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# Systematic review and meta-analysis of the relationship between foreign language anxiety and academic achievement in Chinese language learners

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Foreign language anxiety significantly affects academic performance, particularly in Chinese language learning. This study aims to meta-analyze the relationship between foreign language anxiety and academic performance among individuals learning Chinese as a second language. A meta-analytic approach was employed, analyzing studies involving 3,633 Chinese language learners and 59 independent effect sizes. The degree of correlation between foreign language anxiety and academic performance was examined, along with potential moderating variables. A moderate negative correlation ( $r = -0.33$ ) was found between foreign language anxiety and academic performance. Subgroup analysis and meta-regression revealed that age, gender (biological sex), and the type of “anxiety–performance” relationship were moderating variables in this relationship. The findings suggest that (1) anxiety related to writing and listening in Chinese significantly negatively impacts language performance; (2) male learners and older learners are more susceptible to the influence of anxiety on their Chinese learning outcomes; and (3) the negative correlations between reading anxiety and reading performance, as well as listening anxiety and listening performance, are most pronounced. These results imply that educators should help learners recognize and manage anxiety, utilize AI technologies to create supportive learning environments, and foster positive emotional states to mitigate the negative effects of anxiety.

## KEYWORDS

Chinese language learners, L2 Chinese, foreign language anxiety, academic achievement, meta-analysis

## 1 Introduction

Foreign language learning is a complex cognitive activity accompanied by a wide range of emotional experiences, including anxiety, pleasure, and burnout. Among the negative emotions about language learning, foreign language anxiety has garnered the most widespread attention (Dewaele and MacIntyre, 2014). Foreign language anxiety is considered one of the predictors of second language achievement, as it poses a hidden threat to language learners, potentially interfering with the acquisition, retention, and production of the new language (MacIntyre and Gardner, 1991). Research on anxiety about learning foreign languages has primarily focused on Western languages, although studies on Chinese language learning anxiety have gradually increased in number since 1999. However, there is still no consistent conclusion regarding the correlation between Chinese language anxiety and academic performance. Additionally, comparative research on anxiety across different Chinese language

skills is scarce, and inconsistent findings in the existing literature have not been sufficiently and reasonably explained.

At present, AI is being increasingly integrated into Chinese language education, with the development of tools and applications such as AI-based speaking assistants aimed at enhancing the learning experience and addressing foreign language anxiety. Further exploration and clarification of the relationship between Chinese language anxiety and academic performance can provide clearer intervention targets and theoretical support for the design of AI tools. Such research can also guide the precise implementation of AI interventions and offer a benchmark for evaluating the effectiveness of AI applications in alleviating foreign language anxiety.

This study adopted a meta-analytic approach to explore the relationship between learners' Chinese language learning anxiety and academic performance and completed subgroup analyses on moderating variables to reveal factors that may negatively affect academic performance.

## 2 Literature review

In a general sense, anxiety is a subjective experience that evokes autonomic nervous system responses such as unease, worry, tension, and concern (Teimouri et al., 2019). In research on second language acquisition, anxiety has been defined and measured as a trait, mindset, or situation-specific anxiety (Chen et al., 2000; Horwitz, 2017). Regarding the types of foreign language learning anxiety, Horwitz et al. (1986) suggested the existence of three categories: communication apprehension, test anxiety, and fear of negative evaluation. This classification scheme has had the most widespread influence on subsequent studies. Early research generally defined foreign language anxiety as a relatively stable personality trait at different stages or as a temporary emotional state at specific moments (e.g., during high-stakes exam periods) (Cattell and Scheier, 1961). However, over time, an increasing number of second language acquisition researchers have adopted a situation-specific definition of anxiety, hypothesizing that anxiety persists and develops over time within the given context (MacIntyre and Gardner, 1991). The first situation-specific foreign language anxiety concept introduced in second language acquisition was foreign language classroom anxiety (FLCA), which refers to the unique combination of self-perceptions, beliefs, feelings, and behaviors exhibited by learners in relation to classroom language learning (Horwitz et al., 1986). In their work, Horwitz et al. (1986) systematically defined classroom anxiety and developed the Foreign Language Classroom Anxiety Scale (FLCAS), which has since become the most widely used measurement tool in empirical research in this field.

Research on anxiety in Chinese language learning began with work by Qian (1999), and subsequent studies have primarily focused on the issue of Chinese learning anxiety among international students in Chinese universities, with specific studies focusing on areas like the levels of anxiety among international students learning Chinese, the relationship between learning anxiety and oral fluency, the correlation between Chinese language anxiety and academic performance, and the relationship between language use anxiety and attribution (Zhang, 2001, 2002, 2008; Zhang and Wang, 2002; Zhang and Yang, 2011). Other studies have examined the sources of speech anxiety in Chinese as a second

language (Sun and Teng, 2021), as well as the relationship between Chinese learning anxiety and other foreign language learning emotions, such as perseverance, boredom, and enjoyment (Zhao and Wang, 2024). Research shows that foreign students learning Chinese typically experience moderate levels of anxiety, with communication apprehension being the most prominent type of anxiety (Basith et al., 2019). However, existing research on Chinese learning anxiety remains fragmented and limited in scope, with few studies integrating and examining the anxiety levels of different learner groups in a comprehensive manner.

Language anxiety can affect students' willingness to engage in social interactions and use the target language, which in turn impacts their academic adaptation and performance (Lou and Noels, 2020), especially in speaking and writing performance (MacIntyre et al., 1994; Cheng et al., 1999). Anxiety also has a direct negative impact on Chinese language performance (Qian, 1999; Zhang and Wang, 2002), particularly when academic performance is assessed through course grades rather than proficiency tests (Wang and Du, 2020). Currently, there is no unified conclusion regarding the degree of the negative correlation between Chinese language anxiety and academic performance.

In addition to examining the relationship between overall foreign language learning anxiety and overall academic performance, scholars have also focused on foreign language anxiety pertaining to different language skills, including speaking anxiety, reading anxiety, listening anxiety, and writing anxiety. These studies have found that anxiety related to specific language skills is significantly negatively correlated with corresponding foreign language proficiency (Cheng, 2004; Elkhafaifi, 2005). In the context of Chinese language skills, research has primarily focused on speaking anxiety and reading anxiety. Studies indicate that foreign language anxiety directly impacts the complexity and fluency of Chinese speaking but does not affect accuracy (Gong et al., 2024). Regarding reading anxiety, there is a lack of comparative analysis between reading anxiety and overall Chinese proficiency or reading performance. Due to limitations in research methods and tools, there is a scarcity of studies discussing the relationships between learners' overall foreign language anxiety, specific skill-related anxiety, overall foreign language performance, and skill-specific performance. Currently, there are no consistent conclusions regarding the correlation between language skill anxiety and performance, and the connection between different language skill anxieties and overall Chinese language anxiety remains unclear.

In recent years, a growing number of exploratory studies have examined the impact of AI on learners' foreign language anxiety. Overall, findings suggest that AI holds significant potential to reduce learners' anxiety by creating supportive, interactive, and personalized learning environments (Almineeai et al., 2025). For instance, AI chatbots have been widely recommended as speaking partners or tutors to facilitate language learning. They provide opportunities for students to practice speaking in low-pressure contexts, thereby alleviating anxiety and enhancing performance (Hapsari and Wu, 2022; Wang et al., 2024; Wu et al., 2025). However, the underlying mechanisms linking Chinese language anxiety to academic performance remain insufficiently understood. Clarifying this relationship is crucial for the further refinement and optimization of AI tools, enabling more personalized interventions that precisely regulate the reduction of language anxiety and ultimately improve academic outcomes.

Since the early 21st century, the “meta-analysis” approach has been introduced to the field of language acquisition research. This method allows for a comprehensive and objective consideration of sampling errors and non-significant statistical results, thus avoiding analytical biases caused by subjective factors, such as emotions and memory (Ahn et al., 2012). Teimouri et al. (2019), Zhang (2019), Botes et al. (2020), and Dong (2021) successively applied meta-analysis techniques to study the relationship between foreign language anxiety and academic performance. Their findings indicate a moderate negative correlation between foreign language anxiety and foreign language performance, with correlation coefficients of  $-0.36$ ,  $-0.34$ ,  $-0.39$ , and  $-0.33$ , respectively. However, these studies focused on the anxiety associated with Western languages, such as English, and it remains to be verified whether these conclusions are applicable in the context of Chinese language teaching.

The relationship between foreign language anxiety and academic performance may be influenced by a variety of potential moderating factors, including age, gender, learning duration, self-assessed proficiency, categories of foreign language anxiety, and methods of academic performance evaluation, although there is ongoing debate on these issues (Teimouri et al., 2019; Zhang, 2019; Botes et al., 2020; Dong, 2021). Additionally, cultural uniqueness and educational context also play roles in shaping anxiety levels. For instance, Chinese students exhibit greater levels of classroom anxiety compared to international samples, influenced by their educational environment (Jiang and Dewaele, 2019). In their works, Zhang (2019) and Dong (2021) argue that age is a moderating variable in the foreign language “anxiety–performance” relationship, whereas Botes et al. (2020) found no such result. Elsewhere, Teimouri et al. (2019) concluded that foreign language proficiency significantly moderates this relationship, while Zhang (2019) reached a different conclusion. In summary, existing research does not fully address the degree of correlation between different categories of anxiety and academic performance among Chinese language learners nor the moderating variables involved. Therefore, this study employed a meta-analysis approach to focus on the relationship between foreign language anxiety and academic performance among Chinese language learners and its moderating variables.

Accordingly, examining the relationship between Chinese language anxiety and academic achievement holds both theoretical and practical significance. From a theoretical standpoint, previous research on foreign language anxiety (FLA) has predominantly concentrated on learners of Indo-European languages such as English, Spanish, and French, with relatively limited attention given to Chinese language learners. Given the distinctive linguistic characteristics of Chinese—such as its tonal system, complex character script, and highly implicit discourse structures—clarifying the specific correlation between Chinese language anxiety and academic performance offers an opportunity to assess the applicability and boundary conditions of existing FLA research findings across typologically distant languages. Moreover, it contributes to advancing cross-linguistic comparative studies on language anxiety. From a practical perspective, understanding the overall strength of the anxiety–achievement relationship can enable Chinese language instructors and curriculum designers to more precisely identify the extent to which anxiety undermines learning outcomes. Additionally, identifying significant moderating variables provides critical guidance for the development and implementation of more targeted

pedagogical interventions, including those supported by AI-based tools aimed at alleviating learner anxiety and enhancing academic performance.

## 3 Research design

### 3.1 Research questions

This study primarily explores the following questions:

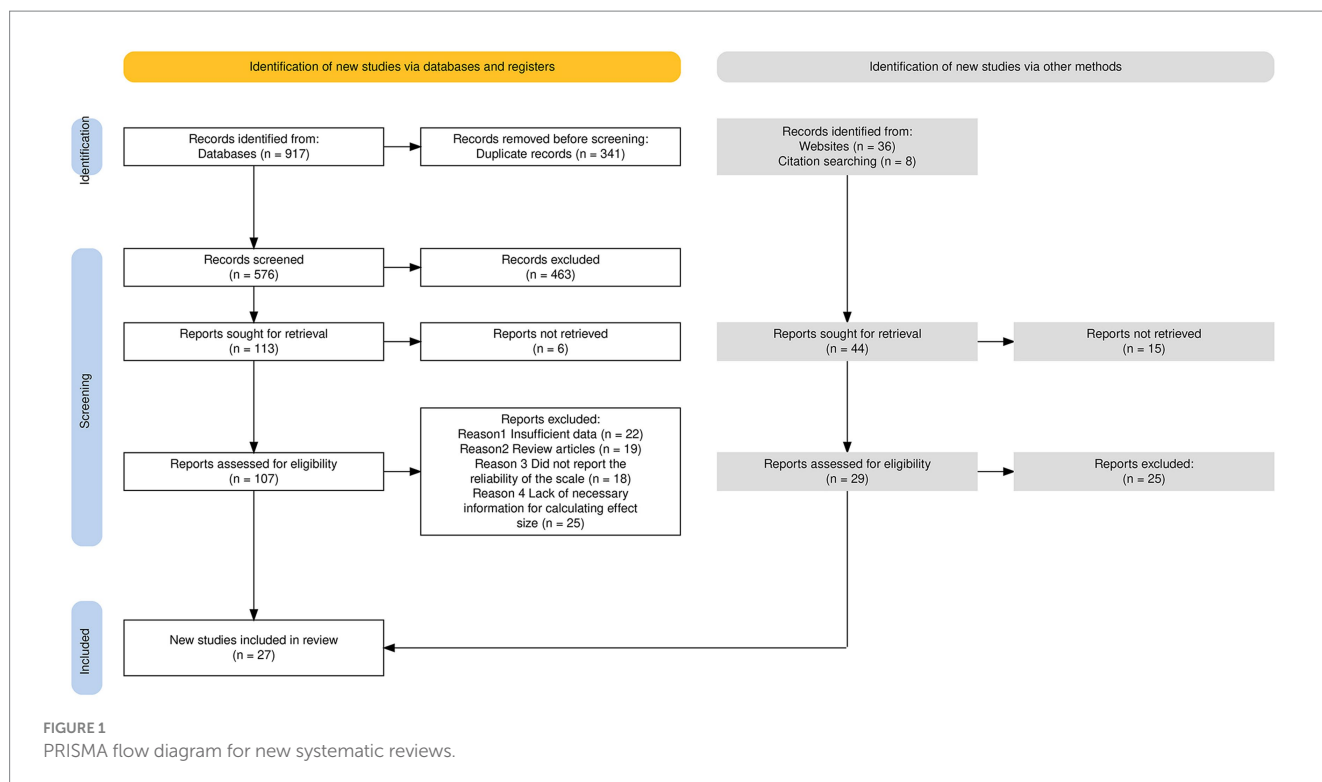
1. Based on existing research findings, what is the overall correlation between foreign language anxiety and academic performance among Chinese language learners?
2. What are the moderating variables affecting the relationship between foreign language anxiety and academic performance among Chinese language learners, and how do these variables influence this relationship?

### 3.2 Literature retrieval

This study conducted a comprehensive search for relevant literature in several databases (Web of Science, China National Knowledge Infrastructure, Wanfang databases) and search engines (Chinese Bidu Scholar and Google Scholar). We employed a search strategy combining the following keywords: “foreign language anxiety,” “L2 anxiety,” “second language anxiety,” “speaking anxiety,” “reading anxiety,” “writing anxiety,” “listening anxiety,” “classroom anxiety,” “L2 Chinese anxiety,” “HSK (*Hanyu Shuiping Kaoshi*, a Chinese proficiency test) anxiety,” “test anxiety,” “emotion,” “language achievement” “proficiency” and “affect.” To ensure thoroughness, we also performed a backward reference search of the literature cited in pertinent papers. Given that most Chinese universities require students majoring in international Chinese education to participate in teaching internships as volunteer Chinese language instructors, they constitute one of the main groups of teachers in Chinese language education. Consequently, many studies on foreign language anxiety among Chinese language learners abroad originate from master’s theses. These theses often provide comprehensive details on the development of scales for foreign language anxiety research, basic participant information, and performance assessments. Therefore, in addition to journal articles, this study also included master’s theses and applied the following filtering criteria to ensure the scientific rigor and relevance of the studies to the research at hand.

The literature included in this meta-analysis must meet the following criteria:

1. Publication date: the study was published after the introduction of the FLCAS by Horwitz et al. (1986).
2. Measurement tools: the study employed widely used foreign language anxiety scales to assess learners’ Chinese language learning anxiety levels, such as FLCAS or the Foreign Language Reading Anxiety Scale (FLRAS) developed by Saito et al. (1999). The study reported that these scales demonstrated good reliability and validity.
3. Correlation data: the study reported correlation coefficients for the relationship between at least one aspect of Chinese language



anxiety and academic performance or other indicators that could be converted into corresponding effect sizes.

- Participant information: the study provided basic information about the participants.

These criteria were used to ensure the inclusion of studies that are methodologically sound and relevant to the research focus.

In order to demonstrate the screening and selection procedures, this meta-analysis utilized the PRISMA Flow Diagram for new Systematic Reviews (Haddaway et al., 2022). The diagram is presented in Figure 1. We conducted a comprehensive review of 961 initially identified articles by examining their titles, abstracts, and keywords to exclude those irrelevant to the topic (Figure 1). Subsequently, we thoroughly read the full texts, eliminating review articles, studies lacking complete effect size calculation information, and those reporting results from the same survey. Ultimately, 27 articles published between 1999 and December 2024 met the inclusion criteria. Each study reported the internal consistency of the anxiety measurement scales, with Cronbach's alpha ( $\alpha$ ) exceeding 0.80, indicating good reliability.

We conducted a feature coding of the collected literature, which included the following variables (Table 1): basic bibliographic information (author, publication date, document type), learner information (gender, average age, nationality, Chinese proficiency), assessment methods, "anxiety-performance" categories, sample size, correlation coefficients, and others. Each independent sample corresponds to one effect size. If a single article reported multiple effect sizes, each effect size was coded as an independent research sample.

After coding, the 27 articles yielded a total of 56 independent effect sizes related to the relationship between Chinese language anxiety and overall academic performance, involving 105 "anxiety-performance" samples and 3,633 Chinese language learners. To ensure the reliability of the coding process, all data were independently coded

by two researchers specializing in international Chinese education. The coding results were then compared, and the consistency was found to be 0.97. The two coders discussed any discrepancies in their coding until full agreement was reached on all outcomes.

### 3.2.1 Meta-analysis process

We input the coded data into the Comprehensive Meta-Analysis<sup>1</sup> Version 3.3, converting the sample size and correlation coefficients into Fisher's Z values. Subsequently, we conducted publication bias tests, heterogeneity tests, and effect size calculations.

#### 3.2.1.1 Publication bias test

We assessed publication bias for the selected literature using a funnel plot (Figure 2) and fail-safe N statistics. As shown in Figure 2, most studies are concentrated above the funnel, with a relatively symmetrical distribution on both sides. Only a few studies appear below the funnel and are more dispersed. Based on this, we inferred that the original data errors in most studies were minimal, with good precision, suggesting no publication bias. A fail-safe N test was also conducted, yielding a result of 8,746 ( $p < 0.001$ ), meaning that, in the presence of publication bias, at least 8,746 additional relevant studies would be needed to correct for it. This value exceeds the "5 k + 10" rule (where k = the number of independent effect sizes; in this study, k = 59), indicating that the meta-analysis results were not affected by publication bias. This further supports the representativeness of the literature sample included in this meta-analysis.

<sup>1</sup> Comprehensive Meta-Analysis software is developed by Biostat, Inc., headquartered in Englewood, NJ, USA.



TABLE 1 Coding scheme.

Main category	Number of variables	Variables
Study characteristics	9	Author(s)
		Title of publication
		Year of publication
		Type of publication
		Average age
		Study context
		Female proportion
		Nationality
		Proficiency
Measurement characteristics	4	Anxiety type
		Reliability of the anxiety instrument
		Achievement measure
		Anxiety-academic achievement type
Effect sizes	3	Sample size
		Correlation coefficient
		Effect direction

### 3.2.1.2 Heterogeneity test

We also conducted a heterogeneity test for the selected literature. The results yielded  $Q = 183.954$ ,  $I^2 = 97\%$ , and  $p < 0.001$ . According to the interpretation of heterogeneity judgment criteria by Higgins et al. (2003), an  $I^2 > 75\%$  indicates substantial heterogeneity among the effect sizes. This suggests that the differences in effect sizes are not solely due to sampling errors but also influenced by moderating variables. Therefore, a random-effects model should be used to calculate the effect sizes, and subgroup analysis is necessary.

### 3.2.1.3 Effect size calculation

Since the literature included in this meta-analysis contains studies with small sample sizes, we chose Hedge's  $g$  to correct for small sample bias. As shown in Figure 3, under the random-effects model, the combined overall effect size was  $g = -0.734$ , with a 95% confidence interval of  $[-0.949, -0.519]$ . According to the effect size interpretation criteria proposed by Plonsky and Oswald (2015), this effect size is considered moderate.

## 4 Results

### 4.1 Correlation between foreign language anxiety and academic performance in Chinese language learners

The meta-analysis results revealed a correlation coefficient of  $-0.33$  ( $p < 0.001$ ) between foreign language anxiety and academic performance in Chinese language learners, indicating a moderate negative correlation between the two variables.

### 4.2 Moderating variables in the “anxiety–performance” relationship of Chinese language learners

#### 4.2.1 Categorical moderators of the “anxiety–performance” relationship

To further explore the potential moderating variables influencing the “anxiety–performance” relationship in Chinese language learners, we conducted subgroup analyses based on categorical variables. The results are presented in Table 2.

##### 4.2.1.1 Anxiety type

Among all the included studies, six types of anxiety were identified, with the most common being classroom anxiety, followed by reading anxiety. The results of the subgroup analysis showed that the anxiety type variable did not significantly predict the correlation between anxiety and academic performance ( $Q_{\text{between}} = 5.444$ ,  $p = 0.364$ ). The anxiety types most strongly correlated with academic performance were reading anxiety ( $r = -0.420$ ,  $p < 0.001$ ), test anxiety ( $r = -0.402$ ,  $p < 0.001$ ), and listening anxiety ( $r = -0.383$ ,  $p < 0.001$ ). The correlation between classroom anxiety (general) and academic performance was moderate ( $r = -0.315$ ,  $p < 0.001$ ), while the weakest correlations were observed with speaking anxiety ( $r = -0.297$ ,  $p < 0.001$ ) and writing anxiety ( $r = -0.193$ ,  $p < 0.001$ ).

##### 4.2.1.2 Achievement measures

The study included three types of achievement measures: course grades, language tests, and self-perceived academic performance. Among these, language tests primarily refer to HSK. The correlation between course grades and anxiety was the highest ( $r = -0.353$ ,  $p < 0.001$ ), while language tests showed no significant correlation with anxiety ( $r = -0.342$ ,  $p = 0.142$ ). Self-perceived academic performance had the lowest correlation with academic performance ( $r = -0.261$ ,  $p < 0.001$ ). However, there were no significant statistical differences between these three correlations ( $Q_{\text{between}} = 4.822$ ,  $p = 0.090$ ).

##### 4.2.1.3 Study context

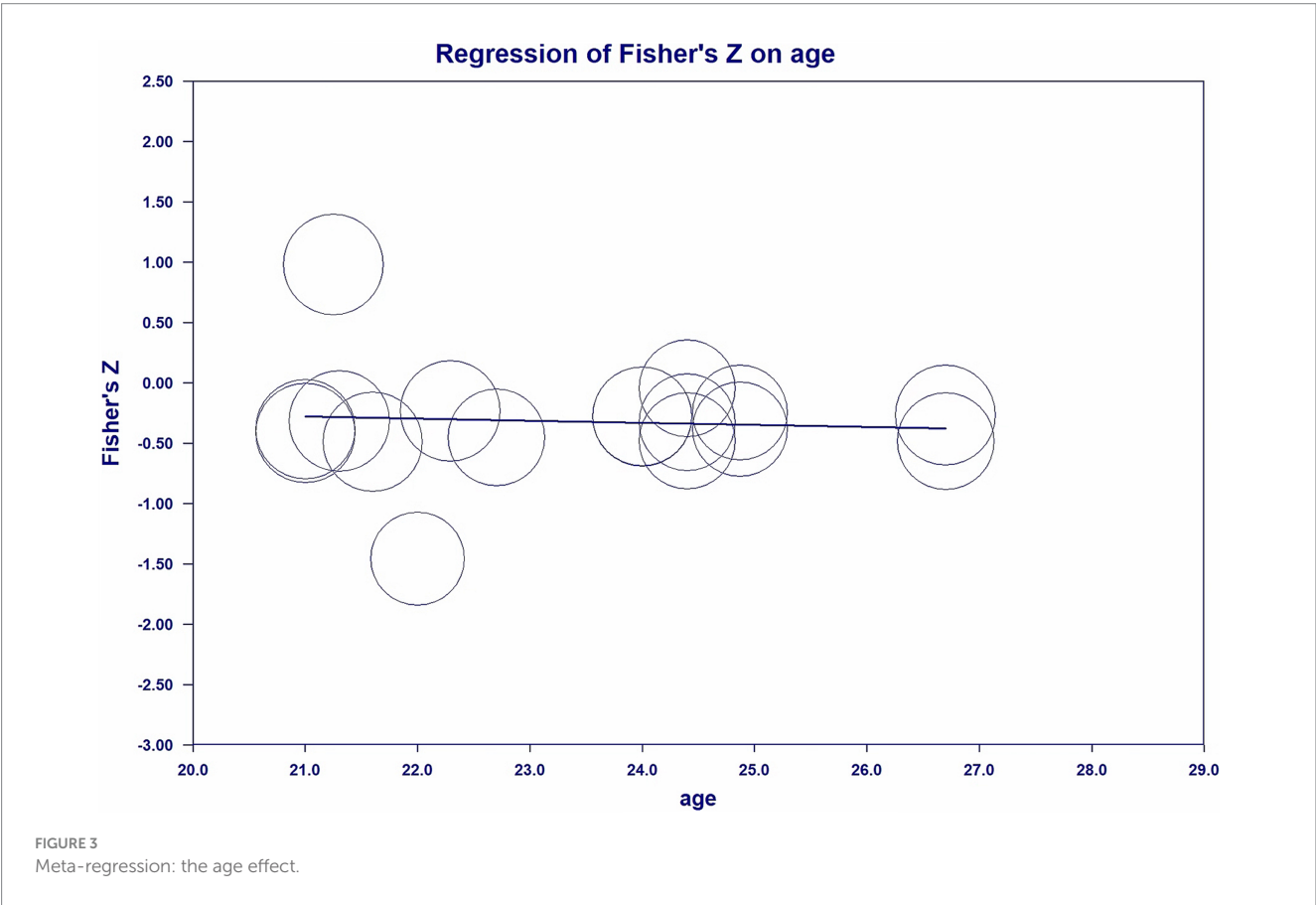
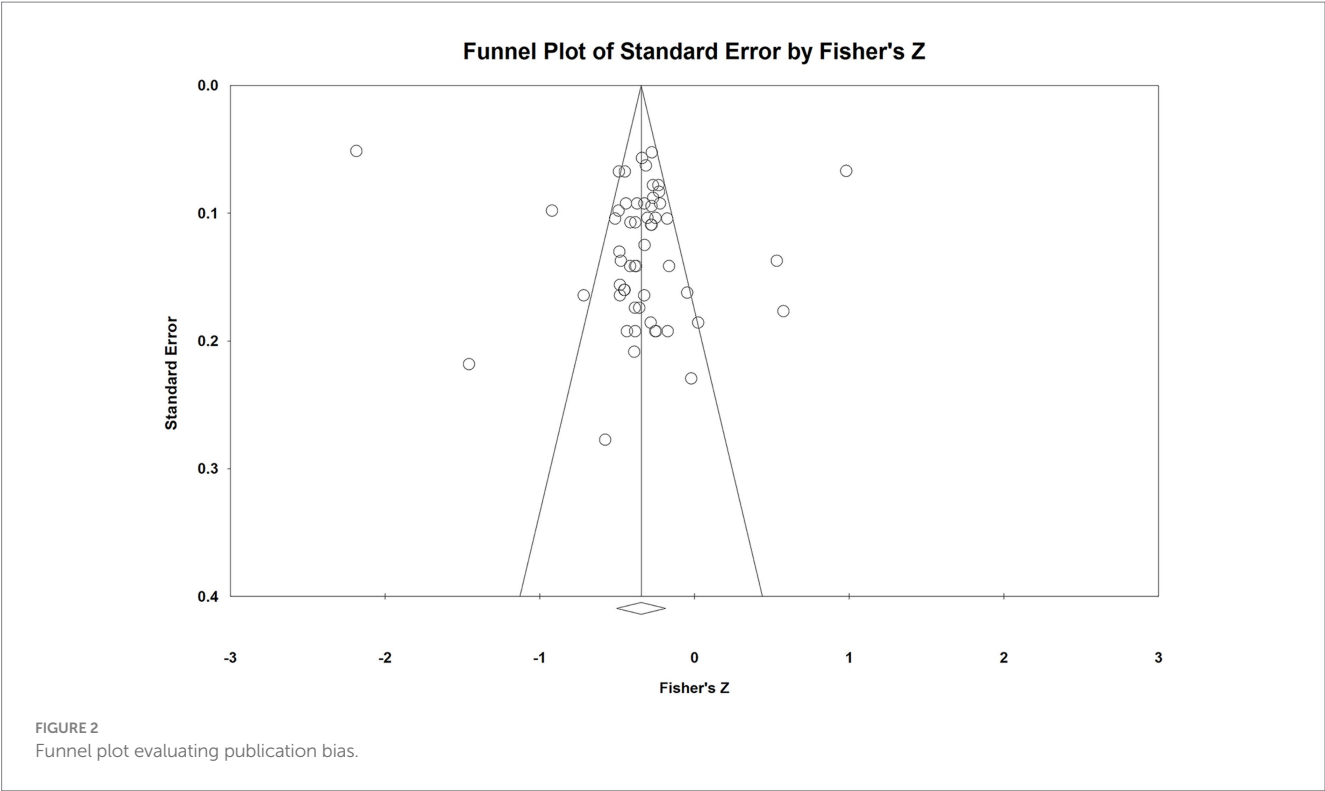
The results indicated that anxiety was prevalent among learners in the three different learning contexts of L2, L2/FL combined, and study abroad, with no significant difference in correlation ( $Q_{\text{between}} = 0.708$ ,  $p = 0.702$ ). Relatively speaking, learners studying abroad showed the strongest correlation between anxiety and academic performance ( $r = -0.337$ ,  $p < 0.001$ ), while learners in the L2/FL combined context showed the weakest correlation ( $r = -0.284$ ,  $p < 0.001$ ).

##### 4.2.1.4 Nationality

Since most study samples reported mixed nationalities, involving primarily students from Asia, we divided the learners' nationalities into Asian and non-Asian categories. The analysis revealed no significant difference in the correlation between anxiety and academic performance across different nationalities ( $Q_{\text{between}} = 0.708$ ,  $p = 0.702$ ). However, the correlation for non-Asian learners was slightly higher ( $r = -0.314$ ,  $p < 0.001$ ) compared to that for Asian learners ( $r = -0.312$ ,  $p < 0.001$ ).

##### 4.2.1.5 Publication type

For studies published in journals, the correlation between anxiety and academic performance was  $r = -0.228$  ( $p < 0.05$ ). In contrast, for



thesis-based research, the correlation was stronger ( $r = -0.395$ ,  $p < 0.001$ ), though no significant statistical difference was found between the two types of publications.

4.2.1.6 Proficiency

In terms of Chinese proficiency, most learners in the studies were learning at beginner to intermediate levels. Among these, the anxiety

TABLE 2 Moderator analysis<sup>1</sup>.

Moderator variable	<i>k</i>	Effect size and 95% confidence interval			<i>p</i> -value	Q <sub>between</sub>
		<i>r</i>	Lower limit	Upper limit		
Anxiety type						
CA	39	−0.315*	−0.491	−0.113	0.003	5.444
LA	2	−0.383***	−0.556	−0.179	0.000	
RA	8	−0.420***	−0.600	−0.198	0.000	
SA	2	−0.297***	−0.400	−0.187	0.000	
TA	3	−0.402***	−0.480	−0.319	0.000	
WA	2	−0.193	−0.395	0.028	0.087	
Overall	56	−0.350***	−0.404	−0.295	0.000	
Achievement measure						
Course grades	26	−0.353***	−0.405	−0.298	0.000	4.822
Language tests	22	−0.342	−0.681	0.118	0.142	
Self-perceived	8	−0.261***	−0.322	−0.197	0.000	
Overall	56	−0.312***	−0.352	−0.270	0.000	
Study context						
L2	1	−0.326***	0.422	−0.223	0.000	0.708
L2/FL combined	6	−0.284***	−0.344	−0.222	0.000	
Study abroad	49	−0.337***	−0.494	−0.159	0.000	
Overall	56	−0.290***	−0.346	−0.231	0.000	
Nationality						
Asian	27	−0.312***	−0.383	−0.238	0.000	0.000
Non-Asian	3	−0.314***	−0.409	−0.212	0.000	
Overall	30	−0.313***	−0.370	−0.253	0.000	
Publication type						
Articles	22	−0.228*	−0.413	−0.024	0.029	1.504
Dissertation	34	−0.395***	−0.557	−0.203	0.000	
Overall	56	−0.312***	−0.439	−0.173	0.000	
Proficiency						
High	1	−0.447*	−0.666	−0.157	0.003	5.267
Intermediate	18	−0.149	−0.361	0.078	0.198	
Low	28	−0.342***	−0.403	−0.279	0.000	
Mixed	9	−0.609*	−0.850	−0.158	0.011	
Overall	56	−0.336***	−0.393	−0.277	0.000	
Anxiety–academic achievement type						
TA-LAA	1	−0.207*	−0.391	−0.007	0.043	25.819*
TA-WAA	1	−0.284**	−0.458	−0.089	0.005	
TA-RAA	1	−0.325***	−0.493	−0.133	0.001	
TA-GAA	3	−0.402***	−0.480	−0.319	0.000	
CA-SAA	7	−0.565	−0.884	0.112	0.096	
CA-LAA	18	−0.212***	−0.329	−0.089	0.001	
CA-WAA	7	−0.259*	−0.449	−0.047	0.017	
CA-GMA	7	0.087	−0.243	0.399	0.610	
CA-RAA	16	−0.092	−0.262	0.083	0.302	
CA-GAA	28	−0.172	−0.336	0.004	0.055	
SA-SAA	2	−0.297***	−0.400	−0.187	0.000	
LA-LAA	2	−0.383***	−0.556	−0.179	0.000	
WA-WAA	2	−0.193	−0.395	0.028	0.087	
RA-RAA	8	−0.427***	−0.606	−0.207	0.000	
RA-GAA	2	−0.324**	−0.526	−0.087	0.008	
Overall	105	−0.284***	−0.325	−0.242	0.000	

CA, classroom anxiety (general); GAA, general academic achievement; GMA, grammar academic achievement; LA, listening anxiety; LAA, listening academic achievement; RAA, reading academic achievement; SA, speaking anxiety; SAA, speaking academic achievement; TA, test anxiety; WA, writing anxiety; RA, reading anxiety; WAA, writing academic achievement.

\* $p \leq 0.05$ . \*\* $p \leq 0.01$ . \*\*\* $p \leq 0.001$ . <sup>1</sup>Studies that did not explicitly report the relevant categorical variables were excluded from the subgroup analysis.

of beginner-level Chinese language learners had a more significant impact on academic performance. The correlation between anxiety and academic performance for beginner-level learners was  $r = -0.342$  ( $p < 0.001$ ), which was higher than that for intermediate-level learners ( $r = -0.149$ ,  $p = 0.198$ ). However, this difference was not statistically significant ( $Q_{\text{between}} = 5.267$ ,  $p = 0.153$ ).

#### 4.2.1.7 Anxiety–academic achievement type

Anxiety–academic achievement type was found to be a significant moderating variable in the relationship between anxiety and academic performance for Chinese language learners ( $Q_{\text{between}} = 25.819$ ,  $p < 0.05$ ). Regarding the correlation between overall classroom anxiety and the scores of different language skills, significant correlations were found with listening scores ( $r = -0.212$ ,  $p < 0.001$ ) and writing scores ( $r = -0.259$ ,  $p < 0.05$ ), with the correlation for writing scores being stronger than that for listening scores. Among the various language skill anxieties and their correlations with language skill performance, reading anxiety showed the strongest correlation with reading scores ( $r = -0.427$ ,  $p < 0.001$ ), followed by listening anxiety with listening scores ( $r = -0.383$ ,  $p < 0.001$ ). The correlation between writing anxiety and writing scores was the weakest ( $r = -0.193$ ,  $p = 0.087$ ), though this was not statistically significant. Due to the small number of studies examining the correlation between exam anxiety and various types of academic performance ( $k = 1$ ), caution is needed when interpreting these findings.

#### 4.2.2 Continuous variables moderating the “anxiety–achievement” relationship

Seventeen studies reported the average age of participants (most were 20–30 years old, with the youngest being 13 years of age and the oldest 61 years of age). We conducted a meta-regression analysis on the continuous variable of age among Chinese language learners. The results (Figure 3) indicated that age significantly moderates the relationship between foreign language anxiety and academic achievement ( $I^2 = 95.70\%$ ,  $Q = 371.97$ ,  $p < 0.001$ ). As learners' age increases, the correlation between anxiety and academic performance strengthens. In other words, older students show a greater correlation between anxiety and academic achievement.

As the proportion of female participants in the studies is also a continuous variable, we employed a random-effects meta-regression analysis to examine whether the gender ratio is associated with the relationship between anxiety and academic achievement. Twenty-two studies reported the gender proportion of participants. According to the results in Figure 4, gender significantly moderates the relationship between anxiety and academic achievement ( $I^2 = 97.59\%$ ,  $Q = 1784.83$ ,  $p < 0.001$ ): as the proportion of female participants increases, the correlation between anxiety and academic performance decreases, meaning the “anxiety–achievement” correlation is stronger in males than in females.

## 5 Discussion

### 5.1 Overall correlation between Chinese language anxiety and academic performance (RQ1)

The results for the first research question indicate a moderate negative correlation between Chinese language anxiety and academic performance. Reviews of meta-analyses conducted by Teimouri et al.

(2019), Zhang (2019), Botes et al. (2020), and Dong (2021) on samples of foreign language learners—both domestic and international—reported correlation coefficients of  $-0.36$ ,  $-0.34$ ,  $-0.39$ , and  $-0.33$ , respectively, for the anxiety–performance relationship. These studies, which encompassed languages such as English, French, German, and Japanese, yielded findings consistent with our observed correlation between Chinese language anxiety and academic performance. This convergence is an encouraging sign for Chinese language learners. Despite the challenges posed by Chinese's unique tonal system and complex character writing—factors that have led to the stereotype that “Chinese is difficult to learn”—our study confirms that learning Chinese does not inherently trigger greater anxiety than learning other languages (Wang and Du, 2020), nor is the negative impact of anxiety on academic performance more pronounced.

### 5.2 Moderating variables affecting the anxiety–performance relationship (RQ2)

#### 5.2.1 Moderators identified: gender, age, and anxiety–achievement category

Our exploratory analysis identified gender, age, and the specific anxiety–achievement category as significant moderators of the relationship between Chinese language anxiety and academic performance.

##### 5.2.1.1 Gender

The correlation between anxiety and academic performance among male Chinese language learners was found to be significantly stronger than that among female learners. The relationship between gender and foreign language anxiety remains a topic of debate in the existing literature. For instance, Lu and Liu (2015) similarly suggested that male learners tend to experience greater levels of foreign language anxiety than female learners. However, Dewaele and MacIntyre (2014) argued that female foreign language learners tend to be more emotionally sensitive and thus more susceptible to experiencing foreign language anxiety; specifically, they may worry more about their shortcomings, focus on areas where they struggle, and develop greater psychological pressure, which in turn negatively affects their academic performance. We believe that the contradictory findings regarding adult learners' foreign language anxiety may be attributed to differences in the sociocultural contexts of the participants. Most of the studies included in our meta-analysis involved international students enrolled in Chinese universities. In these institutions, female learners tend to make up a larger proportion of Chinese language classes (as evidenced by the fact that most studies included in this analysis had a female-majority sample), and female learners are also more prevalent among high-achieving students. In such a classroom environment, female learners may find it easier to establish connections with peers over shared topics of interest or dormitory life. In contrast, male learners, being a minority in these classes, may experience heightened communication anxiety and feelings of isolation. Given that Asian learners are generally more reserved and reticent, these social factors may contribute to increased anxiety, ultimately exerting a negative impact on their academic performance.

##### 5.2.1.2 Age

The age effect observed in this study indicates that the correlation between anxiety and academic performance strengthens with



increasing age. This finding contrasts with the results of Dong (2021), who found that, among Chinese learners of English, the correlation between anxiety and academic performance weakened as age increased. Given that learners' anxiety is shaped by specific cultural contexts, we believe that contextual differences can explain this discrepancy. Dong's (2021) study covered high school and early university students with an average age range of 15–20 years. In the Chinese high school system, English is a core subject in the National College Entrance Examination (*Gaokao*) and is also a mandatory requirement for those planning to study abroad. English, along with Chinese and Mathematics, carries the greatest weight in *Gaokao*, making it a decisive factor in students' final scores. As a result, students face high expectations from schools, families, and society, with frequent English examinations contributing to significant academic pressure. However, younger students in this age group may lack the emotional coping skills to manage foreign language anxiety effectively. Upon entering university, the mandatory nature of English learning diminishes, and, as students mature, they develop a deeper understanding of their emotions and acquire more effective strategies to regulate and manage anxiety, thereby reducing its negative impact on academic performance.

Contrasting with this, the participants in our study were primarily aged 20–30 years old, with most being university-level adult learners. The younger or lower-grade learners in our sample were mostly non-degree students (e.g., those enrolled in short-term Chinese language training programs without formal university enrollment). For them, learning Chinese primarily serves as preparation for future academic applications or employment, and exam results have limited

long-term consequences. Moreover, learners at this stage often have only a basic proficiency in Chinese, with relatively simple lesson content and exam requirements. However, as age increases, there is a growing proportion of graduate students majoring in Chinese (including master's and doctoral students). Many of these learners must study and take exams alongside native Chinese students, where academic assessments become more specialized, complex, and discipline-specific. Among these individuals, the pressure to achieve proficiency in Chinese for career advancement becomes more pronounced, and they are more likely to experience anxiety about their pronunciation (DeKeyser, 2000). Consequently, learners in this older age group exhibited a stronger correlation between anxiety and academic performance. Additionally, prior studies suggest that foreign language anxiety tends to increase with years of study, as learners may face greater challenges as they progress (Onwuegbuzie et al., 1999). Other researchers have noted that, compared to older learners, younger learners tend to experience less anxiety when speaking a second or third language with strangers (Dewaele, 2007). Differences in language learning attitudes may also play a role, as older learners are often more concerned with grammatical accuracy and formal correctness, which can enhance foreign language anxiety.

It is important to note that the age effect may manifest differently across linguistic domains, including phonetics, syntax, and semantics. Notably, the age effect identified in this study is based on language proficiency test scores reported in the analyzed studies and thus may not be generalizable to specific linguistic components. Future research should conduct more targeted assessments to explore these

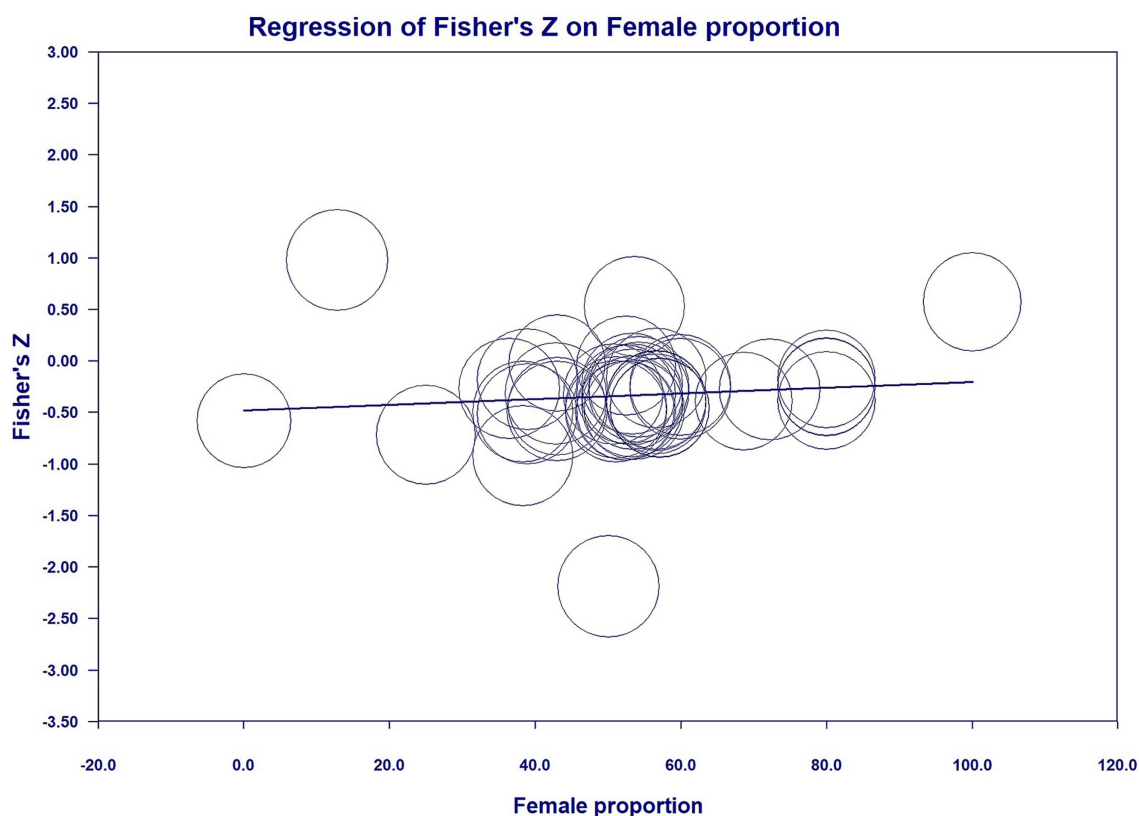


FIGURE 4  
Meta-regression: proportion of female participants.

distinctions further. Nevertheless, findings concerning the age-related influence on the anxiety–performance correlation in Chinese language learning provide an important foundation for understanding the role of age in this relationship.

### 5.2.1.3 Anxiety–achievement category

The “anxiety–achievement” category is a significant moderating variable in the relationship between learners’ anxiety and academic performance. This finding is consistent with the results of [Botes et al. \(2020\)](#) and [Dong \(2021\)](#), who, based on samples of international foreign language learners and Chinese learners of English, respectively, also identified this moderating effect. Regarding the correlation between classroom anxiety and specific language skills, our analysis found that classroom anxiety is most strongly associated with writing and listening performance—learners who experience greater levels of classroom anxiety tend to score lower in writing and listening exams. This suggests that general foreign language anxiety has a more pronounced impact on writing and listening skills. For Chinese language learners, foreign language anxiety is highly correlated with listening proficiency, which we attribute to the unique characteristics of the Chinese language. Unlike alphabetic languages such as English, Chinese is a logographic language with a large number of homophones. Many Chinese words share the same syllables but are distinguished only by tone, making comprehension more difficult for beginner and intermediate learners. Additionally, the Chinese writing system is highly distinctive, with a vast number of characters and visually similar components. [Saito et al. \(1999\)](#) pointed out that learning in an unfamiliar writing system can induce high levels of anxiety among learners. Therefore, linguistic distance may be a key factor contributing to the strong negative correlation between classroom anxiety and writing performance, a hypothesis that requires further validation in future studies.

### 5.2.2 Non-significant moderators

Factors such as anxiety type, achievement measure, study context, nationality, publication type, and proficiency did not emerge as significant moderators between Chinese language anxiety and performance. We believe that, although current research on the relationship between Chinese language anxiety and performance shows such results, it is essential to maintain an open mind regarding these findings. As research on Chinese language anxiety becomes more extensive in the future, the diversity of studies will increase. Currently, the number of studies on different types of anxiety is relatively small, and, for moderator variable analysis, having  $k \geq 10$  is considered an ideal condition ([Higgins et al., 2019](#)). Additionally, we consider that these factors may overlap in their influence on the relationship between anxiety and performance and could interact with other potential moderating variables. For instance, the learning environment can affect learners’ foreign language anxiety and performance. However, the learning environment is a composite factor; current studies only report the study context. Researchers suggest that the intensity of language courses can also impact FLCA and academic performance. More intensive courses may reduce students’ average anxiety levels in foreign language learning ([Baker and MacIntyre, 2000](#); [MacIntyre et al., 2003](#)). Future research on the relationship between foreign language anxiety and performance should further focus on the differences among individual learners in various contexts. We also call for the inclusion of more detailed descriptions of courses in research reports to provide more

interpretable information for understanding the correlation between learners’ anxiety and performance in specific learning environments. Moreover, current studies lack precise data; for example, the classification of learners’ Chinese proficiency should include standardized references, such as HSK levels.

In our study, we did not find a significant impact of Chinese proficiency levels on the correlation between anxiety and performance, indicating that anxiety persists among learners of varying proficiency levels ([Horwitz, 2000](#); [Zhang, 2019](#)). Therefore, it is essential to acknowledge and address anxiety as an influential factor across all stages of Chinese language learning. Notably, the correlation between anxiety and performance was most pronounced among beginner-level learners. This heightened correlation may be attributed to beginners still acclimating to instructors, course content, and the learning environment, as well as exploring effective study methods and test-taking strategies. Consequently, they may experience greater uncertainty and concern regarding their academic performance. However, anxiety is not exclusive to beginners. [Horwitz \(1996\)](#) noted that advanced language learners may also experience significant anxiety when using a foreign language.

In this study, we found that the method of foreign language achievement assessment did not produce statistically significant differences in the “anxiety–achievement” relationship, a conclusion that corroborates and supports [Zhang’s \(2019\)](#) findings. Specifically, in studies using language tests, researchers predominantly employed HSK scores to assess the correlation between foreign language anxiety and achievements. Compared to general foreign language proficiency tests, the HSK is the most standardized and influential large-scale Chinese proficiency examination, covering a broad range of knowledge areas and being closely linked to international students’ scholarship applications and employment prospects. However, our meta-analysis revealed a weaker correlation between learners’ classroom anxiety and HSK performance. Upon further investigation, we discovered that many learners are required to provide HSK scores meeting certain standards when applying for study-abroad programs at Chinese universities. These scores are typically obtained before their formal Chinese language studies commence, thereby diminishing the association between subsequent classroom anxiety and prior HSK performance.

The “course grades” category encompasses midterm and final exams, as well as various Chinese language skill assessments. One study selected a specialized examination that combined medical professional course content with Chinese language testing. In this context, the correlation between anxiety and achievement among Chinese language learners was higher than that associated with other types of course examinations. We speculate that the significant effect size observed in medical professional course exams is related to the increased difficulty of these assessments. Unlike standard language tests, professional course exams are more academically demanding, involving a greater number of specialized terms. Additionally, as these exams pertain to students’ major courses, they have a substantial impact on overall academic performance, thereby potentially eliciting heightened levels of anxiety among learners.

## 5.3 Notable findings: specific skill areas and grammar performance

Among the correlations between anxiety and performance in specific language skills, reading anxiety exhibits the strongest negative correlation with reading performance, followed by listening anxiety

with listening performance and speaking anxiety with speaking performance, respectively. Researchers have pointed out that anxiety can interfere with text decoding and processing (Saito et al., 1999). Additionally, anxiety affects learners' working memory, with highly anxious learners recalling significantly fewer details from reading texts (Sellers, 2000). Unlike English and other Western languages, Chinese discourse tends to convey logical relationships and viewpoints in a more implicit and indirect manner. The narrative logic is often embedded within the meaning rather than explicitly signaled through transition and linking words. For learners, heightened anxiety further impairs memory, critical analysis, and comprehension of Chinese passages, exacerbating the negative impact on reading performance.

Interestingly, while most types of anxiety in this study exhibited a negative correlation with academic performance, classroom anxiety showed a positive correlation with grammar performance. Previous research provides several insights into why classroom anxiety might be positively related to grammar performance. Moderate levels of anxiety may enhance learners' attentional focus and effort investment, leading to improved accuracy in grammar-related tasks (Horwitz et al., 1986; MacIntyre et al., 1994). In examination-driven educational contexts, such as those in China and South Korea, classroom anxiety may encourage the adoption of performance-oriented strategies, including rote memorization and repetitive practice, which can boost grammar test scores in the short term (Liu, 2006). Furthermore, anxiety has been found to promote self-monitoring behaviors that contribute to grammatical accuracy, particularly in formal testing situations (Skehan, 1998).

## 5.4 Conclusion and limitations

This study uses meta-analysis to comprehensively examine domestic research on the relationship between foreign language anxiety and academic achievement among Chinese language learners. The findings reveal a moderate negative correlation between foreign language anxiety and academic performance. Age, gender, and the type of "anxiety-achievement" relationship were identified as moderating variables in the connection between learners' foreign language anxiety and academic performance. These results provide significant insights for Chinese language teaching.

For beginner and intermediate Chinese language learners, reading and listening anxieties are particularly impactful on their academic performance. Teachers should explore the sources of anxiety in learners' reading and listening activities and use multimodal strategies, such as visual cues, to support students' comprehension, memory, and the expression of auditory and written content, thereby reducing their cognitive load. Furthermore, it is crucial to allocate sufficient time to explain and practice unfamiliar or challenging knowledge points, provide timely positive feedback on learners' reading and listening tasks, and enhance learners' confidence and sense of accomplishment.

Technological interventions can provide significant benefits in language learning, particularly in addressing anxiety and enhancing engagement. Teachers can integrate AI-driven technologies to create diverse language learning opportunities; foster a supportive classroom

environment; and increase students' enjoyment of learning, confidence, and willingness to engage in Chinese communication. The use of automatic speech recognition technology and conversational AI assistants has previously been shown to improve vocabulary knowledge, reduce speaking anxiety, and increase language enjoyment among learners (Bashori et al., 2021; Zhang et al., 2024). Moreover, the use of computer-assisted language learning media in second language learning helps build positive teacher-student relationships, motivates learners, and reduces potential learner anxiety (Jiang and Ramsay, 2005). Based on our findings, individual factors mediate the relationship between Chinese language learning anxiety and academic achievement. In future research and development of AI tools to support Chinese language learning, it is essential to establish adaptive regulation systems tailored to group-specific characteristics. Such systems would enable more effective enhancement of learners' self-efficacy according to their needs, helping them feel more comfortable and reducing anxiety during language practice.

Of concern is the moderate negative effect that Chinese language learning anxiety has on learners' academic performance. This negative impact is likely to persist, leading to greater risks for adverse effects on learners' mindset and self-perception. In teaching activities, educators should help learners develop a deeper understanding of their own emotions and acquire strategies for regulating and managing emotions, thereby reducing the impact of negative emotions on academic performance. For male learners and older learners, anxiety is more likely to have an adverse effect on academic performance. Therefore, it is essential for educators to monitor the onset of anxiety and provide timely interventions. Based on our analysis, the higher the level of anxiety in Chinese language learning, the lower the learner's academic performance may be. Low academic performance can bring about numerous practical negative consequences for language learners. Hence, both educators and researchers must pay particular attention to methods for reducing or managing anxiety during language learning to help learners minimize its negative impact. Thus, we hope that this meta-analysis provides a useful evidence-based guide for Chinese language teachers, course designers, teaching material developers, and researchers, enhancing awareness of the importance of individual differences in language learners.

Due to the limited number of existing studies, this research does not provide a comprehensive examination of the relationship between Chinese language learners' foreign language anxiety and academic performance, as well as the moderating variables. Furthermore, the moderating factors currently explored in the literature are limited. Variables such as self-efficacy, learning motivation, and learning styles may all play a moderating role in the relationship between anxiety and academic performance. However, there is a lack of sufficient research data on these factors in existing studies, preventing their analysis in this meta-analysis.

## 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.

## Author contributions

WC: Writing – original draft, Writing – review & editing.

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## Conflict of interest

The author declares 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/feduc.2025.1576224/full#supplementary-material>

SUPPLEMENTARY FIGURE 1  
Studies Included in the Analysis.



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