit using linear mixed-effects models (Baayen et al., 2008) and accuracy rate data with a binomial distribution were fit using logistic mixed-effects models (Jaeger, 2008). Fixed effects were grammatical aspect and lexical aspect in statistical models set up for both groups. The L2 group was also assessed for the influence of language proficiency, WMC, and language exposure experience as additional fixed effects that were included in relevant models. We also added sentence length (centered and scaled) and its interactions with other predictors as covariates to account for its potential influence.[11] Sum-coding (-0.5, 0.5) was adopted for categorical predictors to obtain ANOVA-style main effects and interactions.[12] *Post-hoc* tests were performed using the 'emmeans'

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11 Sentence length and its interaction with other fixed factors included in the models as the covariates revealed no significant effects for any model (all $p > 0.05$), hence excluding this potential confound.

12 With such coding schemes, intercepts represent the grand mean rather than the mean for the baseline as determined otherwise by the default treatment contrasts in R. Treatment contrasts are not recommended for

package version 1.7.0 (Lenth, 2020), with Tukey adjustments for pairwise comparisons. The random effects structure was kept maximal for the initial model allowed by the experimental design, for which we included by-participant and by-item intercepts, by-participant random slopes for within-subject factors (e.g., grammatical aspect and lexical aspect) and their interactions, and by-item random slopes for between-subject factors (e.g., proficiency, WMC). In cases where models failed to converge, we simplified the random effects structures by iteratively removing the correlation between random effects and the random effect contributing to the least variance until models converged.

Results

We first report the results from the sentence-picture matching task and then from the translation task. For the SPMT, results of accuracy rates and response times are presented in order. The translation task is reported for the accuracy rates only. Results from the L1 and L2 groups are reported separately. Exploratory analyses were conducted on the L2 data for influences of individual differences including learners' language proficiency and WMC. As our participants had mixed language exposure experience, participants' heritage vs. non-heritage background was also considered in our analyses.
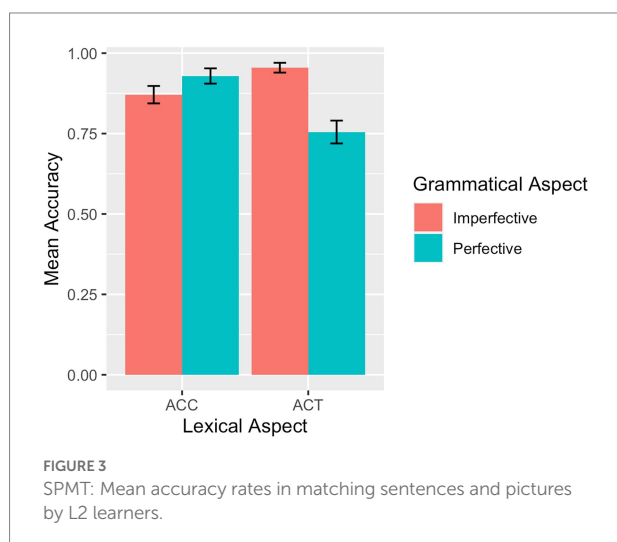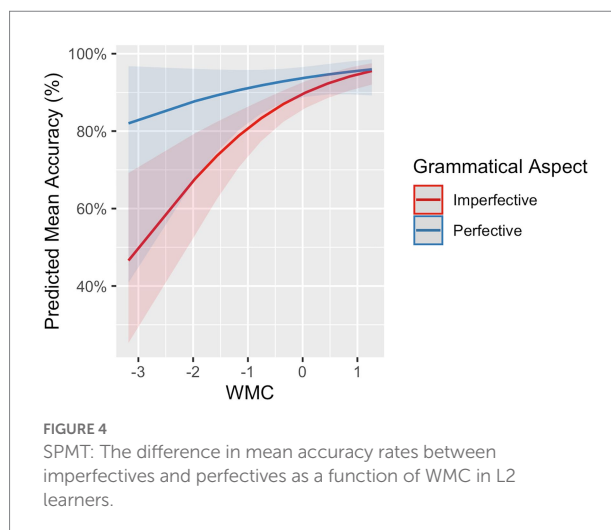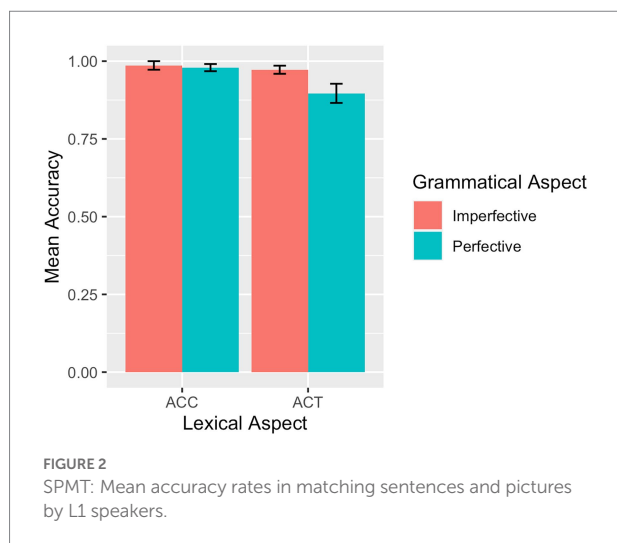
Sentence-picture matching task

Accuracy rate data

The mean accuracy rates across conditions for each group are summarized in Table 1. The descriptive results of the accuracy rates are also visualized for the L1 group in Figure 2 and the L2 group in Figure 3. For the L1 group, the overall mean accuracy rate in matching the picture with the sentence read was 0.96 ($SD = 0.83$). As shown in Table 1 and Figure 2, the L1 group performed at or close to ceiling on ACCs. For the L2 participants, the overall mean accuracy rate in matching sentences and pictures was 0.88 ($SE = 1.32$).

Results of the model fit to the L1 accuracy rate data revealed a significant main effect of grammatical aspect ($\beta = -1.23$, $SE = 0.55$, $p = 0.025$), indicating that imperfective sentences were responded to more accurately than perfective sentences. Although we did not find a significant interaction between grammatical and lexical aspects, we nevertheless conducted separate analyses to pinpoint the potential locus of the grammatical and lexical aspect effects precisely. Only the model for the ACT sentences showed a main effect of grammatical aspect ($\beta = -1.47$, $SE = 0.59$, $p = 0.013$) in that imperfective sentences were responded to more accurately

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models where interactions are included, as it would lead to results being difficult to interpret (Singmann and Kellen, 2019).

FIGURE 2
SPMT: Mean accuracy rates in matching sentences and pictures by L1 speakers.

FIGURE 4
SPMT: The difference in mean accuracy rates between imperfectives and perfectives as a function of WMC in L2 learners.

FIGURE 3
SPMT: Mean accuracy rates in matching sentences and pictures by L2 learners.

than perfective sentences in the case of ACT sentences. Turning to the results for the accuracy rate from the L2 group, the model fit showed a main effect of grammatical aspect ($\beta = -0.64$, $SE = 0.29$, $p = 0.029$), induced by higher accuracy rates for imperfective sentences than for perfective sentences. In addition, there was an interaction between grammatical aspect and lexical aspect ($\beta = -2.62$, $SE = 0.59$, $p < 0.001$): Imperfective sentences were responded to with higher accuracies than perfective sentences if they contain ACTs ($\beta = 1.95$, $SE = 0.43$, $p < 0.001$) and perfective sentences were responded to with marginally higher accuracies than imperfective sentences if they contain ACCs ($\beta = -0.67$, $SE = 0.40$, $p = 0.091$).

When included in the model as a continuous variable, language proficiency did not exhibit any effect. Language proficiency was then added to the model as a categorical variable and again showed no main effect and interaction between grammatical aspect and lexical aspect. However, treating

proficiency as a categorical predictor allowed us to conduct by-proficiency level analyses to detect if each level of L2 participants revealed the same pattern of effects caused by the grammatical and lexical aspects. For the intermediate level L2 subgroup, a significant interaction between grammatical aspect and lexical aspect was observed ($\beta = -2.94$, $SE = 1.05$, $p = 0.005$) and this L2 subgroup had significantly more accuracies on imperfective sentences than on perfective sentences in the ACT condition ($M = 0.96$ vs. $M = 0.76$). The same imperfective advantage in ACT condition was observed among both the advanced level ($M = 0.92$ vs. $M = 0.78$) and the advanced-plus level subgroups ($M = 1.0$ vs. $M = 0.7$). In other words, in all the three proficiency subgroups, imperfective sentences were responded to more accurately than perfective sentences in the ACT condition.

The influence of WMC on L2 participants' accuracy rates was also explored. The model for the L2 group including working memory span (centered and scaled) and its interaction with grammatical aspect and lexical aspect returned a main effect of working memory span ($\beta = 0.33$, $SE = 0.16$, $p = 0.035$). That is, not surprisingly, participants with a higher working memory span responded to the stimuli more accurately. More crucially, grammatical aspect significantly interacted with working memory ($\beta = -0.56$, $SE = 0.28$, $p = 0.046$). Mean accuracy rates for each grammatical aspect (imperfective vs. perfective) are presented as a function of L2 participants' working memory scores in Figure 4, which were plotted from the model fit. For both imperfective and perfective aspects, L2 participants with higher WMC performed more accurately than those with lower WMC. As accuracies in imperfectives improved more rapidly than accuracies in perfectives, the difference in accuracy rates between imperfectives and perfectives decreased as participants' WMC increased.

Finally, we probed the potential influence of participants' heritage vs. non-heritage language experience by modeling participants' accuracy rates as a function of language exposure

experience (heritage vs. non-heritage) and its interaction with the grammatical and lexical aspects. The model fit revealed no main effect and interaction for language experience. Separate analyses on heritage and non-heritage language participants showed that both groups of participants responded to imperfective sentences more accurately than to perfective sentences in the case of ACT (Heritage: $\beta = 2.07$, $SE = 0.66$, $p = 0.002$; Non-heritage: $\beta = 1.88$, $SE = 0.57$, $p = 0.001$).

Response time data

Descriptive statistics for raw response times by group are reported in Table 2 and plotted for the L1 group in Figure 5 and for the L2 group in Figure 6.

The model for the RT data from the L1 group showed a significant interaction between grammatical aspect and lexical aspect ($\beta = 0.29$, $SE = 0.06$, $p < 0.001$), driven by shorter RTs for perfectives than for imperfectives in the ACC condition and shorter RTs for imperfectives than for perfectives in the ACT condition, as confirmed in the *post hoc* pairwise comparison. Results of the model fit to the data from the L2 group demonstrated a main effect of grammatical aspect ($\beta = 0.07$, $SE = 0.03$, $p = 0.025$), indicating that imperfective sentences overall were processed faster than perfective sentences. The interaction between grammatical aspect and lexical aspect was significant ($\beta = 0.15$, $SE = 0.07$, $p = 0.030$) and ACT sentences were processed faster for imperfectives than for perfectives.

The influence of language proficiency, WMC, and language exposure experience on the L2 performance was evaluated in order. First, if treated as a continuous variable, language proficiency neither surfaced as a main effect nor interacted with any other fixed factor (grammatical aspect and lexical aspect). If treated as a categorical variable, proficiency level did not modulate RTs. As has been done for the accuracy rate data, separate analyses by proficiency level were conducted to precisely locate the effects of the grammatical and lexical aspects within each proficiency level. Specifically, intermediate level participants were shown to process imperfective sentences faster than perfective sentences in the case of ACT ($\beta = -0.16$, $SE = 0.07$, $p = 0.029$). For advanced level participants, RTs for imperfective sentences were not significantly different from those for perfective sentences. Advanced-plus level participants, on the other hand, showed a

pattern that was similar to intermediate level participants in that they processed imperfective sentences with ACTs significantly faster than perfective sentences with ACTs ($\beta = -0.25$, $SE = 0.11$, $p = 0.019$).

Second, WMC was explored for its effects on the processing performance of L2 participants. Results from the model including working memory and its interaction with the grammatical and lexical aspects showed an interaction between working memory and lexical aspect ($\beta = 0.09$, $SE = 0.03$, $p = 0.005$). Figure 7 illustrates the size of the difference in RTs between ACTs and ACCs as a function of L2 participants' working memory capacity. RTs especially for ACC verbs decreased as participants' WMC increased. As a whole, it showed that the difference in RTs between ACT and ACCs decreased as participants' WMC increased.

Third, modeling RT data by L2 participants as a function of language experience and its interaction with the grammatical and lexical aspect yielded no main effect or interaction for language experience. We nevertheless conducted separate analyses on heritage and non-heritage language participants. It was found that heritage language participants processed imperfective sentences faster than perfective sentences in the case of ACTs ($\beta = -0.21$, $SE = 0.07$, $p = 0.001$), but there were no other significant results.
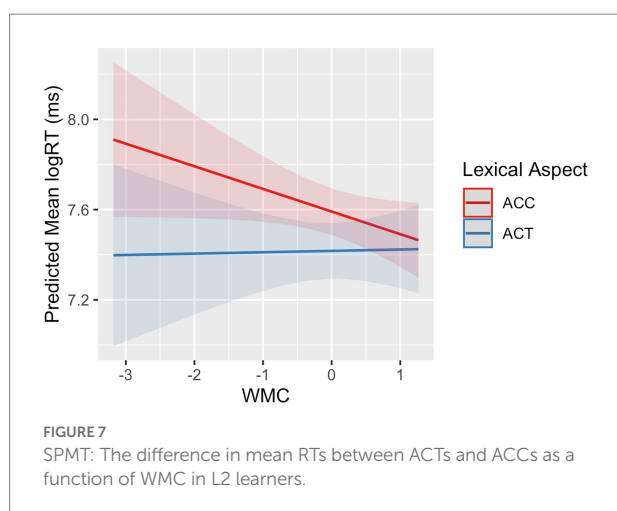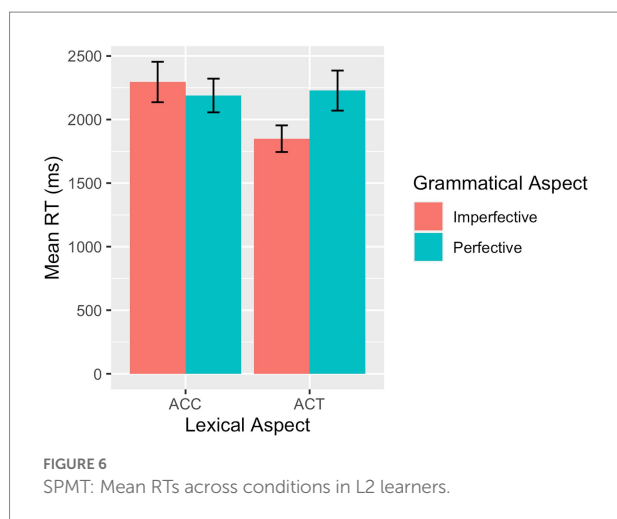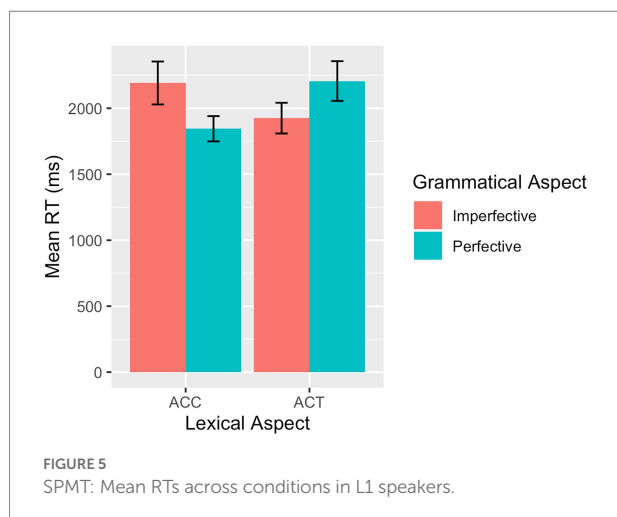
Translation task

Table 3 summarizes the descriptive statistics for the accuracy rates across conditions on the translation of grammatical aspect and lexical aspects by each language group. Figure 8 visualizes the L1 group data and Figure 9 the L2 group data on their performance on grammatical aspect translation. The overall accuracy of the L1 participants on the translation of grammatical aspect was 0.99 ($SD = 0.45$), indicating that they performed at or near ceiling in all conditions in the case of grammatical aspect. Since there was not enough variation in the accuracy rates for any relationship to be detected, we did not conduct any statistical modeling in this case.

The overall accuracy of the L2 participants on the translation of grammatical aspect was 0.93 ($SE = 1.01$). Results from the model for the translation of grammatical aspect showed a main effect of grammatical aspect ($\beta = -1.20$, $SE = 0.46$, $p = 0.009$), driven by higher accuracy rates for imperfective sentences than for perfective sentences. The model also returned a marginal interaction between grammatical aspect and lexical aspect ($\beta = -1.58$, $SE = 0.92$, $p = 0.088$), indicating that imperfective sentences were translated more accurately than perfective sentences in the case of ACT. Influence from language proficiency (continuous or categorical), working memory, and language experience was explored. No effects of language proficiency and language exposure experience were observed. WMC was found to play some role, as reflected in a marginal three-way interaction among working memory, grammatical aspect, and lexical aspect ($\beta = 2.81$, $SE = 1.46$, $p = 0.053$). As in Figure 10, for ACCs in both perfective and imperfective aspects, higher WMC was associated

TABLE 2 Response times across conditions by group: mean (standard deviation: sd).

Group	ACC		ACT	
	Imperfective	Perfective	Imperfective	Perfective
L1	2191.57 (876.50)	1844.68	1925.19 (626.25)	2206.23
($n = 29$)		(515.57)		(811.04)
L2	2295.10 (885.34)	2188.93	1849.26 (582.61)	2227.70
($n = 31$)		(737.12)		(877.28)

FIGURE 5
SPMT: Mean RTs across conditions in L1 speakers.

FIGURE 6
SPMT: Mean RTs across conditions in L2 learners.

FIGURE 7
SPMT: The difference in mean RTs between ACTs and ACCs as a function of WMC in L2 learners.

with higher accuracy in general. As WMC increases, accuracies in imperfective sentences with ACCs improved more rapidly than accuracies in perfective sentences with ACCs. In other words,

WMC affected ACCs in imperfectives more than ACCs in perfectives. For ACTs predicates, ACTs in imperfective received accuracies close to 100% regardless of WMC, while ACTs in perfectives improves as WMC increases.

The mean accuracy rate on the translation of lexical aspect is visualized in Figure 11 for the L1 group and in Figure 12 for the L2 group. The overall accuracy of the L1 participants on the translation of lexical aspect was 0.96 ($SD = 0.81$). The overall accuracy of the L2 participants on the translation of lexical aspect was 0.93 ($SE = 1.05$). Modeling accuracy rates on the translation of lexical aspect in the L1 group yielded a marginal interaction between grammatical aspect and lexical aspect ($\beta = -4.26$, $SE = 2.30$, $p = 0.064$), with higher accuracy rates for perfective sentences than for imperfective sentences in the case of ACCs. Results from the model fit to accuracy rates on the translation of lexical aspect in the L2 group showed a main effect of grammatical aspect ($\beta = -1.16$, $SE = 0.43$, $p = 0.007$), and imperfective sentences overall received higher accuracy rates than perfective sentences for their translation. The same model also returned a marginal interaction between grammatical aspect and lexical aspect ($\beta = -1.60$, $SE = 0.86$, $p = 0.065$), driven by higher accuracy rates for imperfective sentences than for perfective sentences in the case of ACT. No apparent effects of language proficiency, working memory, and language exposure experience were detected on the translation of lexical aspect among the L2 participants.

Discussion

The results of the SPMT suggested that native speakers overall achieved higher accuracies for imperfectives than for perfectives, and this trend has also been observed in L2 accuracy rates for the SPMT and the translation task. Likewise, the main effect of grammatical aspect was evident in L2 RTs from the SPMT, signaling that imperfectives in general were processed faster than perfectives. This result contrasts with the finding from Madden and Zwaan (2003), which used a similar experimental paradigm (i.e., picture verification task) but found a perfective facilitation effect. But the current finding is in line with Magliano and Schleich (2000), which used a quite different method (i.e., spoken narrative task) and obtained a similar imperfective advantage in processing. We consider and evaluate three possible reasons. First, *-le* is relatively more complex than *zai*, both syntactically and semantically (Jing-Schmidt et al., 2022). For example, as discussed earlier, *-le* allows a wider range of semantic interpretation depending on the kind of lexical aspect associated with, and the pragmatic context it occurs. According to the Semantic Complexity Hypothesis (Van Hout, 2008, p. 1753), semantic complexity of aspectual morphemes is consequential in the acquisition of tense-aspect among children, namely semantics of simple semantic operations is acquired early. As such, perfectives are likely harder to process and acquire for learners. This explanation coincides with Duff and Li's (2002, p. 446) observation that learner difficulties with *-le* can be related to the

TABLE 3 Translation accuracy rates across conditions by group: mean (standard deviation: sd).

Aspect	Group	ACC		ACT	
		Imperfective	Perfective	Imperfective	Perfective
Grammatical Aspect	L1 ($n = 29$)	1.00 (0)	0.97 (0.09)	0.99 (0.04)	0.99 (0.04)
	L2 ($n = 31$)	0.92 (0.17)	0.89 (0.17)	0.99 (0.05)	0.93 (0.17)
Lexical Aspect	L1 ($n = 29$)	0.96 (0.08)	0.99 (0.04)	0.97 (0.08)	0.92 (0.10)
	L2 ($n = 31$)	0.92 (0.16)	0.88 (0.13)	0.99 (0.05)	0.92 (0.11)

FIGURE 8
Translation: Mean accuracy rates in translating grammatical aspect by L1 speakers.
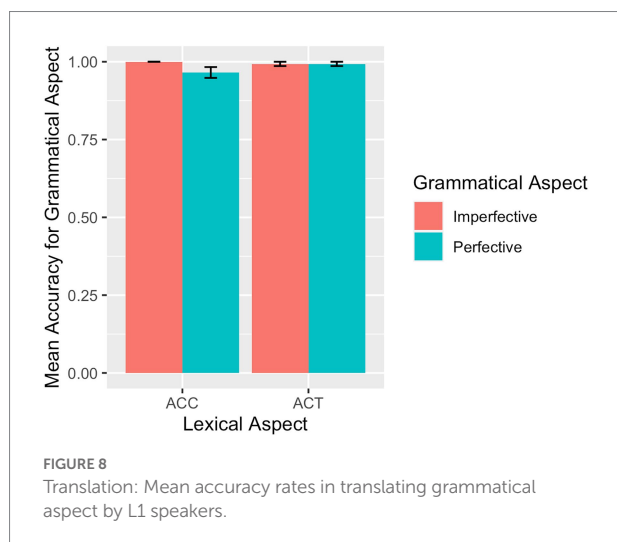
"multifunctionality" of the aspect marker. Second, the fact that *zai* occurs preverbally and *-le* postverbally may have led to the observed imperfective facilitation. When integrating information from different parts of the sentence during reading, the parser would encounter the aspect marker first and then the verb in the case of *zai*, thus immediately constructing the representation of an ongoing event due to this priming effect. In the case of *-le*, the parser must encounter the verb first and integrate information from the verb processed to the subsequent experienced-*le*, which presumably would take longer for relevant representations of structural events to be built up. In an earlier study by Fang and Yuan (2021), the researchers found that sentences containing the perfective-*le* were processed faster than sentences containing the postverbal-*zhe* at the spillover region in a self-paced study. Thus, the location of the marker may be an additional factor contributing to the difference in RTs in the SPMT. A third possibility is that the activation level for imperfectives decays at a slower rate than that for perfectives, leading to an imperfective advantage, as suggested by Magliano and Schleich (2000).

We now turn to the interactive effects of grammatical and lexical aspects with reference to the prototypical association between certain aspects of L2 processing and acquisition of Chinese temporality, as stipulated in the AH. Cases showing clear ceiling effects were not discussed here because the null effect was likely to be masked by the ceiling effects. In the online comprehension task (SPMT), L1 participants' accuracies

with accomplishments were close to ceiling, thus revealing no significant differences between imperfectives (99% correct) and perfectives (98% correct). Meanwhile, the L1 participants' data were generally in line with the prototype associations in the AH: L1 participants had faster and more accurate processing with imperfectives than with perfectives in the case of activities, and sentences with ACCs were processed faster for perfectives than for imperfectives. For L2 participants, the prototype effect was reflected in shorter RTs and higher accuracies in ACTs for imperfectives than for perfectives, and marginally higher accuracies in ACCs for perfectives than for imperfectives. Despite no significant difference, RTs in ACCs were also numerically shorter for perfectives than for imperfectives.

In the offline translation task, except for the (near) ceiling effects among the L1 group on grammatical aspect, the prototypical influence emerged from both L1 and L2 groups. For L1 participants, sentences with ACCs were translated slightly more accurately for perfective sentences than for imperfective sentences. For the L2 participants, sentences with ACTs were translated more accurately for imperfectives than for perfectives. Thus, the results of the online and offline tasks in both groups of participants generally follow the prototype predictions. As online tasks are believed to tap into learner's implicit knowledge and offline data can reflect explicit knowledge, this also shows that participants' implicit and explicit knowledge converge in their learning of the grammatical and lexical aspects. This prototype effect is in agreement with previous L2 Chinese studies using production data (Jin and Hendriks, 2005; Yang, 2016). Because the pattern was consistent across tasks and in both L1 and L2 data in the study, our results indicate that the prototypical association as a fundamental principle guides the cognitive processing among language speakers in general. This result can also be considered an extension of Yap et al. (2009), who used the SPMT among Cantonese speakers and made similar arguments. As mentioned earlier, the AH can be explained from the angle of semantic congruency (Anderson, 1993). According to Shirai (2010), the grammatical and lexical association due to semantic congruency is closely related to input frequency, as "…the semantic bias comes from biased frequency distribution in the input…" (p. 186). As such, certain combinations should be statistically more frequent than others in the language input. Specific to Chinese, based on Xiao and McEnery's (2004, p. 104-105) analysis of
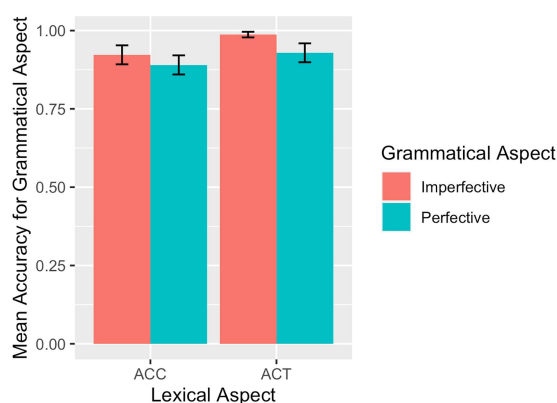
FIGURE 9
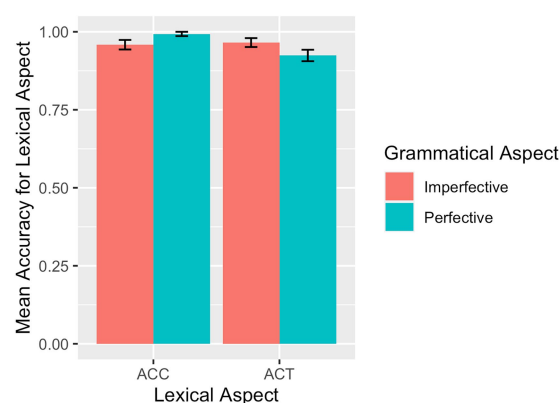Translation: Mean accuracy rates in translating grammatical aspect by L2 learners.

FIGURE 11
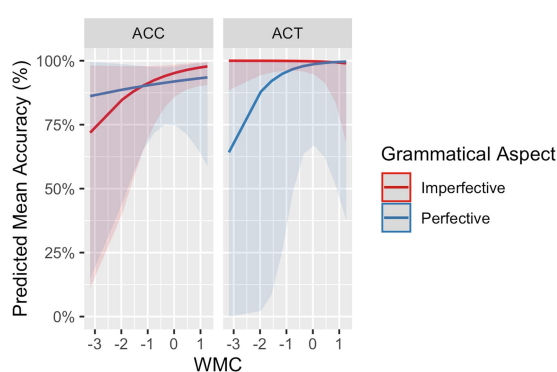Translation: Mean accuracy rates in translating lexical aspect by L1 speakers.

FIGURE 10
Translation: The difference in mean accuracies in translating grammatical aspect across conditions as a function of WMC by L2 learners.
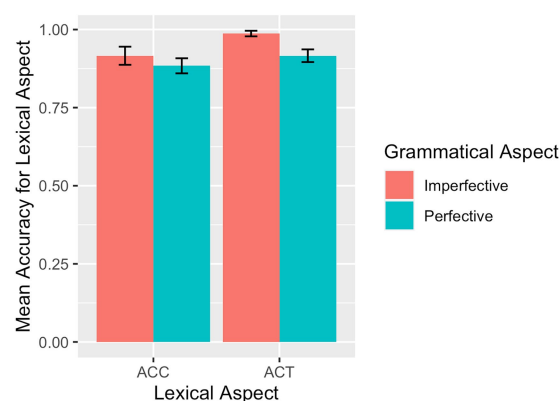

FIGURE 12
Translation: Mean accuracy rates in translating lexical aspect by L2 learners.

1,138 samples in a Chinese corpus, the distribution of perfective-*le* used with the four main predicate types are as follows: achievement 49.9%; accomplishment 29.6%; activity 13.1%; state 5%. When it comes to the imperfective *zai*, it occurs predominantly with ACTs: Out of a total sample of 88 *zai* in the corpus reported by Xiao and McEnery (2004, p. 209), 73 tokens occur with ACTs and 8 and 3 tokens with accomplishments and achievements, respectively. In other words, the frequency distributions map onto the prototype associations specified in the AH. As the present study found prototypical associations in both L1 and L2 data, results indicate that language learners can be sensitive to such distributional statistics.

For the L2 group, the prototypical association was found clearly in SPMT accuracies for ACT predicates and marginally for ACC predicates, and the prototypical preference pattern was also more evident in ACTs compared to ACCs in RT data (i.e., significant differences between grammatical aspects in

ACTs but only non-significant numerical differences in ACCs). Similarly, the prototypical advantage only showed up in the case of ACTs but not ACCs in the translation task for L2 participants. In other words, for the L2 participants in our study, Chinese ACTs appear to be more robust than ACCs in their prototypical association with relevant grammatical aspect markers. We believe that the input frequencies of bounded events in Chinese and the association of perfective marker -*le* with various predicates are responsible for this pattern. Xiao and McEnery's (2004) data, cited above, showed that the perfective aspect occurs more often with achievements than with accomplishments. Similarly, Yang (2016) argued for an associative hierarchy between various predicates and perfective-*le*, with achievements being the most associative, followed by ACCs, and with ACT and stative predicates being the least associative. The Chinese perfective aspect, aside from being associated with [+telic], is often associated with

[−durative] or [+punctual] (e.g., Yang, 2016). Thus, ACC predicates are not the most prototypical predicate that goes with -le. This could explain why the prototype preference showed up more evidently in the ACT cases than in ACCs, since zai statistically occurs with ACTs most among the four predicate types. It should be noted that the lack of a clearer contrast between grammatical aspect preferences in ACCs was observed primarily in the L2 group. We contend that this could still be the result of input frequencies. In language classrooms where L2 participants receive most of their language exposure, teachers most likely drill students with different verbs in combination with event structures. These verbs taught and drilled as vocabulary items can be activity, state, or sometimes accomplishment verbs (such as resultative verb compounds). Accomplishments in Chinese, however, are unlikely to be expressed in a single vocabulary item and more often take the form of verbs plus additional elements, such as verbs + quantified noun phrases (e.g., kan yi-ben shu 'read a book'), verbs plus durational or distance phrases (e.g., pao liang xiaoshi 'run two hours'; pao yiquan 'run a circle') or verbs taking a goal (e.g., fei qu Beijing 'fly to Beijing'). When L2 students learn grammatical aspects in the classroom, they may be exposed to a variety of verb associations with different aspect markers and ACCs can come up less, as instructors often aim to provide students with richer varieties of vocabulary items (e.g., da qiu 'play ballgames'; chi-fan 'have meal; eat'; kan dianying 'watch movies') instead of repeatedly using the same verbs to create different ACCs (e.g., he yi-bei shui 'drink a cup of water'; he yi-ping kele 'drink a bottle of cola'). This practice of using more ACT verbs in the classroom was confirmed in our follow-up interview with the instructors who taught our participants. That is, assuming that -le occurs with ACCs about 29.6% of the time in L1 speakers' language exposure, -le may occur with ACCs much less in the L2 learners' language input and output. This input frequency explanation is consistent with several earlier studies that pointed to a usage frequency effect (e.g., Wen, 1997) or the factor of learners' exposure to typical constructions that co-occur with -le (e.g., Duff and Li, 2002). This biased pattern of prototype effect had also been reported in previous L2 studies using production data. For instance, in Yang's (2016) analysis of L2 Chinese learners' production in a composition corpus, 39% of the achievement predicates constitute le-obligatory context and learners supplied the aspect marker 90% of the time, whereas 30% ACC predicates required -le and learners supplied the marker 87% of the time. While no statistical significance can be claimed regarding the difference, the pattern indicated that learners associated perfective -le more with achievements than with accomplishments. In addition, Jin and Hendriks (2005) found that ACCs were used together with their prototypical perfective aspect marker -le to a much lesser extent than activities together with their prototypical imperfective aspect marker zai in both native speakers and learners. Overall, among Chinese L2 learners,

the association between ACTs and imperfective aspect is consistently observed across tasks in different studies, whereas the association between ACCs and perfective may be of a less degree in strength.

Finally, we turn to the influence of learners' heritage/non-heritage experience, L2 proficiency, and WMC. The only effect of heritage language exposure experience arose from the RTs data such that only the heritage language speakers but not the non-heritage group processed the imperfective sentences faster than perfective sentences in the case of activities. We tentatively suggest that language input from home versus from a formal classroom setting may lead to different acquisition patterns. The impact of the language exposure variable often went unaddressed in the previous literature. Our findings point to the need to scrutinize the potential influence of heritage language exposure on the AH predictions, but due to our small sample size, no conclusive interpretation is possible at this stage.

Next, while there was no effect of language proficiency when it was treated as a continuous variable, possibly due to the relatively narrow range of proficiencies included, some interesting patterns emerged when proficiency was treated as a categorical variable: Learners at the intermediate and the advanced-plus level, but not at the advanced level, processed sentences with ACTs faster for imperfectives than for perfectives. This result suggests that prototypical patterns did not necessarily develop linearly as predicted by the AH; rather, in some cases, the development of grammatical and lexical associations can be U-shaped or reverse U-shaped (e.g., Salaberry, 1999; Ryu et al., 2015). For example, in Salaberry's (1999) study, a greater non-prototypical effect showed first, and then disappeared, and showed again, as learners' proficiency increased. In McManus (2013), the author also suggested that a U-shaped development might explain why their prototypical association was not found in their low-proficiency group but in their advanced-proficiency group. Our study found that learners from proficiency levels at both ends within the investigated range exhibited a prototypical effect in both accuracies and reaction times in the sentence-picture matching task, but those from the mid-proficiency level group did not exhibit such effects as consistently. One conceivable explanation is that our advanced-plus group was still in their developmental paths to overcome the constraint of the prototype effect. Another possibility is that the advanced-plus group, similar to the L1 participants in this study, performed in a pattern that was affected by the Semantic Congruency Principle or input frequency. Note that the U-shaped pattern was only observed in ACT predicates in reaction times in SPMT but not in ACC predicates or in other tasks, and the exact shape of learners' developmental path crossing various predicates and wider proficiency levels is worth investigating in future research.

Compared to L2 proficiency, WMC seems to be more consistent and robust in its effect, because it arose across different tasks. The results of the RTs and accuracy data from the SPMT

suggested that learners with higher WMC tend to process the aspectual information faster and more accurately. These results are in line with findings from many previous studies on the positive role of WMC in L2 sentence processing (see Roberts, 2012, for a comprehensive review). It is reasonable to assume that cognitive resources afforded by WMC facilitate language processing, especially in the case of L2 processing, which taxes memory resources more than L1 processing. Therefore, learners with high WMC generally performed well across different grammatical aspects and lexical aspects. The modulating effect of WMC helps decrease processing cost differences (either RT or accuracies) between the two grammatical aspects and also between the two lexical aspects. Particularly interesting is the observed WMC effect for the translation of grammatical aspect, signified by a three-way interaction among grammatical aspect, lexical aspect, and WMC. As in the SPMT, WMC contributed to L2 performance: Learners with higher WMC performed better than those with lower WMC, evident in perfective sentences with both ACCs and ACTs and in imperfective sentences with ACCs. The effect of WMC, however, did not surface for imperfective sentences with ACTs due to the ceiling effect. To the best of our knowledge, this is the first study that explored and detected the influence of WMC in both the online and offline tasks examining the L2 processing and acquisition of temporality. We propose that individual differences in WMC should be modeled as a factor among others to account for learners' aspect acquisition and processing profiles.

From the perspective of teaching and learning, the prototype effect revealed in this study can help instructors understand why associations between aspect markers and specific predicate types may be easier for learners and how learners gradually extend the use of aspect markers to non-prototypical association. Further, our suggestion regarding the effect of input frequency in learners' exposure also has several implications to practice. For instance, when a new aspect marker is first introduced, instructors can use pedagogical materials that highlight the salient semantic features of aspect markers (e.g., the boundedness of -le) by frequently using them with lexical items and constructions with congruent features (e.g., resultative verb compounds and accomplishment predicates taking the "verb + quantified noun phrase" forms). When learners have acquired these prototypical associations, it can then be beneficial for instructors to expose them to a variety of predicate types to overcome the prototype constraint. Second, findings from the study suggest that intermediate level learners still need help understanding and using perfective aspect with activity predicates and such learning may have a critical acquisition stage: The U-shaped developmental pattern observed in the study suggests that it may be especially effective to introduce aspect markers' varied usages including non-prototypical associations to learners who are approaching the advanced level. Finally, as typical language use in the classroom may show biased patterns of predicate types, opportunities should be created whenever possible to immerse learners with naturalistic language input outside the classroom to achieve optimal integration of in-class and real-world language

practices. For instance, Gong et al. (2021) reported that students' formal learning in the classroom can be enhanced by strategic effort of practicing language outside the classroom in study abroad settings. Since our study shows that learner patterns are influenced by frequency biases, there is reason to believe that naturalistic exposure can help learners comprehend and use -le structures in more native-like ways.

Conclusion

Investigating the effects of grammatical and lexical aspects on L2 acquisition and processing of temporality by L2 Chinese learners through a combination of online and offline comprehension tasks, we found that (1) imperfectives overall were processed faster across the board, explained by the relative semantic complexity of aspect markers and their syntactic properties; (2) grammatical and lexical aspect in general interactively constrain L2 aspect acquisition and processing, accounted for by semantic congruency and input frequency; (3) a prototypical grammatical aspect effect was evident for activities but less so for accomplishments in the L2 group across tasks, and (4) L2 proficiency and WMC were observed to modulate certain processes such as differences between the two grammatical aspects or lexical aspects. The study has several limitations. First, because the role of proficiency level in L2 performances examined was based on a rather small sample in each learner group, the interpretations regarding the influence of L2 proficiency are tentative. Future studies could also test a larger sample of L2 learners with a wider range of proficiency to fully investigate potential proficiency effects. Another issue that warrants further systematic research is the influence of WMC. WMC is a complex construct, and accurately measuring WMC is not an easy task (Juffs and Harrington, 2011). Given WMC's multi-faceted nature, future studies could assess WMC using a battery of tests, and outcomes from each test could be aggregated for an overall estimate of WMC of the population in question (see Huettig and Janse, 2016 for an example). Finally, learners' language exposure experience (heritage vs. non-heritage) was examined for its effect only as an exploratory analysis in the current study and is worth investigating more fully in future research.

Data availability statement

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found at: OSF: https://osf.io/h2m5a/.

Ethics statement

The studies involving human participants were reviewed and approved by IRB of University of Pittsburgh. The patients/ participants provided their written informed consent to participate in this study.

Author contributions

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Conflict of interest

Publisher's note

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