

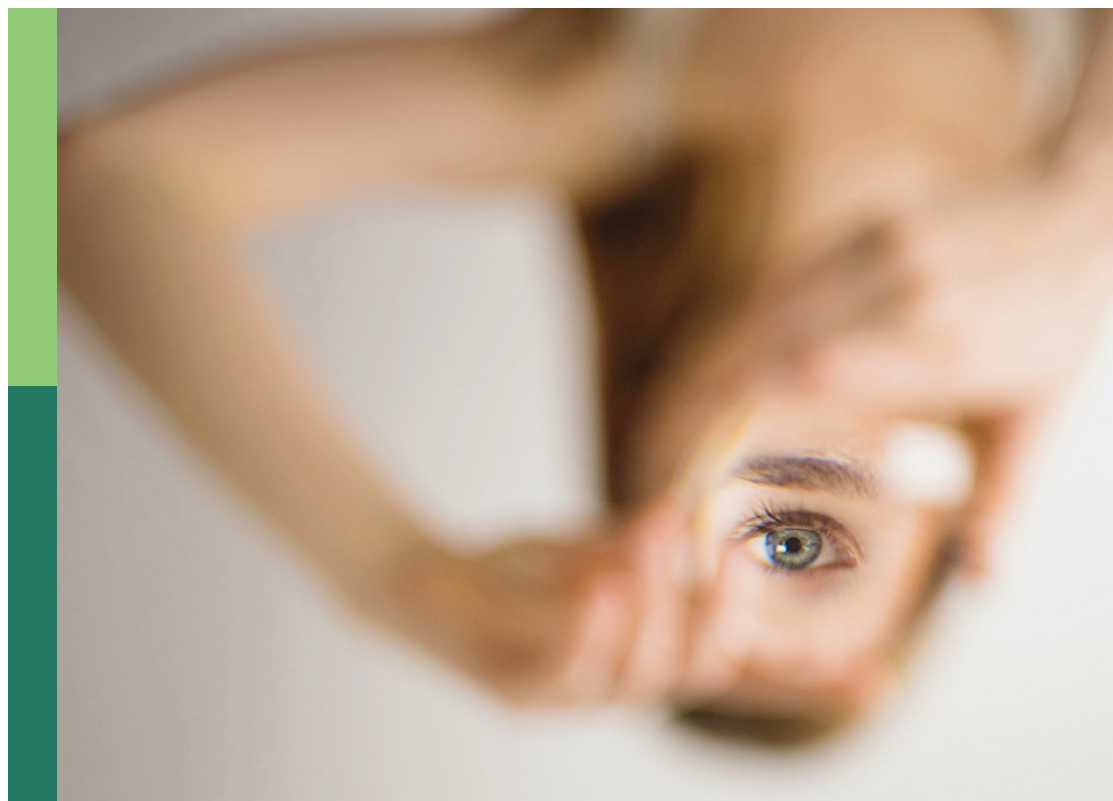
Well-being in Asia

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Martijn Burger and Nicholas Pang

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Well-being in Asia

Topic editors

Martijn Burger — Open University of the Netherlands, Netherlands

Nicholas Pang — Universiti Malaysia Sabah, Malaysia

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EDITED AND REVIEWED BY

Llewellyn Ellardus Van Zyl,
Optentia, North West University, South Africa

*CORRESPONDENCE

Martijn J. Burger
✉ mburger@ese.eur.nl

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Editorial: Well-being in Asia

Martijn J. Burger^{1,2,3*} and Nicholas Tze Ping Pang^{4,5}

¹Erasmus Happiness Economics Research Organisation, Erasmus University Rotterdam, Rotterdam, Netherlands, ²Faculty of Management, Open University of the Netherlands, Heerlen, Netherlands, ³C.WAISS and Faculty of Economics, University of Johannesburg, Johannesburg, South Africa, ⁴Faculty of Medicine and Health Sciences, Universiti Malaysia Sabah, Kota Kinabalu, Malaysia, ⁵Unit of Clinical Psychiatry, Department of Clinical Neurosciences/DIMSC, Polytechnic University of Marche, Ancona, Italy

KEYWORDS

wellbeing, Asia, China, Taiwan, happiness

Editorial on the Research Topic

Well-being in Asia

Over the past decades, the literature on happiness and wellbeing has been increasing tremendously, a fact corroborated by bibliometric mapping (Veenhoven, 2018; Pang et al., 2023). Yet, a frequent criticism of research on wellbeing and happiness is its heavy reliance on WEIRD populations—those from Western, Educated, Industrialized, Rich, and Developed societies—just like other fields related to psychological science (e.g., Henrich et al., 2010; Hendriks et al., 2019). This raises concerns about whether the field has been disproportionately influenced by Western viewpoints (Lambert et al., 2020; Van Zyl et al., 2024; Steger, 2025), and more importantly whether we truly understand happiness from the perspective of the majority of the population of the world.

For example, comparative studies across countries typically use evaluative indicators like Cantril's Ladder or life satisfaction scales. When emotional balance is assessed, the focus is often on the ratio of high-arousal positive to negative emotions. However, cultural differences in how subjective wellbeing is experienced and valued are significant. For example, East Asian cultures may place greater importance on low-arousal positive states such as tranquility and harmony, rather than on more intense feelings like excitement (Lim, 2016). Additionally, Western ideas of wellbeing often prioritize individual fulfillment, whereby many non-Western cultures view wellbeing as inherently relational or collective (Lambert et al., 2020).

In recent years, an increasing number of studies are beginning to happiness and wellbeing in non-WEIRD contexts, with a precipitous increase in the number of studies from the greater culturally Chinese region (China, Hong Kong, Taiwan/Taipei and Macao) (Easterlin et al., 2021). This Research Topic aims to spotlight wellbeing in Asia in general and the Greater China region in particular, focusing on varieties of hedonic and eudaimonic wellbeing, as well as general and domain-specific wellbeing outcomes such as life satisfaction, meaning in life, psychological wellbeing, and work engagement (see Wijngaards et al., 2022 for a taxonomy).

In this research topic

Most articles in this Research Topic focus on the wellbeing of younger populations, a topic of pivotal importance as younger populations are experiencing a mental health crisis globally (Blanchflower, 2025).

The study by [Wan et al.](#) examines variations in psychological wellbeing across students, reporting that females, only children, first-year students, urban students and students that receive less financial assistance report higher levels of psychological wellbeing. On the same theme, [Cui et al.](#) study the relationship between gratitude and academic engagement in Chinese students and find a positive relationship between the two variables that is serially mediated by locus of control and subjective feelings of happiness.

An article by [Rudolf](#) presents a cross-national comparison of adolescent life satisfaction, affective wellbeing, and meaning in life. One main finding is that adolescent wellbeing outcomes are not only related to global predictors of subjective wellbeing (such as relationship quality and social economic status), but that also several culture-specific explanations explain the gap in subjective wellbeing across world regions. Most notably, in Confucian East Asia (Greater China, Japan, Korea, Singapore, and Vietnam), low levels of life satisfaction of adolescents are associated with low self-efficacy, low peer wellbeing, as well as with high emotional interdependence compared to other world regions. Moreover, emotional interdependence is more strongly associated with life satisfaction in Confucian East Asia compared to other parts of the world.

The importance of interdependence is also reflected in the study of [Han and Yuen](#), which addresses the role of parental support for life satisfaction and educational hope, defined as a *combination of educational aspirations and goal commitment in education*. The authors find for high school students in Jiangsu (China) that students that receive more intangible support (information, advice, encouragement, praise and care) from their parents are more satisfied with their lives, and this effect is partly mediated by goal commitment.

In a similar vein, [Li et al.](#) examine how initial levels of family functioning (including communication, emotional support, parental concern and harmony in the family) affect positive youth development, which is conceptualized as a set of developmental attributes that preadolescents and adolescents need to become contributing members of society. Using four waves of data and latent growth curve modeling, the authors—amongst others—find initial levels of healthy family functioning significantly and positively predicted both Chinese students' initial level and change in positive youth development. The role of the family in adolescents' wellbeing in China is also evident in the study of [Zhou et al.](#), who examine meaning of life in a sample of Chinese adolescents. The authors find that adolescents from intact families with higher educated mothers report a higher meaning in life and better mental health outcomes.

Although most studies in the Research Topic focus on adolescents, it is important also to gauge wellbeing at younger ages. Given that it is sometimes difficult to gauge subjective wellbeing of children using traditional scales, [Xiang and Choi](#) developed an assessment tool for measuring happiness among Chinese preschoolers. They verified its reliability and validity in a sample of preschoolers aged 3–5 years from kindergartens and childcare centers in the Hangzhou region. [Feng et al.](#) on the other focus on the occupational wellbeing of school counselors, who play an important role in safeguarding the mental health of students ([Fang et al., 2025](#)). It is of critical importance to understand the

main drivers of work-related wellbeing for this occupational group as it is related to work efficacy. The authors find that organizational support, student support, and satisfaction of psychological needs (particularly autonomy and competence) are associated with higher counselors' wellbeing.

Other studies in the Research Topic utilize the China Family Panel Studies and examine the roles of educational inequality and digital technologies for subjective wellbeing respectively. The study by [Lin and Liu](#) finds that a higher degree of educational inequality in a region is negatively associated with residents' happiness levels, particularly in lower developed rural areas and central and western regions. The authors also find that the relationship between educational inequality and happiness is mediated by income inequality and lower levels of economic development. [Hu et al.](#) report a positive association between the use of digital technologies and happiness, but the association is stronger for women, younger people, primary and college graduates, rural residents, and people with lower incomes. In addition, the authors find that health status, interpersonal relationships, employment situations and income levels mediate the relation between digital technologies and happiness.

The final two studies address the wellbeing of vulnerable populations. [Hsu et al.](#) find two distinct subjective wellbeing trajectories among Taiwanese retirees using latent growth mixture models: a group with high-increased wellbeing and a group with a low-declined wellbeing. The first group was characterized by a better health, stronger economic status, greater social participation, more family support, and higher educational attainment, highlighting the importance of different resources during retirement. Finally the study by [Zhang and Cao](#) examined relationships between dyadic coping, marital adjustment, and post-traumatic growth in patients with maintenance hemodialysis and their spouses, showing that marital adjustment partially mediates the relationship between dyadic and posttraumatic growth.

Directions for future research on wellbeing in Asia

Overall, the studies in this Research Topic underscore that wellbeing in Asia, specifically in the Greater China region, cannot be adequately captured by frameworks rooted in Western societies. The studies in this Research Topic on Asian wellbeing underscore that social context plays an important role in shaping wellbeing. Hence, this Research Topic on wellbeing in Asia highlights the limitations of applying a universal model of well-being and points toward the necessity of developing more culturally grounded theories that recognize non-Western values as legitimate pathways to a good life. Perhaps most importantly, this Research Topic challenges Western scholars to change their view of wellbeing and to recognize that the future of wellbeing science lies not in universalizing WEIRD models. Instead, there is a need to pluralize global perspectives and co-construct a more inclusive and representative science of wellbeing.

What directions should future research on wellbeing in Asia take? First, although the majority of studies on Asia currently focus on East Asia (Greater China, Japan, and South

Korea), more work is needed on other parts of the continent. In particular, it is important to address the extent to which conceptualizations of wellbeing differ across Asian cultures and how values such as relational harmony, religiousness, and duty affect wellbeing in these societies. WEIRD models emphasize autonomy and self-esteem, but to what extent do these values contribute to wellbeing in Asian societies? Likewise, WEIRD models focus on hedonic wellbeing (Joshnloo and Jarden, 2016), but should eudaimonic wellbeing not be the central focus in studies on Asian wellbeing, particularly given that the Eastern concept of happiness is mostly eudaimonic in nature (Joshnloo, 2014)?

Second, future research should examine how valid existing wellbeing measures are in Asian contexts. For example, it is known that the Cantril ladder often elicits thoughts about power and wealth (Nilsson et al., 2024). However, is this also the case in Asian cultures? In this regard, there is still insufficient understanding of the extent to which wellbeing scales can be compared across cultures. Without proper measurement tools, wellbeing levels are easily misinterpreted. In addition, it should be examined to what extent indigenous constructs better capture culturally specific dimensions of wellbeing, such as *amae* in Japanese (Niiya et al., 2006) and *Ananda* in India (e.g., Nagar, 2018). Should we develop not only universal tools but also more culturally sensitive measurement scales?

Third, it is important to study the developing Asian context and how it drives wellbeing in the region. Particular attention should be given to geopolitical tensions across the Asian continent, as well as societal developments such as rapid urbanization and increasing educational pressure in some Asian countries. It would also be valuable to examine the roles of informal economies, kin networks, and communal safety nets in influencing wellbeing. Finally, governments appear to play a substantial role in shaping daily life in many Asian societies. How do national frameworks such as Gross National Happiness in Bhutan or Vision 2030 in

Saudi Arabia shape wellbeing in these countries? These are all important questions that future research could address.

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EDITED BY

Martijn Burger,
Open University of the Netherlands,
Netherlands

REVIEWED BY

Lindan Tan,
Hong Kong Polytechnic University,
Hong Kong SAR, China
Supalak Luadlai,
Chulalongkorn University, Thailand

*CORRESPONDENCE

Yankun Ma
✉ ykma66@sina.com

[†]These authors share first authorship

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Gratitude and academic engagement: exploring the mediating effects of internal locus of control and subjective well-being

Hongbo Cui^{1,2†}, Xiaoyan Bi^{1†}, Weiyu Chen¹, Tao Gao¹,
Zaihua Qing¹, Keke Shi¹ and Yankun Ma^{1*}

¹School of Education, Guangzhou University, Guangzhou, China, ²Mental Health Education and Counseling Center, Guangzhou University, Guangzhou, China

This study aimed to explore the relationship between gratitude and academic engagement in Chinese students. The students of some junior high schools in Guangzhou were surveyed using the Gratitude Questionnaire-6, the School Engagement Questionnaire, the Levenson's IPC Scale, and the General Well-being Schedule. A total of 708 valid responses were collected. The results indicate a significant positive relationship between gratitude and academic engagement. Subjective well-being plays a mediating role between gratitude and academic engagement. Locus of control and subjective well-being serve as serial mediators between gratitude and academic engagement. These findings suggest that promoting students' academic engagement can be achieved by fostering gratitude and improving their internal locus of control and subjective well-being. By cultivating gratitude and enhancing these factors, educators and policymakers can create a more engaging and supportive learning environment for students.

KEYWORDS

gratitude, academic engagement, internal locus of control, subjective well-being, mediating effects

Introduction

Learning psychological problems such as learning anxiety and academic burnout often occur (Diestel and Schmidt, 2010; Fernández-Castillo, 2021), and improving the enthusiasm of adolescents to learn has always been a concern for educators. With the development of the positive psychology research paradigm, some researchers have shifted their attention from learning burnout to academic engagement in order to positively intervene in the learning behavior of adolescents. Academic engagement refers to an individual's sustained cognitive, behavioral, and positive emotional state during the learning process (Skinner and Belmont, 1993), which reflects a high level of energy and a strong sense of identity in learning, and energy concentration without slack (Schaufeli et al., 2002). It can be achieved through positive emotions, a tendency to strive for a goal, and energetic behavior. It is valuable and urgent to study academic engagement as a multifaceted structure and to integrate emotional, cognitive, and behavioral inputs, as this depicts a richer picture of children than can be portrayed by a single component (Fredricks et al., 2004; Appleton et al., 2008). Academic engagement is an important indicator of education quality and student development. For example, engaged students are more likely

to be motivated, persistent, and achieve higher levels of academic success than their less engaged peers (Fredricks et al., 2004). However, research has shown that many students struggle with academic engagement, which can lead to academic disengagement, lower academic performance, and even dropping out of school (Kiuru et al., 2014). Given the importance of academic engagement, it is essential to understand the factors that contribute to it.

Additionally, the high school stage is a critical period for the physical, mental, and intellectual development of individuals. Adolescents in this stage are experiencing rapid self-awareness growth, characterized by a combination of immaturity and maturity, which makes them more susceptible to environmental influences that can impact their academic engagement (Kiuru et al., 2014; Chen et al., 2015). Moreover, in China, junior high school students face significant pressure from the College Entrance Examination, leading to a heavy academic workload and challenging content. It becomes even more crucial for high school students to maintain a state of high academic engagement (Chen et al., 2015). Therefore, it is of great practical significance to study the influence mechanism of Chinese high school students' academic engagement.

Gratitude and academic engagement

The factor that has received increasing attention in recent years that affects academic engagement is gratitude. Gratitude is the positive emotions induced by positive subjective experiences and the positive cognition and personality acquired by others (Emmons and Shelton, 2005; Froh et al., 2010). Gratitude includes two categories: trait gratitude and state gratitude (Emmons and McCullough, 2003). We study the trait gratitude in this paper. Trait gratitude refers to the positive personality traits in which individuals experience gratitude in return for helping others, and from this deriving a positive personality trait of gratitude for daily life (Wood et al., 2008), which are important resilience factors for individual growth. Most scholars view gratitude as a positive personality trait with stability and consistency across time and context (Wood et al., 2008; He et al., 2013). Many psychologists have put forward theories to illustrate the important value of gratitude in human development, and empirical studies have shown that gratitude can promote the development of physical health, quality of life, mental resilience, and prosocial behavior in individuals (Watkins et al., 2003; Emmons and Shelton, 2005). Research has also found that gratitude reduces learning burnout in adolescents (Emmons and Shelton, 2005). Academic engagement, as the antithesis of burnout, may also be affected by gratitude. Recent studies have also suggested that gratitude may be associated with academic engagement. For example, a study by Froh et al. (2011) found that higher levels of gratitude were associated with higher levels of academic motivation and engagement among high school students. Similarly, Wen et al. (2010) found that gratitude can positively predict the academic engagement of Chinese high school students. In addition, the theory of psychological capital emphasizes the importance of individuals' positive psychological traits for learning and work performance (Luthans et al., 2006; Luthans and Youssef-Morgan, 2017). Gratitude, as a positive emotion and attitude, can be considered as part of psychological capital and has a positive impact on academic engagement (Froh et al., 2010). When individuals have higher levels of psychological capital, including a sense of gratitude, they are more likely to actively engage in and participate in academic tasks.

Therefore, gratitude, as part of psychological capital, can promote individuals' academic engagement and improve academic outcomes.

However, there are some limitations in the above studies. First of all, most of the studies are carried out in the context of Western culture, and gratitude under Chinese Confucian culture and gratitude under Western Christian culture are quite different, so it is necessary to test the cultural similarity and specificity of gratitude. Secondly, gratitude is a traditional virtue of the Chinese nation, and ancient teachings such as "The gratitude of dropping water should be reciprocated by springs" still deeply influence Chinese today (Ma et al., 2022), but the study of gratitude in Chinese adolescents' learning behavior is insufficient. In the context of collectivist cultures, gratitude is strongly associated with a sense of indebtedness that motivates the recipient to have an obligation to give back to the donor or others (Naito et al., 2005). In theory, students who feel more favored by others and show more gratitude will be more willing to stay in school, more receptive to their teachers' views, and study harder. In fact, Wen et al. (2010) also verified this hypothesis: gratitude in high school students can positively predict their academic engagement. Despite these findings, the mechanisms underlying the relationship between gratitude and academic engagement among Chinese high school students are not well understood. In particular, it is unclear whether gratitude operates through specific psychological processes that mediate the relationship between gratitude and academic engagement.

Internal locus of control as a mediator

One such psychological process that mediate the relationship between gratitude and academic engagement may be internal locus of control. The concept of Locus of Control (LOC) has been written about extensively since the term was first introduced by Rotter. LOC refers mainly to people's general perception of the outcome of a behavior or event, which is determined by expectations and reinforcement values in a particular context (Rotter, 1966). There are differences between internal control and external control in the source of individual psychological control, and internally controlled individuals usually believe that the development of things is determined by their own behavior, personality and ability, while external controllers believe that the development of things is mainly determined by external forces and is less affected by individual behavior (Guo, 2000). Locus of control and a person's position along a bipolar scale of internalism to externalism has been shown to have effect on many aspects of one's life (Thomas, 2013). Previous research has demonstrated that individuals with strong internal locus of control are more likely to engage in academic pursuits and achieve academic success (Grillo, 2015; Dong et al., 2017). Specifically, students with high internal locus of control tend to attribute academic performance to their own controllable factors, so they are more likely to actively participate in learning through subjective initiative to change the unfavorable situation and strive for better results. According to the self-determination theory (SDT) (Ryan and Deci, 2000), individuals' motivation for their behavior stems from intrinsic autonomy and perceived (internal locus of control) importance. A sense of gratitude can enhance the intrinsic motivation of junior high school students toward learning, making them more willing to invest time and energy in completing academic tasks, thereby demonstrating higher academic engagement (Singh et al., 2021).

On the other hand, several studies have explored the relationship between gratitude and internal locus of control. In a study by [Emmons and McCullough \(2003\)](#) participants who were asked to write down things they were grateful for over a period of 10 weeks reported an increase in their internal locus of control beliefs, indicating that gratitude may have a positive impact on an individual's belief in their ability to control events in their lives. Another study by [Ping and Peng \(2018\)](#) found that people with gratitude traits have a higher level of inner control and a sense of control and autonomy over their lives. Similarly, [Duprey et al. \(2018\)](#) found that gratitude interventions increased perceptions of control in both daily life and stressful situations, suggesting that gratitude can enhance an individual's belief in their ability to cope with challenging situations. Therefore, we hypothesized that students with high levels of gratitude may have high internal locus of control and, in turn, may show more academic engagement.

Subjective well-being as a mediator

Subjective Well-Being (SWB) mainly refers to people's overall evaluation of their quality of life, including three dimensions: life satisfaction, positive emotions and negative emotions ([Diener et al., 2015](#)). At the individual level, subjective well-being measures an important aspect of an individual's mental health ([Yao et al., 2018](#)) and is also an important indicator of the positive degree of an individual's psychological development ([Donaldson et al., 2015](#)). Subjective well-being may also have a certain impact on academic engagement. For example, [Diestel and Schmidt \(2010\)](#) suggested that individuals with higher levels of subjective well-being tend to be more resilient in the face of challenges, which may translate to greater academic engagement. Similarly, research has shown that students with higher levels of subjective well-being tend to have better academic outcomes, such as higher grades and greater persistence in the face of academic challenges ([Suido et al., 2008](#)).

Besides, according to the Broaden-and-Build theory of Positive Emotions ([Isgett and Fredrickson, 2004](#)), gratitude can broaden people's thinking patterns and construct positive social and psychological resources, thereby enhancing individual subjective well-being. Empirical researches also explored the important role of gratitude in subjective well-being. Previous studies have shown a positive correlation between gratitude and subjective well-being ([Yoshimura and Berzins, 2017](#)). Longitudinal studies have also found that gratitude is a predictor of subjective well-being ([Luo and Zhou, 2015](#)).

Moreover, [Severino et al. \(2011\)](#) suggested that individuals with a stronger internal locus of control may experience more positive emotions, such as pride and satisfaction, as a result of their sense of control over their own outcomes. These positive emotions, in turn, contribute to greater subjective well-being overall. A recent study also found similar results that internally controlled individuals are more likely to attribute success to their own efforts and abilities, which can lead to subjective well-being ([Smallwood et al., 2023](#)).

Given these findings, it is possible that both internal locus of control and subjective well-being may mediate the relationship between gratitude and academic engagement. In addition, China is a collectivistic culture that places a strong emphasis on filial piety, respect for authority, and group harmony ([Hofstede, 2001](#)). These

cultural values may influence the way in which gratitude is experienced and expressed, as well as the extent to which gratitude is associated with academic engagement. Therefore, this study aims to investigate the relationship between gratitude and academic engagement in a Chinese context, and to examine the mediating roles of internal locus of control and subjective well-being in this relationship. In the present study, we hypothesize that internal locus of control and subjective well-being may act as parallel mediators, with each pathway independently mediating the relationship between gratitude and academic engagement. Additionally, internal locus of control and subjective well-being may act as a chain mediator, with gratitude predicting internal locus of control, which in turn predicts subjective well-being, and ultimately predicts academic engagement. This means that gratitude may predict internal locus of control, which in turn predicts subjective well-being, and ultimately leads to academic engagement. By conducting this study within a Chinese cultural context, we can gain insights into how cultural values and beliefs impact the relationship between gratitude and academic engagement. This research has the potential to contribute to both the existing literature on gratitude and academic engagement, as well as provide a deeper understanding of the cultural factors that shape these associations in a collectivistic society like China.

Based on the above, this study proposes the following three hypotheses: (1) Gratitude has a positive predictive effect on academic engagement; (2) internal locus of control and subjective well-being serve as parallel mediators between gratitude and academic engagement; (3) internal locus of control and subjective well-being also serve as a chain mediating between gratitude and academic engagement. The model is illustrated in [Figure 1](#).

Materials and methods

Participants

This study used convenience sampling and questionnaires of the study were gathered in March 2022 in certain normal high schools in Guangdong Province in China. After obtaining the informed consent of the school leaders and students, the researchers first explained the rules for filling in the questionnaire to the students, and then the students completed the questionnaire through mobile phones independently. A total of 724 questionnaires were distributed. After eliminating incompleteness questionnaires, 708 valid questionnaires were obtained, with an effective rate of 97.79%. The average age of the subjects is 16.47 ± 1.01 years. Among them, there are 318 (44.92%) males, 372 (55.08%) females; 228 (32.20%) only children, and 462 (65.25%) non only children. The number and percentage of students in junior high school from first to third year are 106 (14.97%), 520 (73.45%) and 82 (11.58%) respectively.

Measures

Gratitude Questionnaire-6

Gratitude was measured using the Gratitude Questionnaire-6 (GQ-6). The GQ-6 consists of six items that assess an individual's dispositional gratitude. Responses are rated on a 7-point Likert scale

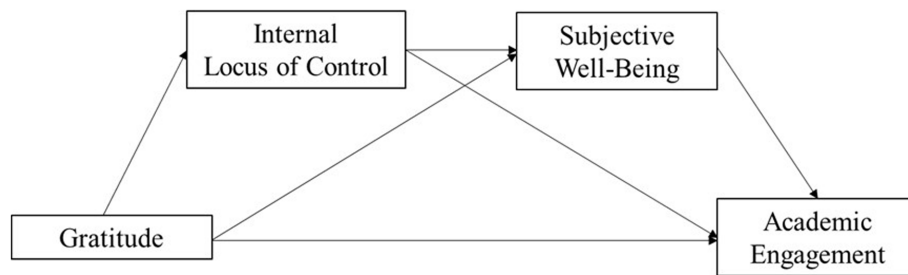


FIGURE 1
The hypothesized model.

ranging from 1 (strongly disagree) to 7 (strongly agree). Example items include “I have so much in life to be thankful for” and “If I had to list everything that I felt grateful for, it would be a very long list.” Items 3 and 6 are reverse scoring questions. Higher scores indicate a higher level of gratitude. The questionnaire was modified by [Wei et al. \(2011\)](#) for localization to be suitable for Chinese. The Chinese version has been reported as a reliable tool. The GQ-6 Cronbach’s α coefficient is 0.81 in the present study.

Levenson’s IPC scale

Levenson’s IPC scale is a commonly used tool for measuring locus of control, including three dimensions: internal, powerful others and chances ([Levenson, 1973](#)). Internal locus of control was assessed by the Internality subscale from the Levenson’s IPC Scale. The examples of items are: “When I make plans, I am almost certain to make them work”; “When I get what I want, it is usually because I worked hard for it.” The Levenson’s subscale consists of eight items that are rated on a 6-point Likert scale from -3 , indicating complete disagreement, to 3 , indicating complete agreement. When calculating the score, 24 is added to offset the negative score, so each subscale score is 0 – 48 . The Levenson’s subscale Cronbach’s α coefficient was 0.75 in the present study.

General well-being schedule

The General Well-being Schedule (GWB) was used to measure subjective well-being. The GWB was developed by the National Center for Health Statistics in the United States as a prescriptive testing tool to evaluate subjective feelings of happiness among subjects. There are 33 items in the scale, and the higher the score, the higher the level of subjective well-being. This Chinese version revised by [Duan \(1996\)](#) consists of 18 items for evaluation. Responses are rated on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The GWB Cronbach’s α coefficient was 0.77 in the present study.

School engagement questionnaire

The School Engagement Questionnaire (SEQ) developed by [Wang et al. \(2011\)](#) was used to measure academic engagement. The SEQ

consists of 23 items that assess an individual’s cognitive, behavioral, and emotional engagement in learning activities. Responses are rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The SEQ includes three dimensions of behavioral engagement, emotional engagement, and cognitive engagement, which can better reflect various aspects of academic engagement. The higher the score, the higher the level of academic engagement. In this study, the Chinese version of the SEQ Cronbach coefficient was 0.83 .

Data analysis and common method bias test

This study used SPSS 26.0 to perform descriptive statistics, t -test, and correlation analysis on the collected data, and used the PROCESS V4.0 macro program of Hayes to test and analyze mediating effects. The data collected in this study is self-reported, so the common method deviation test is required. In this study, Harman single factor test method was used for exploratory factor analysis. The results showed that 11 common factors with characteristic value greater than 1 were obtained from the factor analysis without rotation, and a total of 11 factors were greater than 1. The first factor explained 17.03% variance and less than 40% marginal value, indicating that there was no serious common method deviation in this study ([Zhou and Long, 2004](#)).

Results

Descriptive statistics and correlation analysis

Descriptive statistics and Pearson’s correlations for the main variables are presented in [Table 1](#). The results show gratitude is positively correlated with internal locus of control, subjective well-being, and academic engagement, respectively ($p < 0.001$). Internal locus of control is positively correlated with subjective well-being and academic engagement, respectively ($p < 0.001$). Subjective well-being is significantly positively correlated with academic engagement ($p < 0.001$). In addition, t -tests were conducted to examine the differences between variables. The results revealed that males had significantly higher levels of internal locus of control compared to females ($t = 4.96^{***}$). However, no significant differences were found for the other variables.

TABLE 1 Descriptive statistics and correlation coefficient matrix ($N = 708$).

	Male	Female	1	2	3	4
1 Gratitude	5.07 ± 1.12	5.04 ± 1.09	1			
2 Internal locus of control	30.57 ± 8.46	27.17 ± 9.11	0.39***	1		
3 Subjective well-being	79.32 ± 11.67	77.72 ± 11.55	0.44***	0.44***	1	
4 Academic engagement	79.99 ± 13.37	81.06 ± 12.68	0.41***	0.18***	0.42***	1

** $p < 0.01$, *** $p < 0.001$.

TABLE 2 Model for regression analysis between variables ($N = 708$).

Predictor variable	Outcome variable: ILC		Outcome variable: SWB		Outcome variable: AE	
	β (Boot SE)	95% Boot CI	β (Boot SE)	95% Boot CI	β (Boot SE)	95% Boot CI
Gr	0.39 (0.05)	[0.43, 0.61]	0.31 (0.06)	[0.44, 0.68]	0.30 (0.08)	[0.44, 0.75]
ILC			0.32 (0.04)	[0.33, 0.51]	−0.08 (0.06)	[−0.23, 0]
SWB					0.32 (0.04)	[0.28, 0.46]
	$R^2 = 0.15$		$R^2 = 0.28$		$R^2 = 0.24$	
	$F = 121.08^{***}$		$F = 133.62^{***}$		$F = 71.80^{***}$	

** $p < 0.01$, *** $p < 0.001$. Gr, Gratitude; ILC, Internal Locus of Control; SWB, Subjective Well-Being; AE, Academic Engagement.

Regression and mediation effect analysis

According to the results of the correlation analysis in this study and the statistical preconditions of the mediation effect, further mediation effect analysis of internal locus of control and subjective well-being can be carried out (Wen and Ye, 2014). With gratitude as the independent variable, academic engagement as the dependent variable, internal locus of control and subjective well-being as the intermediary variables, the study used the bias-corrected percentile Bootstrap method in the SPSS macro program Process compiled by Hayes to analyze the mediating effect, and Model 6, which specialized in analyzing chain mediation effects, was used for testing. The Bootstrap sampling number is 5000, the confidence interval is set to 95%.

The results showed that gratitude has a positive predictive effect on academic engagement ($\beta = 0.30$, $p < 0.001$); gratitude has a positive predictive effect on internal locus of control ($\beta = 0.39$, $p < 0.001$); gratitude has a positive predictive effect on subjective well-being ($\beta = 0.31$, $p < 0.001$); subjective well-being has a positive predictive effect on academic engagement ($\beta = 0.32$, $p < 0.001$); internal locus of control has a positive predictive effect on subjective well-being ($\beta = 0.32$, $p < 0.001$). Internal locus of control had no positive predictive effect on academic engagement ($\beta = -0.08$, $p > 0.05$) (see Table 2).

The intermediary effect test showed that the direct effect of gratitude on academic engagement was 0.41, accounting for 74.54% of the total effect; gratitude affected academic engagement through subjective well-being, and the intermediary effect was 0.10, accounting for 18.18% of the total effect of family function on altruistic behavior; gratitude had an impact on academic engagement through the chain mediating roles of internal locus of control and subjective well-being, with an effect of 0.04, accounting for 7.27% of the total effect. The mediating effect of internal locus of control between gratitude and academic engagement was not significant (The 95% Boot CI is [−0.07, 0.01], including 0) (see Table 3 and Figure 2).

TABLE 3 Mediation effect analysis ($N = 708$).

Model pathways	Effect size	Boot SE	Boot LLCI	Boot ULCI
Gr → AE	0.41	0.07	0.68	0.95
Gr → ILC → AE	−0.03	0.02	−0.07	0.01
Gr → SWB → AE	0.10	0.02	0.07	0.14
Gr → ILC → SWB → AE	0.04	0.01	0.02	0.06

Gr, Gratitude; ILC, Internal Locus of Control; SWB, Subjective Well-Being; AE, Academic Engagement.

Discussion

To summarize the findings, the results suggested that gratitude has significant positive predictive effect on academic engagement, which is consistent with previous research (Wen et al., 2010; Froh et al., 2011). Basic self-determination theory, states that everyone has three innate psychological needs: autonomy, competence, and relatedness. A sense of gratitude can enhance the intrinsic motivation of junior high school students toward learning, making them more willing to invest time and energy in completing academic tasks (Ryan and Deci, 2000). In empirical research, Kashdan et al. (2010) found that the key factor behind gratitude is the awareness of various good deeds, which can raise people's self-confidence and sense of autonomy. When these three basic psychological needs are satisfied, the internal motivation of individuals is stimulated and they show stronger initiative, enthusiasm, and persistence in their study (Neufeld et al., 2020). Therefore, students with a high level of gratitude are more likely to be satisfied with their basic psychological needs, thereby demonstrating more academic engagement.

This study further found that gratitude plays a role in academic engagement through various paths. The gratitude affected academic engagement behavior through subjective well-being. The

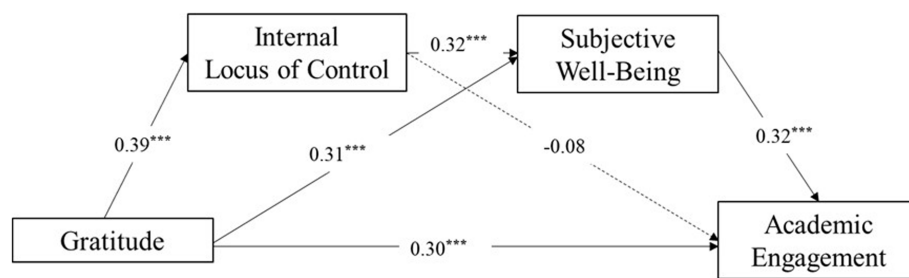


FIGURE 2

Mediating effects of internal locus of control and subjective well-being. ** $p < 0.01$, *** $p < 0.001$.

broaden-and-build theory of positive emotions (Isgett and Fredrickson, 2004; Fredrickson, 2013) believes that positive emotions can expand the attention and cognitive range of individuals, stimulate the flexibility and creativity of thinking, promote individuals to more effectively acquire and analyze information, continuously acquire knowledge and experience conducive to achieving goals, stimulate new problem-solving strategies, and construct persistent resources (intellectual and psychological resources). It is hypothesized that students with high subjective well-being have a greater attention span and cognitive range during the learning process, and their thinking is more flexible and creative. They can effectively master learning methods, accumulate learning experience, provide favorable conditions for learning, and maintain a good learning state. At the same time, positive emotions can enable students to experience a better sense of control, making them more willing to actively construct knowledge, and more engaged in learning (D'Errico et al., 2016). On the other hand, gratitude is closely related to positive appraisals of self and life, and can lessen negative emotions (Magno and Orillosa, 2012). Positive life evaluation, more positive emotions, and less negative emotions are important dimensions of subjective well-being (Ping and Peng, 2018). Therefore, gratitude can enhance individual subjective well-being, which can widen and strengthen social, intellectual and psychological resources, which help individuals demonstrate more academic engagement. While trait gratitude is generally associated with well-being and positive relationships, it is important to note that expressing gratitude inappropriately or excessively can sometimes lead to feelings of indebtedness or dependency. Expressing gratitude inappropriately or excessively may lead to feelings of indebtedness or dependency in the recipient. If gratitude is expressed in a way that creates an imbalanced power dynamic or places an excessive burden on the recipient, it can potentially lead to feelings of obligation or pressure. This can hinder the authenticity and genuine nature of the gratitude exchange and may even strain relationships. Additionally, if gratitude is expressed excessively, it may lose its impact and become less meaningful over time. This can result in a diminished sense of appreciation and potentially undermine the positive effects associated with trait gratitude. Therefore, it is essential for individuals to be mindful of how they express gratitude and consider the appropriateness and balance in their interactions. By being sensitive to the dynamics of gratitude expression, individuals can ensure that it remains a genuine and positive experience for both the giver and the recipient, fostering well-being and strengthening relationships.

Besides, internal locus of control between gratitude and academic engagement was not significant. There are several potential reasons for this non-significant finding. It is possible that other factors not considered in our study may have influenced the relationship between gratitude and academic engagement. Additionally, the sample size and specific characteristics of the participants in our study may have impacted the results. Further research is necessary to explore these factors and better understand the underlying mechanisms between gratitude, internal locus of control, and academic engagement.

This study also found that gratitude could influence academic engagement through a chain-mediated effect of internal locus of control and subjective well-being. This suggested that gratitude may be associated with greater academic engagement in part because it fosters a sense of personal control and a positive outlook on life. Prior studies have mostly analyzed the relationship between gratitude, internal locus of control, subjective well-being, and academic engagement. For example, Grillo (2015) showed that individuals who believe they have greater control over their lives are more likely to engage in behaviors; Suido et al. (2008) found that subjective well-being can significantly predict academic engagement. This study is the first systematic analysis of the chain mediating effects of internal locus of control and subjective well-being on the relationship between gratitude and academic engagement. According to the basic psychological needs, gratitude helps people make choices that meet their own basic psychological needs and makes them more confident in their own abilities, thereby causing them to experience a greater sense of internal locus of control (Hamarta et al., 2013; Cazan and Dumitrescu, 2016). Furthermore, according to the locus of control (Rotter, 1966), internal locus of control is considered as promoting factors for individual mental health and development. Individuals with high internal locus of control believe that they can control their own lives and that their actions can change their current situation. On the one hand, their sense of control over events makes it easier for them to feel their own strength and value, and thus have a higher sense of life significance (Ye and Lin, 2015). On the other hand, in the face of stressful life events, individuals with internal locus of control are more likely to have stable emotions and a higher sense of self-efficacy, and exhibit stronger psychological resilience (Buddelmeyer and Powdthavee, 2016). According to the theory of psychological capital, individuals with high psychological capital, tend to have more flexible cognition and richer coping strategies (Tugade et al., 2005), which can help reduce negative emotional distress and increase positive emotions, thereby positively predicting individual subjective

well-being. According to the broaden-and-build theory of positive emotions indicates (Fredrickson, 2013), students with high subjective well-being are often able to actively adjust learning strategies, devote more psychological resources to learning, effectively monitor their learning behavior, and maintain a high level of academic engagement (Yao et al., 2018). Thus, this finding indicated that individuals with high levels of gratitude tend to have a greater sense of control over their own lives; individuals who have a sense of control over their own lives are further more likely to experience higher subjective well-being, which can translate into greater academic engagement.

However, this study has several limitations. Firstly, the use of a cross-sectional design restricts our ability to establish causal relationships between gratitude, academic engagement, internal locus of control, and subjective well-being. This design captures data at a single time point, making it difficult to determine the directionality of the observed relationships. It is possible that these relationships are bidirectional or influenced by unmeasured confounding variables. Secondly, the use of convenience sampling in this study may introduce limitations and affect the generalizability of the findings. By selecting participants based on their easy availability in certain normal high schools in Guangdong Province in China, the sample may not accurately represent the entire population of high school students in the region or the broader population. Therefore, caution should be exercised when generalizing the study's findings beyond the specific sample and context. Third, reliance on self-report measures to assess variables such as gratitude, academic engagement, internal locus of control, and subjective well-being introduces the potential for biases. Self-report measures are susceptible to social desirability bias, where participants may provide responses that they perceive as socially desirable, rather than reflecting their true experiences or thoughts. Additionally, response bias may occur, leading to inaccuracies in the collected data. It is important to consider these limitations when interpreting the findings of the study. Future research should employ longitudinal designs and incorporate objective measures to establish causal relationships and reduce biases associated with self-report measures. Additionally, in order to address the limitations of convenience sampling in this study, future prospects include the use of more rigorous sampling techniques. Researchers can consider implementing probability sampling methods like stratified random sampling or cluster sampling. These methods offer greater control over sample characteristics and increase the likelihood of obtaining a representative sample. By adopting these techniques, researchers can enhance the validity and generalizability of their findings. Finally, utilizing diverse samples and controlling for potential confounding variables can enhance the generalizability and validity of the results.

Conclusion

The present study provides evidence for the positive relationship between gratitude and academic engagement, and suggests that this relationship is partially explained by internal locus of control and subjective well-being. These findings have important implications for educational practice, suggesting that gratitude interventions may be a promising approach to promoting academic engagement and success. Future research should aim to replicate and extend these findings, and to explore potential moderators of the observed relationships. By

gaining a deeper understanding of the factors that promote academic engagement, educators and policymakers can better support student success and well-being.

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 humans were approved by Research Ethics Committee of Guangzhou University. The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation in this study was provided by the participants' legal guardians/next of kin.

Author contributions

HC: Conceptualization, Data curation, Formal analysis, Investigation, Writing – original draft, Methodology, Validation, Visualization. XB: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Software, Writing – original draft. WC: Data curation, Investigation, Methodology, Software, Writing – review & editing. TG: Data curation, Investigation, Methodology, Supervision, Writing – review & editing. ZQ: Data curation, Investigation, Methodology, Validation, Writing – review & editing. KS: Data curation, Investigation, Validation, Visualization, Writing – review & editing. YM: Conceptualization, Funding acquisition, Resources, Supervision, Writing – review & editing.

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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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EDITED BY

Martijn Burger,
Open University of the Netherlands,
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REVIEWED BY

Emma Pleeging,
Erasmus University Rotterdam, Netherlands
Spyridon Stavropoulos,
University of Patras, Greece
Sarvarubini Nainee,
Tunku Abdul Rahman University, Malaysia

*CORRESPONDENCE

Feng Han
✉ hanfengjy@mail.tsinghua.edu.cn

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Roles of parents in life satisfaction and educational hope among Chinese high school students

Feng Han^{1*} and Celeste Yuet-Mui Yuen²

¹Institute of Education, Tsinghua University, Beijing, China, ²Department of Educational Administration and Policy, Faculty of Education, Hong Kong Centre for the Development of Educational Leadership, The Chinese University of Hong Kong, Shatin, Hong Kong SAR, China

The well-being of the Chinese high school students linked to the National Higher Education Entrance Examination, known as gaokao, has been a spotlight education issue in China. This study employed self-determination theory and Bourdieu's sociocultural theory to examine the relationship between life satisfaction, educational hope, and parental support among Chinese high school students. A number of 3,810 high school students from eight schools in Jiangsu, China, completed a validated context-relevant questionnaire. Structural equation model analysis suggested that parental support significantly impacted students' life satisfaction and educational hope. Findings showed that parental intangible support in terms of providing information, advice, encouragement, praise, and care has a direct and significant impact on the life satisfaction of Chinese youth. The extent to which students attach importance to and put effort into achieving their educational aspirations, known as goal commitment, mediated the relationship between parental support and life satisfaction. Moreover, Chinese high school students' educational hope is shaped by their family. Parental support moderates goal commitment, which varies based on parental education background. In short, parents play a critical role in the growth and development of Chinese high school students.

KEYWORDS

life satisfaction, hope, educational aspirations, goal commitment, parental support, gaokao, high school students

1 Introduction

Mainland Chinese students must pass the high-stake and highly competitive National Higher Education Entrance Examination, known as the *gaokao* in Chinese, to enter university. High school is a critical stage for Chinese youth as it involves preparations for *gaokao*: students typically begin preparing for the Gaokao starting from the 9th grade (around 15–16 years old), and the pressure they face for the gaokao increases as they advance in academic grades (Pang and Zhang, 2021). The legacy of the Confucian examination culture in China upholds the selection mechanism of *gaokao* (Yi, 2012), which is the most widely regarded public examination for higher education stratification. Up to 10 million students take the *gaokao* (China Education Online, 2019) yearly; the results always make headlines. Thus, education aspirations are nurtured by families and reinforced by schools and social values.

Undoubtedly, *gaokao* intensifies the stress of transitioning from high school to university among Chinese high school students and causes their overall health levels to be lower than those of the general population (Ji et al., 2016). Such life impediments mediate their well-being, and recent studies have revealed alarming figures of mental health issues among *gaokao* students, including anxiety (34%), depression (28%), and sleep disorders (23%) (Chen et al., 2017; Yu et al., 2022). The number of anxiety disorder cases has increased over time (Chen

et al., 2017). Hence, the well-being of *gaokao* students in relation to their preparation for higher education examinations is a pressing issue that must be addressed.

Chinese high school students have a strong desire to succeed in *gaokao* reflects their educational hope. Educational hope is a combination of educational aspirations and goal commitment in education. Hope motivates young adults to set and pursue a meaningful goal, which enhances their sense of meaning in life and contributes to their subjective well-being (Guse and Shaw, 2018). Previous studies have confirmed that hope positively predicts academic performance and subjective well-being (Griggs and Crawford, 2017; Dixon, 2019; Pleeing et al., 2021). However, little is known about how educational hope promotes young people's subjective well-being and how different aspects of educational hope, such as educational aspirations and goal commitment, are related to their subjective well-being.

Recent research has emphasized the crucial role that parents play in promoting youth subjective well-being and education aspirations. Research has shown that parent–child closeness and emotional support from parents can increase youth subjective well-being (King et al., 2018; Kiuru et al., 2020). Furthermore, parents' education and tangible support can facilitate their children's educational aspirations through cultural and social capital (Hartas, 2016; Fischer et al., 2019; Hadjar et al., 2021; Ng and Choo, 2021). There is currently a lack of research that explores how various forms of parental support can impact their children's educational hope and well-being. This study is a response to examine the relationships among subjective well-being, educational hope, and parental support among high school students in China, by studying how various types of parental support affect multiple aspects of educational hope and subjective well-being, as well as how educational hope relate to subjective well-being. Through this study, we hope to provide evidence-based and contextually relevant suggestions for improving the well-being of young people in China and beyond, considering the influence of the Confucian examination culture.

2 Literature review

2.1 Well-being and life satisfaction

Well-being is widely recognized as a quality of life and is embodied in an individual's positive functioning and overall flourishing (Ryan and Deci, 2001); it has, thus, become increasingly important in youth studies and social policy as highlighted by Shenaar-Golan and Goldberg (2019). According to Noddings (2003), well-being is the ultimate goal of schooling and is closely associated with youth development. Since young people are still in the process of growing and changing, their well-being is vital for positive self-adjustment, such as the adaptation in stressed life (Lee et al., 2021) and school-related outcomes (Lewis et al., 2011), such as school engagement (Cheng et al., 2021) and academic achievement (Griggs and Crawford, 2017; Kiuru et al., 2020).

Previous research on the subjective well-being of young people has mostly focused on their life satisfaction, which pertains to their cognitive judgment of well-being (Diener et al., 2009). Researchers suggest that supportive social relationships (Koestner et al., 2020), self-esteem (Yan et al., 2021), and stressful events (Wendt et al., 2019)

can all impact well-being outcomes. Studies on young people's life satisfaction have been conducted in various contexts, but most of them have been carried out in Western countries, with limited empirical research examining the well-being of Asian youth (Yuen, 2016) and its association with academic-related variables.

2.2 Hope and educational hope

Hope is a state of mind in which individuals have a fervent desire to achieve and actively work toward it (Pleeing et al., 2021). This goal-oriented thinking is backed by hope theory (Snyder, 2002), which defines hope as a dynamic cognitive process that involves agency and pathway thinking (Colla et al., 2022). Hopeful individuals are committed to achieving their goals and exhibit perseverance in their pursuit. Research has shown that hope is a strong predictor of academic performance (Dixon, 2019; Rand et al., 2020), emotional health (Griggs and Crawford, 2017) and overall well-being among college students (Pleeing et al., 2021).

Educational hope refers to the hope that one has in education. It is a combination of educational aspirations and goal commitment, which are the extent to which students attach importance to educational goals and actively work toward achieving them. However, it is unclear whether educational hope affects youth subjective well-being. Some researchers have examined the relationship between educational aspirations and subjective well-being, but there is no consistency in their findings. For instance, Liu and Helwig (2022) deem that educational aspirations lead to high levels of stress and often cause students to ignore their health and intrinsic motivation, ultimately harming their well-being. On the other hand, Cao et al. (2022) found that educational aspirations have a positive impact on the well-being of young Chinese people. Meanwhile, Wang et al. (2021) argue that increasing high school students' educational hope and motivation is a more effective way to improve their well-being scores than directly decreasing their academic stress.

2.3 Parents' roles in life satisfaction and educational aspirations

Parents are the primary caregivers and educators of their children, particularly in societies where collective culture prevails (Lam et al., 2020). Family background and parental support significantly contribute to the well-being and growth of children. Research has consistently shown that family background factor such as family socio-economic status and parental education level, is a positive predictor for educational aspirations (Hadjar et al., 2021; Ng and Choo, 2021) and subjective well-being (Assari, 2018; Ge, 2020). Parental support, which refers to the supportive parent–child relationship, has been confirmed to be more influential than school-related support on the subjective well-being (Blau et al., 2019) and goal pursuit (Koestner et al., 2020) of young people.

Parental support can be categorized into four dimensions: instrumental, conditional, motivational, and informational. Instrumental support includes providing resources and practical assistance, while conditional support involves monitoring, supervision, and participation in school activities (Beets et al., 2010, p. 624). The former two types are regarded as tangible support while

the latter two types are defined as intangible support. Numerous studies have shown that a positive and nurturing relationship between parents and children, where parents provide encouragement and warmth, can contribute to the overall life satisfaction of young people (Lv et al., 2016; Koestner et al., 2020). However, studies examining the impact of tangible parental support on the well-being of young people have yielded inconsistent results. For instance, Danielsen et al. (2009) suggest that tangible educational support from parents can enhance academic performance and outcomes, which, in turn, can improve life satisfaction. Conversely, Shenaar-Golan and Goldberg (2019) argue that excessive control and inadequate supervision from parents can negatively affect the life satisfaction of young people. While Podaná and Krulichová (2018) believe that parental supervision is inversely linked to youth life satisfaction. Moreover, Hartas (2016, p. 1145) pointed out that parent–child interactions in cultural events and emotional bonding are more robust predictors of children's educational aspirations than supervision and arrangement of extracurricular activities. Therefore, further studies are required to consider the effects of different types of parental support on youth life satisfaction and educational hope.

3 Theoretical framework

Social capital theories have been applied not only to explain the formation of educational hope but also to illustrate the effects of parental support on well-being. These theories are useful for unraveling the relationship between parental support, educational hope, and life satisfaction. Framed by cultural and social capital theories, creating a positive family environment, including providing emotional support, consistent routines, respect, and communication at home, positively influences students' well-being and disposition and inspires their ambitions (Bourdieu, 1977, 1986).

Furthermore, through the parent–child connection, parents activate cultural capital (Lareau, 2000) and impart their educational expectations and cultural competence to their children (Danielsen et al., 2009). In other words, as a form of social capital, parental support can convey parents' attitudes toward education through various forms of interaction, thereby shaping their children's educational hope. Therefore, this theory provides a foundation for understanding the relationship between parental support and educational hope. In addition, based on social capital theories, parent–child supportive relationships can be defined as family social capital for youth subjective well-being (Ge, 2020). In fact, the perspective of positive psychology can help further elucidate the mechanisms by which parental support and goal pursuit influence subjective well-being.

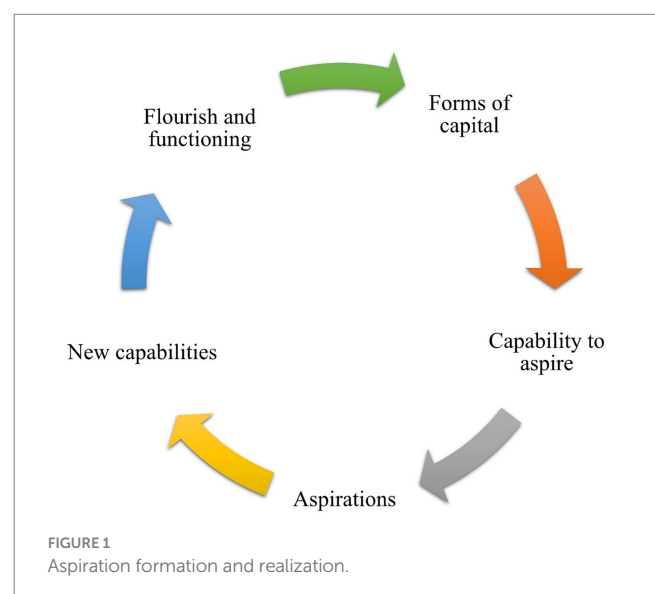
Self-determination theory (SDT) explains the relationships between well-being, goal pursuit and parental support. According to SDT, people's well-being is linked to their satisfaction with their psychological needs for autonomy, competence, and relatedness (Ryan and Deci, 2017). Personal goal pursuit can contribute to well-being if these psychological needs are met during goal progress (Ryan and Deci, 2000). For instance, students feel a sense of well-being when they strive for educational aspirations that meet their competence needs. Additionally, parental support promotes well-being in youth by satisfying their need for relatedness and competence, as observed in the context of China (Yan et al., 2021).

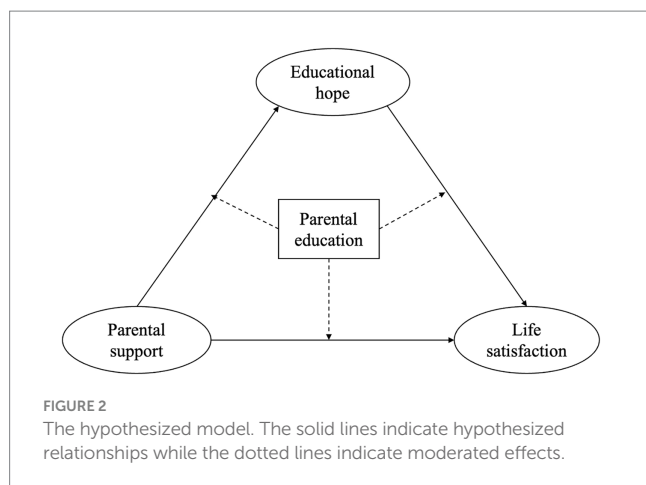
The home advantage factor has been established by research (Lareau, 2000). Middle-class parents are able to offer expert advice on educational choices, develop strategies for navigating program pathways, and increase their children's social networks for lifelong opportunities and economic resources. Furthermore, interactions between parents and children can be seen as beneficial social capital in the form of care and material resources that benefit the child (Coleman, 1988, 1994; Ho, 2010), cultivate their academic abilities, and, in turn, predict their life satisfaction (Danielsen et al., 2009). Therefore, this study used the level of parental education as a grouping variable to analyze the differences between groups.

Drawing on Bourdieu's (1977, 1986) sociocultural theories and Sen's perspective on the capability to flourish (Sen, 1992), Hart (2012, 2016) proposed a framework that examines the relationships among parental support, aspirations, and well-being. The framework suggests that sociocultural capital plays an essential role in promoting an individual's capability for high life aspirations, while personal life aspirations cultivate the capability that leads to flourishing (Hart, 2012, 2016). The relationships between these factors are depicted in Figure 1. Using this framework helps to consider all factors, including parental support, parental education, educational hope, and life satisfaction, in combination.

4 The current study and hypotheses

This study explored the complex connections between life satisfaction, educational hope, and parental support among Chinese high school students. The research was based on existing literature and Hart's (2012, 2016) framework. The capital types are classified as cultural and social capital at home, which are expressed through parental education and support in both tangible and intangible ways. Aspirations refer to educational hope, which includes educational aspirations and goal commitment, while flourishing is associated with well-being, which is assessed by life satisfaction. In line with the objectives of the present study, the following three hypotheses are proposed (see Figure 2):





Hypothesis 1 (H1): Life satisfaction and educational hope are positively predicted by parental support.

Hypothesis 2 (H2): Educational hope mediates the effects of parental support on life satisfaction.

Hypothesis 3 (H3): Parental education moderates the interrelationships among parental support, educational hope, and life satisfaction.

5 Methods

5.1 Samples and procedure

In this study, a three-step sampling method was used. The first step was to choose Xuzhou in Jiangsu Province, China, as the case study. Jiangsu is known for being one of the most competitive provinces in *gaokao*, and previous research has discovered that high school students in East China, including Jiangsu, have the highest detection rate of anxiety disorders (Chen et al., 2017). By selecting this region, we were able to show the variable intensity (Patton, 2002). For the second step, we used a stratified purposeful sampling method to select eight high schools in Xuzhou based on the district distribution and criteria of Jiangsu's 'star rating system' for high schools.

Finally, we used cluster sampling to select 96 classes from *gaokao* 1–3 (10th – 12th graders). Four classes at each grade level were randomly selected from each school. The teacher coordinators assisted us in conducting the online survey with the target participants. The research design was approved by the Survey and Behavioral Ethical Review Committee of the authors' university.

Given that this study was conducted during the COVID-19 outbreak in China, when social distancing regulations were strictly implemented, an online questionnaire survey was administered to collect data. To ensure the accuracy of the data, a pilot test was conducted, which showed that participants took approximately 5 min on average to complete the questionnaire. Thus, during the main study, any responses that were completed in less than 5 min were considered invalid and were deleted.

The sample size after data cleaning was 3,810 students aged 16–19 years, with a valid response rate of 86.59%. 49.2% were male and 50.8% were female. Around two-thirds of the parents had no

college experience (71.1%) and the rest had college experience (28.9%). Students whose parents had no college experience were considered as the reference group (Group 1).

5.2 Measures

Life satisfaction was measured by an adapted Multidimensional Student Life Satisfaction Scale. This scale assesses students' satisfaction with five life domains: family, friends, school, self, and living environment (Huebner, 1994; Gilman et al., 2000). The version of the scale that was translated and adapted by Yuen and Lee (2016) and has been previously administered in Hong Kong with satisfactory validity and reliability (Yuen, 2013, 2016). To ensure the effectiveness of the responses, we simplified this version based on its structure and our exploratory factor analysis (EFA) in the pretest. The final version of the questionnaire comprised 17 items. The respondents were required to indicate their agreement with statements such as 'I feel happy at school' on a 6-point Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree). In our study, this scale displayed satisfactory internal consistency ($\alpha=0.947$) and performed well in the confirmatory factor analysis (CFA) [$\chi^2(118)=847.788$ ($p<0.001$), root mean square error of approximation (RMSEA) = 0.048, comparative fit-index (CFI) = 0.967, Tucker-Lewis index (TLI) = 0.962].

Educational hope is a combination of educational aspirations and goal commitment. Educational aspirations were measured by questions such as 'What is your ultimate educational goal?' which refers to the final education level that one wishes to achieve. Four categories of aspirations were coded based on China's educational system as follows: (1) 12 = None or graduating from high school, (2) 15 = Attending a three-year vocational college, (3) 16 = Attending a four-year university, and (4) 19 = Obtaining a postgraduate degree. Goal commitment was measured using the five-item Hollenbeck, Williams, and Klein Goal Commitment Scale. One sample item was 'I think this is a good goal to shoot for' (Klein et al., 2001, p. 34). The participants reported their agreement on a 6-point Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree). The items were translated into Chinese, and back-translation and verification of equivalence were performed. The validity [$\chi^2(5)=83.615$ ($p<0.001$), RMSEA = 0.068, CFI = 0.950, TLI = 0.922] and internal reliability ($\alpha=0.852$) of this scale were satisfactory for our sample.

The academic-related support subscale in Yuen and Lee's (2016) questionnaire was used to evaluate parental support for Hong Kong adolescents' well-being and academic performance. In our pilot study, the EFA results identified three items as tangible parental support, such as 'My parents discuss with me about my learning' and 'My parents provide resources for my learning.' Three items were seen as intangible parental support, such as 'My parents encourage me when I am in trouble' and 'My parents offer advice when I need it.' The CFA results showed that the model had an acceptable fit [$\chi^2(8)=107.301$ ($p<0.001$), RMSEA = 0.063, CFI = 0.975, TLI = 0.953]. The six-item scale's coefficient alphas were greater than 0.90 ($\alpha=0.930$), indicating satisfactory internal reliability.

5.3 Analytical strategies

Descriptive statistics, including *t-test* for group comparison and Pearson correlation analysis, were performed using SPSS 25.0.

Structural equation modeling via Mplus 8.0. was used to test the hypotheses. Path analysis with maximum likelihood estimation was performed to examine the relationships among the key variables. Mediation and multigroup analyses were also conducted to verify the last two hypotheses. Participants were required to answer all questions to complete the online questionnaire. Accordingly, incomplete questionnaires and missing data were excluded from the analysis.

6 Results

6.1 Descriptive statistics

In the first step, descriptive statistics are reported to provide an overview of the characteristics of the key variables in this study. Table 1 shows the means, standard deviations, and *t*-test results, and Table 2 presents the correlations of the key variables between the two groups.

Life satisfaction: As shown in Table 1, the respondents were moderately satisfied with their lives, with the levels of the five dimensions ranging from 4.5 to 5.3 on a 6-point Likert scale, consistent with previous Chinese findings (Tian and Liu, 2005). The reference group exhibited significantly lower levels of life satisfaction. However, the reference group, whose parents had no college experience, exhibited significantly lower level of life satisfaction. They were less satisfied with their friends (mean = 5.078), their school (mean = 4.599), themselves (mean = 4.810), and their living environment (mean = 4.931) than their counterparts (mean = 5.162, 4.734, 4.931, 5.148). The differences in satisfaction with the living environment between the two groups were substantial, with Cohen's *d* between 0.2 and 0.5 ($p < 0.001$, Cohen's $d = 0.225$).

Educational hope: The vast majority of participants (97.2%) expressed a desire to attend college, while 88.4% aimed for a university education or higher. On average, participants aspired to obtain a university education, with the means of educational aspirations

slightly above 16 (as shown in Table 1). Those whose parents had a college background reported higher levels of educational aspirations than their counterparts (mean difference = 0.514, $p < 0.001$, Cohen's $d = 0.297$), which is consistent with previous research (Guo et al., 2015). Additionally, participants with a high level of goal commitment (Group 1: mean = 5.382; Group 2: mean = 5.307) exhibited a strong determination to pursue a university education.

Parental support: Table 1 presents the data on respondents who reported moderately strong levels of tangible and intangible parental support (Group 1: mean = 4.848; Group 2: mean = 5.112 for tangible support, and Group 1: mean = 4.789; Group 2: mean = 5.016 for intangible support). The reference group had lower levels of both tangible support (mean = 4.848) and intangible support (mean = 4.789) compared to their counterparts (mean = 5.112, 5.016) with a statistically significant difference ($p < 0.001$, Cohen's $d > 0.20$). This result confirms the cultural capital view that students with highly educated parents benefit more from their parents' support (Lareau, 2000).

In Table 2, the variables related to parental support were positively correlated with educational hope and life satisfaction. The correlation between life satisfaction, goal aspiration, and goal commitment was weak (Group 1: $r = 0.343$; Group 2: $r = 0.294$).

6.2 Path analysis

Path analysis examined the relationships between life satisfaction, educational hope, and parental support. The results indicated that tangible and intangible parental support contributed significantly to life satisfaction. Notably, intangible parental support significantly predicted educational hope (educational aspirations and commitment) and consequently predicted life satisfaction positively through goal commitment. Thus, the first hypothesis was confirmed.

Furthermore, the structural relationships among the variables confirmed that the hypothesized model was acceptable with a

TABLE 1 Descriptive statistics of the main variables.

Scales/subscales	Range	Mean (<i>SD</i>)		<i>t</i>	Cohen's <i>d</i>
		Group 1: <i>n</i> = 2,710	Group 2: <i>n</i> = 1,100		
Life satisfaction					
Family	1–6	5.223 (0.93)	5.226 (1.03)	−0.089	0.003 < 0.20
Friends	1–6	5.078 (1.01)	5.163(1.06)	−2.268*	0.082 < 0.20
School	1–6	4.599 (1.28)	4.734 (1.31)	−2.921**	0.104 < 0.20
Self	1–6	4.810 (1.15)	4.931 (1.24)	−2.901**	0.101 < 0.20
Living environment	1–6	4.931 (0.99)	5.148 (0.94)	−6.217***	0.225
Higher education aspirations					
Educational aspirations	12–19	16.724 (1.69)	17.238 (1.78)	−8.211***	0.297
Goal commitment	1–6	5.382 (0.74)	5.307 (0.84)	−2.573**	0.095 < 0.20
Parental support					
Tangible support	1–6	4.848 (1.24)	5.112 (1.13)	−6.363***	0.223
Intangible support	1–6	4.789 (1.12)	5.016 (1.07)	−5.849***	0.207

The students whose parents had no college experience were considered the reference group (Group 1). Cohen's *d* (effect size): Substantial significance based on the *t*-test with a threshold value above 0.20. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

TABLE 2 Correlations among key variables between the two groups.

Variables	1	2	3	4	5
(1) Life satisfaction	—	0.124***	0.449***	0.532***	0.598***
(2) Educational aspirations	0.156***	—	0.294***	0.121***	0.192***
(3) Goal commitment	0.433***	0.343***	—	0.419***	0.490***
(4) Tangible support	0.501***	0.150***	0.299***	—	0.767***
(5) Intangible support	0.597***	0.202***	0.391***	0.696***	—

Correlations for Group 1 are below the diagonal while the correlations for Group 2 are above the diagonal. *** $p < 0.001$.

reasonable fit [Group 1, χ^2 (445) = 2238.079 ($p < 0.001$), RMSEA = 0.055, SRMR = 0.050, CFI = 0.944, TLI = 0.937; Group 2, χ^2 (445) = 1333.373 ($p < 0.001$), RMSEA = 0.060, SRMR = 0.063, CFI = 0.935, TLI = 0.927].

Table 3 presents the unstandardized path coefficients (B), standardized path coefficients (β), significance, and effect sizes of each path. The total and direct effects of parental support on life satisfaction were positive and significant. Intangible parental support had a significantly positive effect on educational hope.

Figure 3 presents the standardized path diagram with β across two groups. (1) Life satisfaction was directly and positively predicted by tangible parental support (Group 1: $\beta = 0.184$, $p < 0.001$; Group 2: $\beta = 0.190$, $p < 0.05$) and intangible parental support (Group 1: $\beta = 0.452$, $p < 0.001$; Group 2: $\beta = 0.341$, $p < 0.01$). (2) Educational aspirations (Group 1: $\beta = 0.215$, $p < 0.001$; Group 2: $\beta = 0.247$, $p < 0.01$) and goal commitment (Group 1: $\beta = 0.408$, $p < 0.001$; Group 2: $\beta = 0.512$, $p < 0.01$) were positively predicted by intangible parental support. (3) In the same vein, intangible parental support indirectly and positively predicted life satisfaction via goal commitment (Group 1: $\beta = 0.112$, $p < 0.001$; Group 2: $\beta = 0.138$, $p < 0.001$). These results reveal that Chinese high school students' high value for *gaokao* and their high engagement benefit their life satisfaction. Moreover, intangible parental support plays a greater role in students' life satisfaction than tangible parental support. These results provide the prerequisites for mediation analysis, as described in the following section.

6.3 Mediating effects of educational hope on parental support and life satisfaction

The path analysis revealed that intangible parental support played a significant role in improving goal commitment and life satisfaction. Three prerequisites for mediation effects were confirmed as follows: (1) a significant total effect of the independent variable (intangible parental support) on the dependent variable (life satisfaction), (2) a significant direct effect of the independent variable on the mediator (goal commitment), and (3) a significant direct effect of the mediator on the dependent variable. To test the second hypothesis, bootstrapping approaches and a 95% confidence interval were used to examine the significance of the mediation of goal commitment on intangible parental support and life satisfaction. The study yielded significant results that suggested the estimated mediation path was significant for both Group 1 ($\beta = 0.112$, $p < 0.001$, CR = 5.666, 95% CI = 0.081–0.134) and Group 2 ($\beta = 0.138$, $p < 0.001$, CR = 3.671, 95% CI = 0.085–0.205). This means that goal commitment partially mediated the relationship between intangible parental support and life satisfaction. Therefore, the second hypothesis was supported.

6.4 Multigroup comparison of parents with and without higher education backgrounds

We performed a multigroup analysis to compare group differences in path coefficients, following the method outlined by Preacher et al. (2007). Our objective was to examine the moderating effects of parental educational background on life satisfaction, educational hope, and parental support. We first tested a baseline model where all path coefficients were freely estimated across two groups: Group 1, consisting of students whose parents had no higher education backgrounds, and Group 2, consisting of students whose parents had higher educational backgrounds. We then assessed a series of constrained models and compared the differences in χ^2 (increment 2) between the baseline and constrained models, as described in Hau et al. (2004). As shown in Table 4, we found that χ^2 significantly increased when we constrained the path from intangible parental support to goal commitment ($p < 0.01$). As shown in Table 2 and Figure 3, the effect of intangible parental support on goal commitment was weaker for Group 1 ($B = 0.272$, $\beta = 0.408$, $f^2 = 0.098$) than it was for Group 2 ($B = 0.362$, $\beta = 0.512$, $f^2 = 0.152$). In summary, we found that parental educational backgrounds moderated the relationship between these two variables, supporting our third hypothesis.

7 Discussion

7.1 The influences of parental intangible support

The results of this study offer fresh insights into the intricate connections between parental support, educational hope (educational aspirations and goal commitment), and the life satisfaction of high school students in China. As predicted, the level and type of parental support significantly impact the educational hope and life satisfaction of students.

It has been found that, on the one hand, intangible parental support, such as providing critical information, advice, encouragement, praise, and care, has a direct and significant impact on the well-being of young people. On the other hand, tangible parental support, which includes homework supervision, financial assistance, and educational resources, has a relatively less significant effect. This finding is consistent with previous research that suggests that positive parent–child relationships are beneficial for young people's well-being (Shenaar-Golan and Goldberg, 2019; Koestner et al., 2020). A recent study (Yan et al., 2021) also found that the subjective well-being of Chinese high school students is closely linked to warm and caring relationships with their parents.

TABLE 3 Path analysis results.

Path	<i>B</i>	S.E.	β	C.R.	<i>p</i> -value	<i>f</i> ²
Group 1, <i>n</i> = 2,710						
Direct effects						
Tangible support → Life satisfaction	0.223	0.049	0.184	4.668	<0.001	0.046
Intangible support → Life satisfaction	0.733	0.091	0.452	9.664	<0.001	0.204
Tangible support → Educational aspirations	−0.039	0.057	−0.029	−0.679	>0.05	0.000
Intangible support → Educational aspirations	0.386	0.085	0.215	4.628	<0.001	0.023
Tangible support → Goal commitment	0.015	0.024	0.031	0.642	>0.05	0.003
Intangible support → Goal commitment	0.272	0.037	0.408	8.172	<0.001	0.098
Educational aspirations → Life satisfaction	−0.038	0.023	−0.042	−1.680	>0.05	0.002
Goal commitment → Life satisfaction	0.670	0.106	0.275	7.408	<0.001	0.128
Indirect effects						
Tangible support → Educational aspirations → Life satisfaction	0.001	0.003	0.001	0.555	>0.05	
Tangible support → Goal commitment → Life satisfaction	0.010	0.016	0.008	0.637	>0.05	
Intangible support → Educational aspirations → Life satisfaction	−0.015	0.010	−0.009	−1.544	>0.05	
Intangible support → Goal commitment → Life satisfaction	0.182	0.034	0.112	5.666	<0.001	
Total effects						
Tangible support → Life satisfaction	0.235	0.051	0.193	4.695	<0.001	
Intangible support → Life satisfaction	0.900	0.094	0.555	12.464	<0.001	
Group 2, <i>n</i> = 1,100						
Direct effects						
Tangible support → Life satisfaction	0.234	0.113	0.190	2.180	<0.05	0.032
Intangible support → Life satisfaction	0.494	0.180	0.341	3.040	<0.01	0.075
Tangible support → Educational aspirations	−0.122	0.128	−0.076	−0.960	>0.05	0.003
Intangible support → Educational aspirations	0.467	0.162	0.247	2.967	<0.01	0.026
Tangible support → Goal commitment	0.019	0.056	0.032	0.341	>0.05	0.006
Intangible support → Goal commitment	0.362	0.070	0.512	5.838	<0.001	0.152
Educational aspirations → Life satisfaction	−0.091	0.030	−0.119	−3.054	<0.01	0.022
Goal commitment → Life satisfaction	0.550	0.142	0.269	4.082	<0.001	0.083
Indirect effects						
Tangible support → Educational aspirations → Life satisfaction	0.011	0.014	0.009	0.836	>0.05	
Tangible support → Goal commitment → Life satisfaction	0.011	0.032	0.009	0.341	>0.05	
Intangible support → Educational aspirations → Life satisfaction	−0.042	0.022	−0.029	−1.958	>0.05	
Intangible support → Goal commitment → Life satisfaction	0.199	0.056	0.138	3.671	<0.001	
Total effects						
Tangible support → Life satisfaction	0.256	0.120	0.208	2.240	<0.05	
Intangible support → Life satisfaction	0.651	0.167	0.450	4.538	<0.001	

*f*² (effect size) – cut-off values: 0.02 < *f*² < 0.15 (small), 0.15 < *f*² < 0.35 (medium), *f*² > 0.35 (large).

A positive parent–child relationship is conducive for children to feel like valuable members of their family who are loved and cared for. This creates a harmonious, happy, and loving family environment. According to SDT, when students have a good relationship with their parents or significant family members such as grandparents, they are more likely to feel a sense of belonging and connection to others, which can lead to better overall well-being (Ryan and Deci, 2000). Cultural factors also reinforce the impact of parents on children’s happiness. In Confucian heritage societies, the bond between parents

and children is considered the core of the family (Fei, 2006) and a critical component of happiness (Gu, 2016). The family is at the center of youth development (Liang, 2005) and parent–child relationships are the prime indicator of life satisfaction among Chinese youth.

Our research findings confirm that intangible parental support, such as warmth, care, and knowledge exchange through conversations and interactions, directly promotes students’ educational aspirations (reflected in their desired highest educational level) and goal commitment (demonstrated by their efforts, appreciation, and agency

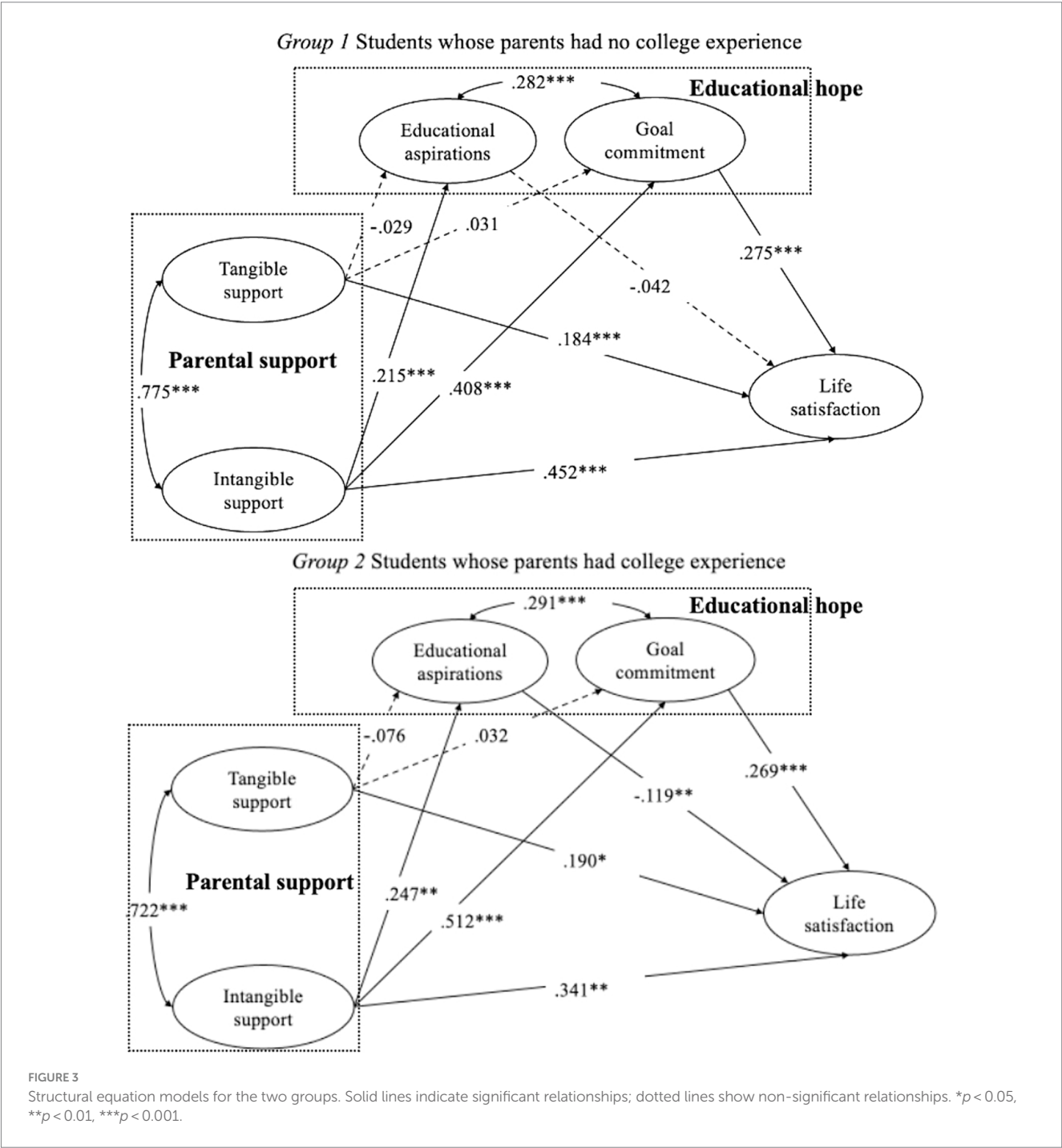


TABLE 4 Model fit comparisons across groups.

Model		χ^2	df	RMSEA	SRMR	CFI	TLI	$\Delta\chi^2$
Baseline model		3,744.312	899	0.058	0.056	0.937	0.931	
Constrained models								
1	'Tangible parental support → Life satisfaction' was constrained	3,746.754	900	0.058	0.056	0.937	0.931	2.442
2	'Intangible parental support → Life satisfaction' was constrained	3,745.783	900	0.058	0.057	0.937	0.931	1.471
3	'Intangible parental support → Educational aspirations' was constrained	3,745.152	900	0.058	0.056	0.937	0.931	0.840
4	'Intangible parental support → Goal commitment' was constrained	3,752.606	900	0.058	0.057	0.937	0.931	8.294**
5	'Educational aspirations → Life satisfaction' was constrained	3,746.303	900	0.058	0.056	0.937	0.931	1.991
6	'Goal commitment → Life satisfaction' was constrained	3,745.889	900	0.058	0.056	0.937	0.931	1.577

When $\Delta df=1$, if $\Delta\chi^2 > 3.84$, $p < 0.05$; if $\Delta\chi^2 > 6.63$, $p < 0.01$, * $p < 0.05$, ** $p < 0.01$.

in *gaokao*). This highlights the crucial role that families play in nurturing educational hope and pursuits. In other words, parents are significant figures who shape their children's educational beliefs. This influence is deeply rooted in Chinese culture, where filial piety is a core familial value. Regardless of their family's socioeconomic status, children are taught to respect and honor their parents by striving for academic excellence. Pursuing high *gaokao* scores is a way of showing respect to senior family members (Wang and Rao 2022). Therefore, for Chinese high school students, a positive parent–child relationship is essential as it enables parents to convey their perspectives and attitudes toward education, leading to a stronger sense of educational hope and a desire to pursue high-quality education in their children.

It is important to note that the impact of parental support on a child's goal commitment varies among children from different educational backgrounds. The impact of parental support is more significant among children whose parents have a college education, highlighting the importance of family advantages (Lareau, 2000). The interaction between family members and people outside the family, such as relatives and friends, can influence how a child navigates their educational and social pathways (Bourdieu, 1977, 1986). Parents who have a low level of education may lack the confidence to get involved in their children's education and are more likely to defer to teachers for advice, meaning that teachers and peers may influence their children's educational hopes. On the other hand, parents with higher levels of education have more knowledge and information about education and are better equipped to encourage and provide guidance, thus, more readily playing a role in constructing their children's educational hopes and planning for their future together with their children.

7.2 Educational hope: a complex construct

We can discern that educational hope is a complex concept, with different aspects exerting varying impacts on subjective well-being. Only goal commitment, which refers to the students' proactive engagement and agency in pursuing educational goals, positively impacts life satisfaction. In contrast, educational aspirations do not positively predict satisfaction and have a significant negative predictive effect for students whose parents have a college experience.

On the one hand, goal commitment reflects individuals' agency and the perseverance, determination, and effort put forth to achieve their objectives. Individuals with high commitment are those who more readily perceive the meaning in life and motivation, so they are likely to feel satisfied with their lives as they strive toward their aspirations (Guse and Shaw, 2018). Besides, the emphasis on education in Chinese culture further enhances the life satisfaction that students experience as a result of actively pursuing their goals. The ethics of diligent learning and self-cultivation (known as *xiu shen* in Chinese) is part of the work ethic embedded in Confucian values (Peow, 2015). From ancient times to the present, being diligent has been revered by Chinese and East Asians as a meaningful code of conduct and way of life. Therefore, it is natural that the active pursuit of educational goals would positively affect life satisfaction.

It has been found that having educational aspirations does not necessarily lead to increased well-being, which contradicts previous research (Cao et al., 2022). The reason for this could be that the previous research did not differentiate between different aspects of educational hope. In reality, the positive impact of educational hope on well-being is not related to the height of goal setting but rather

whether it motivates individuals to strive toward meaningful goals and take action. It is important to note that for students whose parents have a college education, having high educational aspirations may even have a negative impact on their life satisfaction. When expectations are too high, they can lead to direct pressure on students. Additionally, parents with higher levels of education often have higher expectations for their children's education. This is further compounded by Chinese culture, which emphasizes the importance of education in social class reproduction. The pursuit of excellence is often emphasized by families and schools to instill the hope of upward social mobility, career success, and social status (Liu and Helwig 2022). Well-educated parents with more knowledge of education are more likely to view access to higher education as an institutionalized channel for achieving future success (Kwon et al., 2017; Cheng et al., 2021).

7.3 Intangible parental support vs. tangible parental support

The university entrance exams in China, known as *gaokao*, involve many high school students, their families, and school staff. It is important to pay attention to the well-being of these students, especially to identify practical solutions that can help them aspire toward their desired educational pathway and increase their inner strengths. This study emphasizes that family support plays a crucial role in shaping Chinese youth's educational goals, commitment, and overall well-being. Intangible parental support has more advantages than tangible support in shaping students' attitudes toward education and their commitment to *gaokao*. Education is class-based and involves a process of class reproduction. Educated middle-class parents are better positioned to pass their university knowledge on to their children. Coleman (1994) argues that actors' social actions are rational and that they tend to seek more resources. Information and advice directly contribute to realizing students' interest in understanding the meaning of life, the value of education, and the importance of *gaokao*. Persuasive communication, encouragement, and praise gradually shape students' aspirations and determination. They observe the long-term impact of intangible resources on their values, attitudes, autonomy, and self-agency.

In addition, the results verify that intangible parental support has a stronger impact on students whose parents have a college experience compared to those who do not. The research also notes differential intangible parental support. Educated parents provide more specific advice and support and are more knowledgeable in guiding their children toward making better decisions about their education. These parents are more aware of the importance of family education and spare no effort in cultivating their children's educational aspirations (Lareau, 2000; Ho, 2010). Bourdieu's family habitus theory suggests that a family's sociocultural capital provides valuable intangible support. The slope of the positive linear relationship between intangible parental support and goal commitment is noticeable among students with educated parents. In other words, the impact of intangible parental support is strong among these students.

7.4 Major insights and implications

Our findings have highlighted the important role that parents play in the educational success and overall well-being of high school

students. The implications of these findings are significant. Parents of students preparing for the *gaokao* examination, regardless of their own level of education, are advised to prioritize spending quality time with their children. Developing a strong parent–child relationship through personalized care, concern, and support is more beneficial than simply providing material resources, extra tutoring, or constant supervision. This approach will foster a sense of belonging and closeness and will inspire children to aspire toward higher education.

Parents should work collaboratively with their children to plan their growth and development instead of acting as directors. They should avoid imposing their own desires on their children, which can cause them to feel overwhelmed and anxious about the future. Instead, parents should co-create educational aspirations with their children that align with their development and guide them in actively pursuing these goals while encouraging their commitment to achieving them.

Research has shown that when parents increase their children's enthusiasm for higher education, it develops their academic self-efficacy and helps them overcome educational obstacles. Parents can become friends with each other and provide additional support by hiring professional homework tutors to improve their children's education, instead of relying solely on schools or after-school counseling institutions. It is important to collaborate with children in setting educational goals that align with their developmental trajectory and educational hope.

Goal commitment is important for students' inner strength and can help them deal with the effects of intangible parental support on life satisfaction. Empowering students with positive support and advice to make informed educational choices in a supportive environment fosters a sense of personal investment in their growth and success. By understanding the role of functional families in connection with educational hope and life satisfaction, schools can tailor intervention programs to meet students' specific needs. Positive parental support brings warmth, emotional closeness, and care, while school interventions can compensate for the lack of familial educational support among disadvantaged students.

8 Limitations

There are several limitations to our research that we need to acknowledge. Firstly, we used convenience sampling, which may lead to sampling bias. Our sample was drawn from one city in China due to difficulties in obtaining permission from schools and cities, especially during the strict social distancing regulations to curb the spread of the COVID-19 pandemic in China. This unique sociocultural context could have influenced the observed associations between the variables. Therefore, future studies should broaden the scope of this study to include other cities to deepen our understanding of the differences between cities in China.

Secondly, our sample size was small, which means that our findings are indicative rather than representative. The territory-wide pandemic interruptions undoubtedly affected the participants' well-being and willingness to participate in the project. They could have been tired of attending online courses, and their exhaustion could have interfered with their learning and brought academic pressure to some degree. At the beginning of the resumption of face-to-face classes, high school students still suffered from stress and challenges brought on by the unique pandemic situation in China.

Thirdly, the cross-sectional research method we used may not be adequate to capture the changes in students' well-being over time. Students' assessment of well-being changes with time and social circumstances. Finally, the cross-sectional results' causality is not sufficiently rigorous. Longitudinal studies are needed to track the changes in the differential impacts of different factors on *gaokao* students' well-being and aspirations for higher education.

Data availability statement

The datasets presented in this article are not readily available because the data involves school privacy concerns and the permissions do not allow the authors to disclose the original data. The data cannot be disclosed without the updated permission of the schools. Requests to access the datasets should be directed to hanfengjiyy@mail.tsinghua.edu.cn.

Ethics statement

The studies involving humans were approved by the ethics committee at the Chinese University of Hong Kong. The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation in this study was provided by the participants' legal guardians/next of kin. Written informed consent was obtained from the individual(s), and minor(s)' legal guardian/next of kin, for the publication of any potentially identifiable images or data included in this article.

Author contributions

FH: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Validation, Writing – original draft, Writing – review & editing. CY: Conceptualization, Methodology, Supervision, Writing – review & editing.

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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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EDITED BY

Martijn Burger,
Open University of the Netherlands,
Netherlands

REVIEWED BY

Sonia Beatriz Echeverria-Castro,
Instituto Tecnológico de Sonora (ITSON),
Mexico
Wonjae Jeon,
Korea National University of Education,
Republic of Korea

*CORRESPONDENCE

Jieun Choi
✉ choij712@gmail.com

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A study on the development of happiness scale for Chinese young children

Jiaxin Xiang¹ and Jieun Choi^{2*}

¹School of Education, Guangzhou University, Guangzhou, China, ²University Innovation Support Project, Shinhan University, Gyeonggi-do, Republic of Korea

This study was conducted to develop an assessment tool for measuring happiness among Chinese preschoolers, and to verify the reliability and validity of this tool. A total of 269 preschoolers aged 3 to 5 years from kindergartens and childcare centers in Hangzhou, China, were surveyed. The Preschooler Happiness Scale, constructed through literature review and interviews with preschoolers, underwent expert content validity verification and pilot testing to refine items. The validity and reliability of the scale were verified in this study, resulting in the development of the final Preschooler Happiness Scale comprising 6 sub-factors and 25 items. The reliability verification revealed a high overall reliability of 0.91 for the Preschooler Happiness Scale, confirming its trustworthiness as a tool. The academic significance of the findings and the practical utility of the Preschooler Happiness Scale in early childhood education settings in China were discussed based on the results of this study.

KEYWORDS

Chinese, preschoolers, happiness, reliability, validity verification

1 Introduction

The pursuit of happiness is not only a fundamental human right but also a topic of enduring interest among people. Preschoolers, like adults, desire happiness and experience various forms of it. Many researchers have suggested that the happiness experienced during early childhood can have a significant impact on life satisfaction and development even into adulthood (Lee and Seo, 2015). Individuals who had happy childhoods tend to develop emotional stability and empathy, leading to a higher likelihood of living a happy life in old age (Vaillant, 2010). Additionally, children who grow up feeling happy tend to be optimistic, intellectually active, confident, and socially competent, which in turn enhances the efficiency of all activities in life (Cho and Nam, 2011). Furthermore, happiness fosters adaptation, reduces disease incidence, and promotes both physical and mental health by fostering a positive outlook on life and the world (Jeon, 2011). Therefore, happiness is not merely a fleeting aspect of life after becoming an adult; it is considered a crucial factor that influences life quality and human development from an early age. Happiness can be developed by learning abilities such as cognition and creativity and by discovering and practicing one's talents and characteristics (Seligman, 2004; Argyle, 2005). Hence, efforts to provide environments where children can experience happiness and enhance their sense of well-being from an early age are crucial for lifelong developmental purposes.

China recognizes the importance of a happy life, but despite rapid economic growth over the past half-century, many citizens are found to be unhappy with their lives, posing a serious social problem. According to the World Happiness Report by the UN in 2023, analyzing the

happiness index of 156 countries worldwide, China ranked 60th (World Happiness Report, 2024). A study conducted by the Chinese Children's Happy Growth Index Research Group on the Youth Happiness Growth Index surveyed 3,500 children in seven cities including Beijing and Guangzhou, revealing that 64.4% of the children reported being very happy, but 7.5% indicated that their happiness growth index had not yet reached the baseline (Chinese Children's Happy Growth Index Research Group, 2017). This indicates that these children lack happy experiences or are in a state of unhappiness for various reasons. A study analyzing the impact of different cultural contexts on the happiness of young children in China, the United States, and Korea found that, particularly in China, the harmony between traditional family values and modern educational methods plays a crucial role in the happiness of young children (Chen, 2012). A comparative study of students from four countries—China, South Korea, the United States, and Japan—showed that Chinese parents were more concerned about their children's academic achievements compared to parents in other countries and were the least interested in their children's emotions or friendships. However, emotions and friendships are major factors influencing a child's happiness and are also areas where children are most likely to encounter problems (Sun, 2017). Additionally, it has been found that educational methods focusing solely on the infusion of pure knowledge determined by adults, while ignoring the mental needs of young children, are detrimental to their happiness (Feng and Liu, 2019). In response, a researcher argued through the broaden-and-build theory of positive emotions that positive emotions expand children's cognitive and social abilities, and this expansion contributes to their happiness (Fredrickson, 2001). Thus, elements such as emotional stability, positive interpersonal relationships, and satisfying play experiences are included in the components of young children's happiness, and these elements are closely related to their psychological well-being (Holder and Coleman, 2009). Research on happiness-related variables has revealed that factors such as children's academic abilities, temperament, social skills, playfulness, and self-regulation abilities can influence their sense of happiness. Moreover, there is evidence to suggest that children's happiness can reciprocally impact these variables, and studies have elucidated the correlations and mediating effects involved, indicating multidimensional research efforts (Lerner and Benson, 2013; Choi, 2022). Additionally, parental factors such as parental self-efficacy have been found to have a positive impact on children's happiness, while variables related to maternal parenting stress and paternal involvement in caregiving have been shown to act as significant mediators. Furthermore, parenting styles, beliefs about play, and family health have also been identified as influential factors in children's happiness (Sanders and Mazzucchelli, 2013; Cabrera et al., 2014).

With the emphasis on the importance of happiness in early childhood, the need for various educational programs, such as emotion coaching and social-emotional learning programs, has been suggested to enhance happiness during this critical period (Gonzalez-Mena, 2008). The Chinese Ministry of Education implemented the "Double Reduction" policy in 2021. This policy advocates spending joyful time by awakening children's inherent nature and experiencing happiness through natural experiential activities from early childhood (Pi, 2012). The Ministry has not only advocated this theory but also implemented various activities aimed at promoting happiness using different media up to the present. However, when examining research

on happiness in the field of early childhood education in China up to the present, studies have primarily focused on perceptions and surveys targeting young children or parents (Peng, 2008), as well as research on activities aimed at promoting children's happiness (Zhou, 2021). However, the focus has largely been on the happiness of preschool teachers (Zhang, 2022; Huang et al., 2023). Despite the active research on happiness-related activities in the field of early childhood education in China, most existing happiness scales have targeted adolescents and adults. Scales developed for preschoolers either measure subjective happiness alone due to limited content (Wang and Yang, 2013) or focus solely on 5-year-olds (Qu, 2018).

Quantitatively measuring and evaluating the emotions and behaviors of young children is particularly complex. This is because it requires consideration of their developmental levels and characteristics (Denham et al., 2007). Moreover, the fact that many toddlers have limited language and communication skills adds another layer of difficulty to the development of happiness scales that take these factors into account. Moreover, existing measurement tools for preschoolers' happiness primarily rely on self-reports (Wang and Yang, 2013; Abed et al., 2016; Qu, 2018), teacher assessments (Lee, 2010, 2016), or maternal assessments (Dehghani et al., 2016), neglecting the subjective and developmental nature of happiness. Therefore, there is a need for the development of reliable and valid tools that accurately measure preschoolers' happiness levels, taking into account their perspectives and thoughts. Lyubomirsky et al. (2005) claimed that genetic factors account for 50% of happiness, while circumstances contribute 10%, and intentional activities contribute to 40%. The authors argued that although genetics and circumstances are beyond one's control, anyone can achieve a happy life through intentional efforts. It is crucial to initiate intentional efforts to promote happiness from early childhood, as the happiness experienced during this developmental stage is likely to endure into adulthood. Therefore, programs and research aimed at enhancing children's happiness should be activated. To achieve this, it is essential to develop reliable and valid measures that objectively and accurately assess children's happiness levels. Thus, this study aims to develop a measurement tool for assessing the happiness of Chinese preschoolers aged 3–5 years and to validate its reliability and validity. The research questions based on the study objectives are as follows:

First, what are the final items of the Happiness Scale for Chinese preschoolers?

Second, what is the reliability and validity of the Happiness Scale for Chinese preschoolers?

2 Literature review

2.1 Happiness and its components

When conducting scientific research on happiness, one of the most important foundational tasks is defining the concept of happiness itself. In fact, defining "happiness" scientifically is as challenging as defining abstract concepts like "love." Therefore, defining the happiness of children has become a major issue and research topic in happiness studies. To address this, researchers are making

multidimensional efforts to operationalize the concept of happiness and measure it objectively. Children's happiness is a state where they find satisfaction and pride in their daily activities and behaviors, including their relationships with parents, family, friends, teachers, hobbies, leisure activities, and play (Kim and Kim, 2008). Hwang et al. (2013) identify immersion as a subfactor of children's happiness, which encompasses forming close relationships with family and friends, engaging in enjoyable activities, overcoming challenges, achieving goals, and experiencing joy. In this study, children's happiness is defined as their self-assessment of overall quality of life according to their own standards (Diener, 1995). It consists of six subfactors: emotions, peer relationships, teacher relationships, family relationships, achievement, autonomy, and freedom.

2.2 The measurement methods of happiness

Currently, there are two main methods for measuring preschoolers' happiness: structured surveys using questionnaires and open-ended inquiries such as the mosaic approach, narrative artwork analysis, and story completion tasks. Structured surveys primarily involve self-reporting by preschoolers (Kim and Kim, 2008; Wang and Yang, 2013; Jeon and Lim, 2014; Lee S, 2015; Abed et al., 2016; Qu, 2018; Jung and Shim, 2019) or assessments by others (Lee, 2010, 2016; Lee and Seo, 2015; Dehghani et al., 2016) in order to effectively collect data on preschoolers' happiness. Happiness, being a highly subjective concept, is influenced more by individuals' cognitive and evaluative judgments about their own lives than by external judgments (Diener, 1995; Seligman, 2011). Therefore, since personal perceptions and satisfaction with happiness are crucial, this study employs a self-reporting approach, where preschoolers' happiness is assessed through their own stories and thoughts.

3 Methods

3.1 Participants

This study was conducted to develop an assessment tool for measuring happiness among Chinese preschoolers, and to verify the reliability and validity of this tool. For this purpose, a survey was conducted among 295 preschoolers attending kindergartens and childcare centers in Hangzhou, China. Out of the surveys distributed, a total of 274 were collected, and after excluding unreliable responses, 269 preschoolers were selected as the final participants for the study. Specifically, the participants included 86 children aged 3 (31.97%), 92 children aged 4 (34.20%), and 91 children aged 5 (33.83%). The participants comprised 138 boys (51.30%) and 131 girls (48.70%).

3.2 The research procedure

The items of the Preschooler Happiness Scale were constructed through literature review and interviews with preschoolers, followed by expert content validity verification and pilot testing to refine the items. Based on this, the validity and reliability of the scale were verified in this study, resulting in the development of the final

Preschooler Happiness Scale. The process of developing the Preschooler Happiness Scale is depicted in Figure 1.

3.2.1 Analysis of existing measures for assessing preschoolers' happiness

Literature searches were conducted focusing primarily on concepts related to happiness, and well-being. Korean literature was searched using sources such as the National Assembly Library, the Korean Education & Research Information Service (KERIS), and the National Library of Korea. For Chinese literature, searches were conducted using platforms like CNKI (China National Knowledge Infrastructure), while for international literature, academic journals, theses, and dissertations were searched primarily using search engines such as EBSCO.

3.2.2 Analysis of interviews with preschool-aged children

The researchers visited the participating kindergartens in advance to explain the purpose, content, procedures, and schedule of the study to the directors and teachers, obtaining prior consent for the research. The homeroom teachers distributed and collected research explanation sheets and consent forms to each household of the participating children. The final interviews were conducted with a total of 60 children, with 20 children from each age group (3, 4, and 5 years old), attending T Kindergarten in Hangzhou, China. The interviews consisted of two parts: "What is the happiest thing for you?" and "What is the least happy thing for you?" The interviews with the children were recorded and transcribed verbatim. The transcripts were coded sequentially as K1 to K60, and transcribed on the same day based on the recorded data and field notes taken by the researchers. The researchers paid attention to recurring words during the transcription process and analyzed the data.

3.2.3 First expert consensus and item construction

The expert consensus was reached via an online conference using Tencent Meeting. Based on the analysis of existing literature on preschoolers' happiness scales and analyzing interviews with preschool-aged children, the subfactors and items of the Preschooler Happiness Scale were developed through consensus among eight professors and PhDs in early childhood education.

3.2.4 Second round of expert content validity assessment

The content validity verification was conducted through discussions between five professors in early childhood education and ten practicing teachers. Opinions regarding modifications to the items were collected through short-answer questions via the WJX survey platform. The appropriateness of the items was checked using a Likert 5-point scale ranging from '1 point – Not at all' to '5 points – Very much'.

3.2.5 Pilot testing

The pilot testing of the Preschooler Happiness Scale was conducted involving a sample of 15 children aged 3–5 years. Before conducting the pilot testing, the purpose and content of the study were explained to the directors and teachers of T Kindergarten in Hangzhou, China. In addition, informed consent forms and guidance

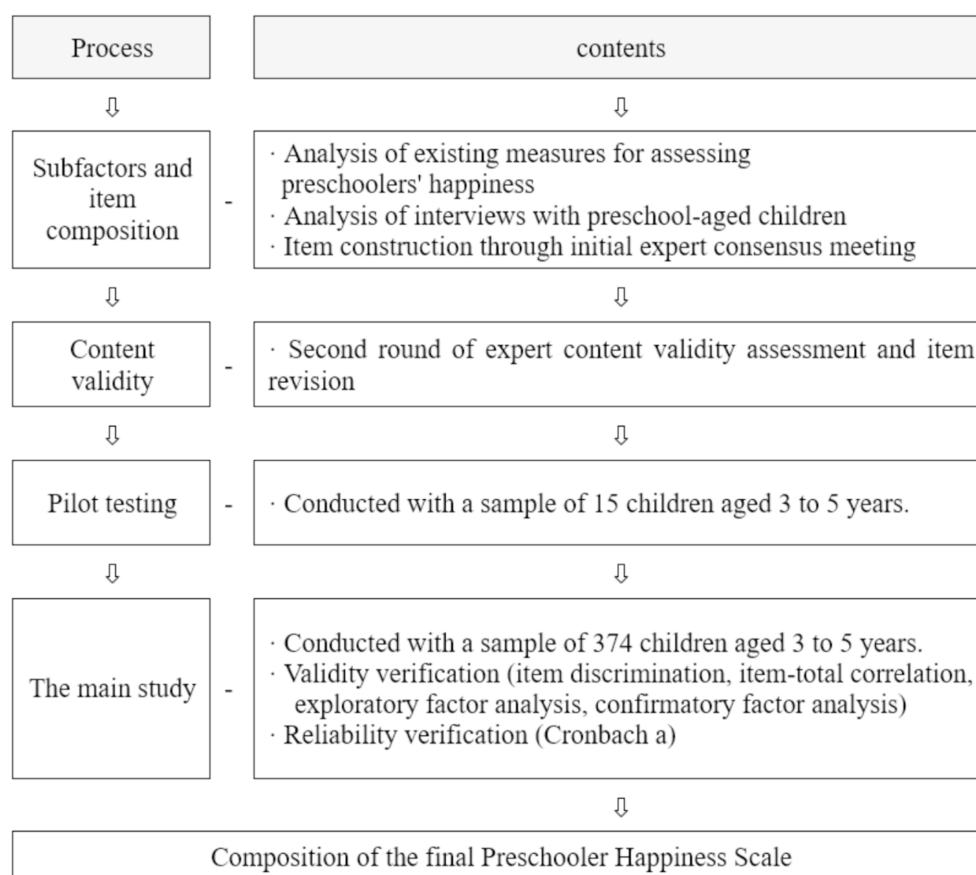


FIGURE 1
Development process of the preschooler happiness scale.

documents detailing the purpose, methods, and content of the research were provided. After obtaining parental consent, the testing was conducted individually with each of the 15 children in a quiet and focused environment, using a one-on-one approach between the researcher and the child, within the counseling room of the kindergarten.

3.2.6 The main study

The participants of this study were selected from children attending childcare centers and kindergartens in Hangzhou, China, excluding those who had participated in the pilot testing phase. First, prior to the administration of the study, research assistants received training to ensure accurate and smooth one-on-one interviews between the children and the examiners. During this session, the researchers provided detailed explanations about the purpose of the study, theoretical background, understanding of the Preschooler Happiness Scale, measurement methods, and important considerations during measurement. In addition, the examiners were given time to understand the examination process by watching recorded videos demonstrating how the researchers measured the happiness of children. Second, after explaining the purpose of the study to the directors and teachers of the childcare centers and kindergartens, their willingness to participate in the study was confirmed. Then, guidance documents outlining the purpose, methods, and content of the research, along with research consent

forms, were sent to the parents. Third, a total of 269 parents agreed to participate in the study, and the researchers and research assistants conducted one-on-one interviews with the children using the Preschooler Happiness Scale. The measurement method involves teachers reading each item of the happiness scale to young children, who then use a Likert 5-point scale. Considering the children's language abilities, they choose and indicate a card with five differently sized circles drawn on it, representing their self-reported level of happiness. The teachers read each item to the children, and if they do not understand, they assist them in understanding through specific situational explanations. After the children make their choice, the teachers ask why they chose that option, confirm their understanding, and then move on to the next item.

3.3 Data analysis

In this study, data were analyzed using SPSS 26.0 and AMOS 24.0 as follows. First, validity verification was conducted through item discrimination, item-total correlation, exploratory factor analysis, and confirmatory factor analysis on the collected data. Additionally, internal consistency reliability testing was performed for the items of the Preschooler Happiness Scale, and Cronbach's alpha coefficients were calculated.

4 Results

4.1 Subfactors and item composition of the preschooler happiness scale

4.1.1 Analysis of existing measures for assessing preschoolers' happiness

Through a review of literature, existing measures for assessing preschoolers' happiness were analyzed to identify the subfactors of preschoolers' happiness. The analysis focused on papers that predominantly used measurement tools for assessing preschoolers' happiness. The subfactors identified in existing measures for assessing preschoolers' happiness were sorted based on frequency, as shown in Table 1. Commonly identified subfactors in existing measures included emotions, peer relationships, teacher relationships, family relationships, achievement, and life satisfaction. Additionally, factors such as health, engagement, self-esteem, and sense of safety were also identified as subfactors of preschoolers' happiness. (A) Emotions: Existing measures for assessing preschoolers' happiness identified emotions as a subfactor of preschoolers' happiness (Lee, 2010, 2016; Wang and Yang, 2013; Lee and Seo, 2015; Lee S, 2015; Qu, 2018; Jung

and Shim, 2019; Lee and Kim, 2020). (B) Peer Relationships: Existing measures for assessing preschoolers' happiness identified peer relationships as a subfactor of preschoolers' happiness (Kim and Kim, 2008; Lee, 2010, 2016; Jeon and Lim, 2014; Lee and Seo, 2015; Lee H, 2015; Qu, 2018; Lee and Kim, 2020). (C) Teacher Relationships: Existing measures for assessing preschoolers' happiness identified teacher relationships as a subfactor of preschoolers' happiness (Kim and Kim, 2008; Lee, 2010, 2016; Jeon and Lim, 2014; Lee and Seo, 2015; Lee H, 2015; Qu, 2018; Lee and Kim, 2020). (D) Family Relationships: Existing measures for assessing preschoolers' happiness identified family relationships as a subfactor of preschoolers' happiness (Kim and Kim, 2008; Lee, 2010, 2016; Jeon and Lim, 2014; Lee and Seo, 2015; Lee H, 2015; Lee and Kim, 2020). (E) Achievement: Existing measures for assessing preschoolers' happiness identified achievement as a subfactor of preschoolers' happiness (Kim and Kim, 2008; Lee, 2010, 2016; Jeon and Lim, 2014; Qu, 2018; Lee and Kim, 2020). (F) Life Satisfaction: Existing measures for assessing preschoolers' happiness identified life satisfaction as a subfactor of preschoolers' happiness (Denham et al., 2007; Lee, 2010; Wang and Yang, 2013; Jeon and Lim, 2014; Abed et al., 2016; Qu, 2018).

TABLE 1 Analysis of existing measurement tools for preschoolers' happiness.

Subfactor		Researcher												
		①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬
Emotion					○	○	○		○	○	○	○	○	
Interpersonal relationships	Peer	○	○	○			○			○	○	○	○	
	Teacher		○							○	○	○	○	
	Family		○								○	○	○	
Ability/achievement		○		○						○	○		○	
Life satisfaction				○				○	○	○	○			
Health				○							○	○	○	
Engagement											○	○	○	
Home environment		○					○							○
Self-esteem					○	○								
Sense of safety				○									○	
Standards of living				○										
Self-identity		○												
Self-concept								○						
Self-acceptance							○							
Cognition														○
Spirituality											○			
Fulfillment of daily life needs			○											
Participation in helping activities			○											
Participation in play activities			○											
Psychological well-being														○
Sense of belonging				○										
Resilience								○						
Freedom										○				

① Kim and Kim (2008), ② Lee (2015a), ③ Jeon and Lim (2014), ④ Lee (2015b), ⑤ Jung and Shim (2019), ⑥ Lee and Kim (2020), ⑦ Abed et al. (2016), ⑧ Wang and Yang (2013), ⑨ Qu (2018), ⑩ Lee (2010), ⑪ Lee and Seo (2015), ⑫ Lee (2016), ⑬ Dehghani et al. (2016).

4.1.2 Analysis of interviews with preschool-aged children

To explore the happiness perceived by preschoolers, qualitative research methods were employed through conducting interviews. The interview content consisted of questions such as “What makes you happiest?” and “What makes you unhappy?” Responses obtained from the interviews regarding what makes preschoolers happy, including peer relationships, teacher relationships, family relationships, achievements, autonomy and freedom, play activities, and fulfillment of needs. Preschoolers primarily reported feeling happy when playing games with friends, making new friends, receiving kindness from friends, receiving praise from teachers, having fun with teachers, playing with parents, achieving success, feeling autonomy and freedom, engaging in play activities, and having their needs met.

Regarding what makes preschoolers unhappy, responses were categorized as peer relationships, teacher relationships, family relationships, achievements, autonomy and freedom, and special events. Preschoolers expressed feeling unhappy primarily when experiencing conflicts with friends, being bullied, criticized by teachers, unable to be with or meet family members, criticized by parents, lacking autonomy and freedom, unable to achieve success, and encountering special events.

4.1.3 1st expert consultation and item construction

Based on the analysis of existing measures of preschoolers' happiness and interviews conducted with preschoolers, a panel of eight early childhood education professors and PhDs convened to establish sub-factors and items. Existing measures of preschoolers' happiness commonly identified factors such as emotions, peer relationships, teacher relationships, family relationships, achievement, and life satisfaction. Similarly, the analysis of interviews with preschoolers highlighted factors such as peer relationships, teacher relationships, family relationships, achievement, autonomy, and freedom. Based on the analysis of existing measures and interviews, an initial version of the preschoolers' happiness scale was developed following discussions with experts. The results of the initial expert panel indicated the inclusion of sub-factors such as emotions, peer relationships, teacher relationships, family relationships, achievement, and autonomy. Since life satisfaction, a sub-factor in existing measures, overlaps with factors such as teacher relationships and family relationships, it was removed, and its items were relocated to the sub-factors of teacher relationships and family relationships.

4.1.4 2nd expert consultation

The content validity of the six subscales and 30 items developed through the initial expert consensus was further evaluated through a second round of expert consensus involving 15 early childhood education specialists. The content validity was assessed using a Likert 5-point scale ranging from ‘Not at all appropriate’ 1 point to ‘Highly appropriate’ 5 point. The content validity ratio (CVR) was calculated according to [Lawshe's \(1975\)](#) formula, which is as follows:

$$CVR = \frac{N_e - N / 2}{N / 2}$$

N represents the total number of expert panelists, while N_e refers to the number of expert panelists who rated the item as high (4 and 5 points). A higher CVR value indicates higher content validity of the item. According to [Lawshe \(1975\)](#), when there are 15 evaluators, a CVR value of at least 0.49 is considered necessary to ensure validity. Therefore, in this study, items 3 and 17 with CVR values below 0.49 were removed. Consequently, through the second round of expert consensus on content validity, a total of six subscales and 28 items were established.

4.2 Pilot testing

A pilot test was conducted to assess the comprehension of the happiness scale items among 15 children aged 3–5 years. Measurements were conducted through individual interviews between the researcher and each child in a quiet and focused kindergarten counseling room. The children demonstrated understanding of each item on the happiness scale and also comprehended the measurement method, which involved selecting and marking one of five differently sized circles drawn on cards. Therefore, it was confirmed that all 28 items and the measurement method were well understood by the children.

4.3 The main study

4.3.1 The item discrimination and item-total correlation of the scale measuring children's happiness

The item discrimination involved analyzing differences between upper and lower groups, with each group consisting of 27% based on item scores. Items with non-significant CR values (< 3) were deleted from the analysis. Consequently, all items of the Children's Happiness Scale were retained as they met the criteria. Furthermore, correlation analysis was conducted between overall children's happiness and each item. Items with item-total correlations below 0.30 were considered for deletion due to poor homogeneity. As shown in [Table 2](#), all 28 items of the Children's Happiness Scale demonstrated high homogeneity with item-total correlations exceeding 0.30.

4.3.2 Exploratory factor analysis of the children's happiness scale

Before conducting exploratory factor analysis to confirm the construct validity of the Children's Happiness Scale, we assessed whether the collected data were suitable for factor analysis by performing the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. A KMO value closer to 1 indicates high inter-correlation among the factors, with values above 0.70 indicating suitability for factor analysis and higher validity. Bartlett's test assesses whether the observed variables intercorrelate significantly, with a significance level below 0.05 indicating that the data are suitable for factor analysis. The KMO value was 0.89, and Bartlett's test of sphericity yielded a statistically significant result of 3898.48 ($df = 378$, $p < 0.001$). Thus, the collected data are suitable for factor analysis, indicating the presence of common factors.

As shown in [Table 2](#), the results of exploratory factor analysis revealed that the overall explained variance of the Young Children's Happiness Scale was 65.50%. Specifically, Factor 1, which accounted for 12.64% of the variance, consisted of 5 items. This factor evaluated

both positive and negative emotions such as joy, sadness, boredom, loneliness, and anger, hence named “Emotion.” Factor 2, explaining 12.34% of the variance, included 4 items after excluding items 12 and 22, which showed correlations above 0.40 with multiple factors. This factor assessed children’s peer relationships and support received from peers, hence named “Peer Relations.” Factor 3, explaining 11.32% of the variance, consisted of 4 items. This factor evaluated children’s relationships with teachers and the support received from teachers, hence named “Teacher Relations.”

Factor 4 explains 10.16% of the variance and includes 4 items, excluding item 16, which shows correlations above 0.40 with other factors. This factor evaluates children’s abilities to do things well or have things they can do well, so it is named ‘Achievement’. Factor 5 explains 9.69% of the variance and includes 4 items. This factor evaluates children’s autonomy and freedom in their daily lives, so it is named ‘Autonomy and Freedom’. Factor 6 explains 9.35% of the variance and includes 4 items. This factor evaluates children’s family relationships and support from their family, so it is named ‘Family Relationships’. Therefore,

TABLE 2 Exploratory factor analysis of preschoolers’ happiness scale.

Item	Factors						Communality
	1	2	3	4	5	6	
T11	0.79						0.71
T10	0.75						0.72
T21	0.73						0.64
T1	0.72						0.57
T18	0.68						0.67
T19		0.82					0.78
T3		0.79					0.76
T20		0.74					0.65
T2		0.72					0.61
T12		0.62	0.60				0.77
T22		0.58	0.56				0.69
T23			0.78				0.74
T24			0.73				0.70
T5			0.70				0.68
T4			0.65				0.54
T25				0.80			0.69
T15				0.76			0.61
T8				0.75			0.70
T9				0.69			0.58
T16	0.41			0.46			0.41
T27					0.81		0.72
T6					0.79		0.67
T26					0.76		0.63
T17					0.72		0.57
T7						0.80	0.74
T14						0.78	0.68
T13						0.75	0.60
T28						0.72	0.61
Eigenvalue	3.54	3.46	3.17	2.85	2.71	2.62	
Explained variance	12.64	12.34	11.32	10.16	9.69	9.35	
Cumulative variance	12.64	24.98	36.30	46.46	56.15	65.50	

TABLE 3 The model fit of the children’s happiness scale was assessed.

	χ^2	df	χ^2 / df	RMSEA	GFI	AGFI	CFI	IFI	NFI	TLI
Model	302.70	260	1.16	0.03	0.92	0.90	0.98	0.98	0.91	0.98

the scale of children's happiness was revised to 25 items by deleting items 12, 16, and 22. The results are depicted in Table 2 and Figure 2.

4.3.3 Confirmatory factor analysis of the scale of children's happiness

As shown in Table 3, to verify construct validity, confirmatory factor analysis was conducted, and the fit indices of the measurement model are as follows. Generally, when GFI, AGFI, CFI, IFI, NFI, and TLI values are above 0.90 and RMSEA value is below 0.05, it indicates a good fit of the model. The fit indices of the model for the developed Children's Happiness Scale in this study are as follows: $\chi^2 = 302.70$ (df = 260), RMSEA = 0.03, GFI = 0.92, AGFI = 0.90, CFI = 0.98, IFI = 0.98, NFI = 0.91, TLI = 0.98, indicating that all indices meet the recommended fit criteria.

Furthermore, to explain the relationships between variables in the children's happiness model, parameter estimates were obtained using maximum likelihood estimation. The results are depicted in Figure 3.

4.3.4 Convergent validity of the children's happiness scale

Convergent validity was assessed by the Average Variance Extracted (AVE) and Construct Reliability (CR). AVE above 0.5 and CR above 0.7 were considered evidence of convergent validity. AVE was larger than 0.5 for both emotion (AVE = 0.57), Relationship of peer (AVE = 0.65), Relationship of teacher (AVE = 0.59), Relationship of family (AVE = 0.53), Achievement (AVE = 0.53) and Autonomy and Freedom (AVE = 0.53) attesting the convergent validity of all the first order constructs (Lazemi and Barkhordari-Sharifabad, 2023; Lu et al., 2023) (see Table 4).

4.3.5 Discriminant validity of the children's happiness scale

Evidence of discriminant validity between first order constructs was assessed with the criterion of the Heterotrait-Monotrait ratio

(HTMT). HTMT below 0.9 was considered evidence of discriminant validity (Sharif-Nia et al., 2023). According to the HTMT, more liberal criterion discriminant validity was observed between the 6 engagement constructs (see Table 5).

4.3.6 Age-invariance analyses and sex-invariance analyses

Table 6 shows changes in CFI and RMSEA values lower than 0.010 and 0.015, respectively, between the successive constrained models for the 6 factor correlated structure. Therefore, the null hypothesis of invariance across gender and age cannot be rejected.

4.3.7 The reliability of the children's happiness scale

To assess the reliability of the Children's Happiness Scale, Cronbach's α coefficient was calculated. The overall reliability of the Children's Happiness Scale was found to be 0.91. Moreover, the reliability coefficients for each subscale were as follows: emotionality ($\alpha = 0.87$), peer relationships ($\alpha = 0.88$), teacher relationships ($\alpha = 0.85$), family relationships ($\alpha = 0.81$), achievement ($\alpha = 0.82$), and autonomy/freedom ($\alpha = 0.81$). Therefore, it was confirmed that the final developed Children's Happiness Scale is a highly reliable tool.

4.3.8 Subfactors and items of the final scale for children's happiness

The subfactors and items of the final scale for children's happiness are as follows (see Table 7).

5 Discussion

Firstly, regarding the discussion on the subscales and measurement method of the happiness scale: Existing happiness

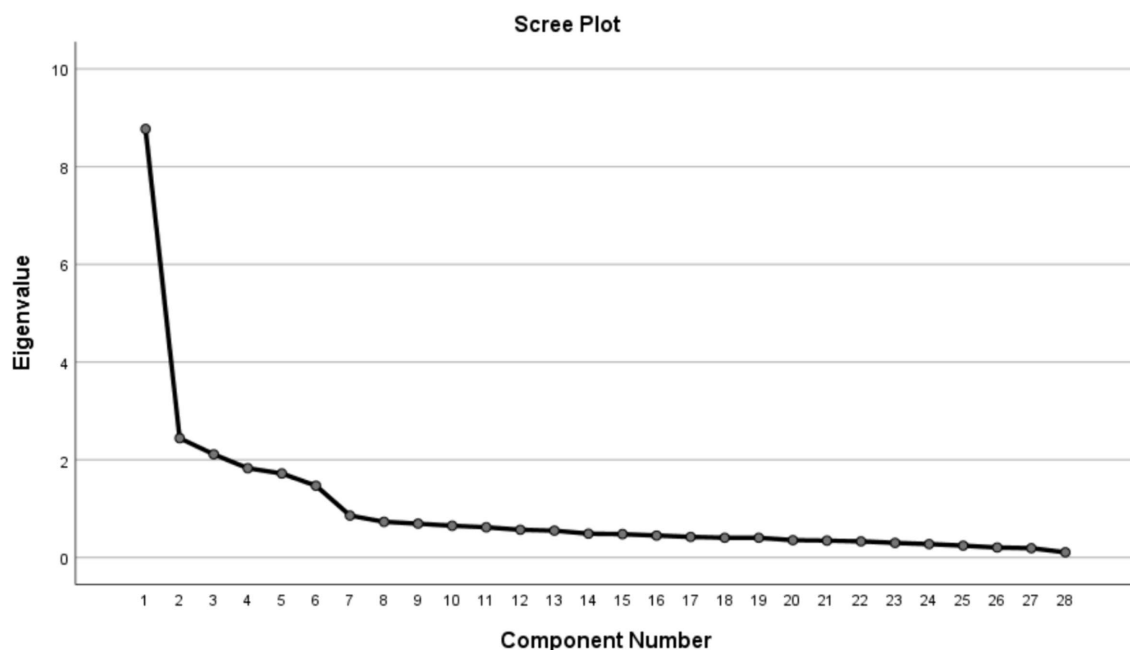


FIGURE 2
Results of the screen test for the scale of children's happiness.

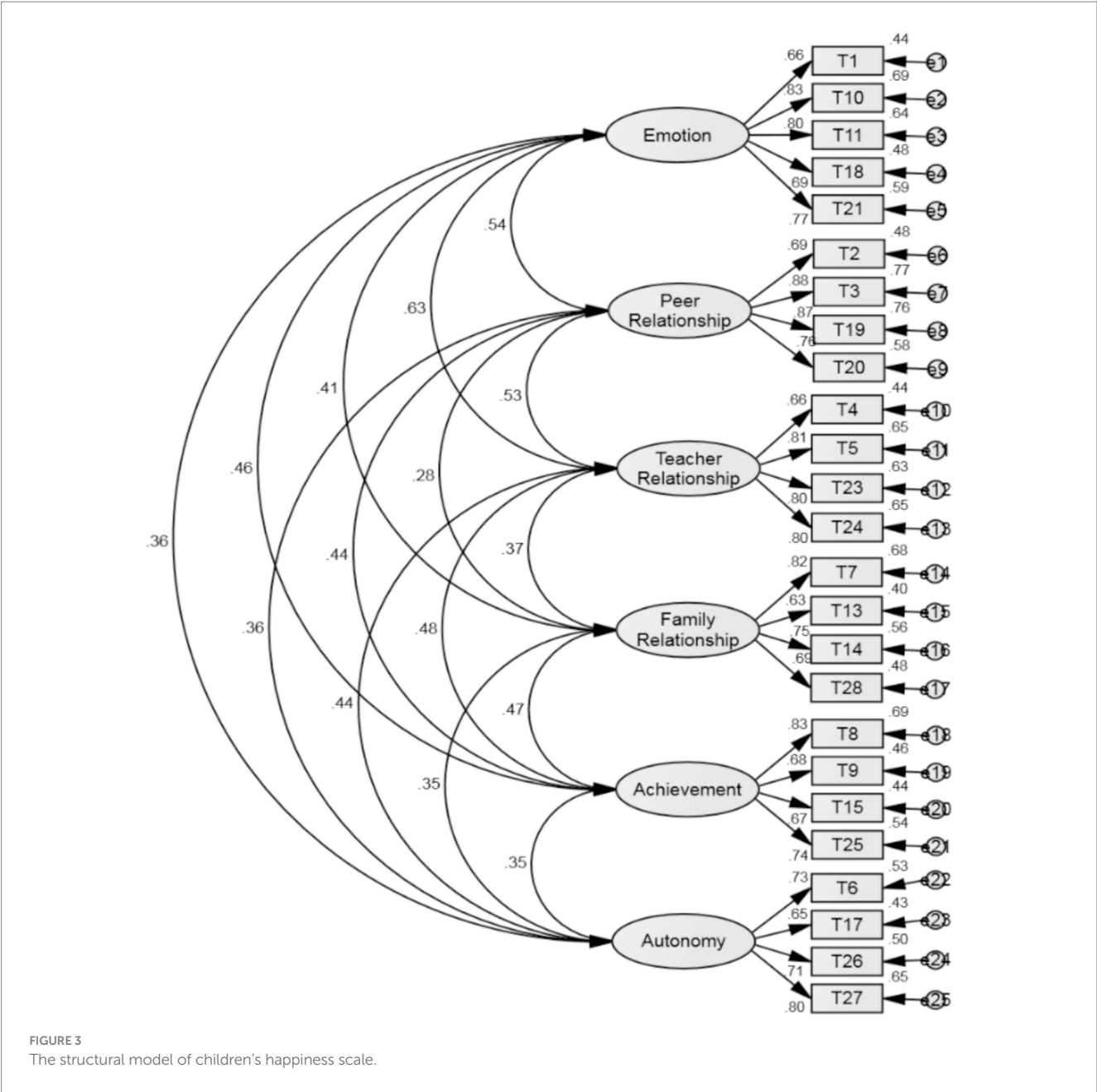


TABLE 4 Convergent validity evidence of the scale.

Subfactor	Number of item	AVE	CR
Emotion	5	0.57	0.87
Peer relationships	4	0.65	0.88
Teacher relationships	4	0.59	0.85
Family relationships	4	0.53	0.82
Achievement	4	0.53	0.82
Autonomy and freedom	4	0.53	0.82

scales for Chinese children mainly targeted adolescents and adults. Happiness scales developed for preschoolers had limitations such as

measuring only subjective happiness (Wang and Yang, 2013) or being limited to 5-year-old children (Qu, 2018). In this study, we addressed the limitations of existing preschool happiness measurement tools and developed a scale that can measure the happiness of Chinese preschoolers aged 3–5 years. The developed happiness scale comprises six subscales: Emotions, Peer Relationships, Teacher Relationships, Family Relationships, Achievement, and Autonomy and Freedom. This is consistent with previous research that identified emotions (Wang and Yang, 2013; Lee H, 2015; Jung and Shim, 2019; Lee and Kim, 2020) peer relationships (Lee, 2010; Lee and Seo, 2015; Lee H, 2015; Qu, 2018), teacher relationships (Kim and Kim, 2008; Jeon and Lim, 2014; Lee H, 2015; Lee and Kim, 2020) family relationships (Lee, 2010, 2016; Lee and Seo, 2015; Lee H, 2015), achievement (Kim and Kim, 2008; Jeon and Lim, 2014; Qu, 2018), and autonomy and freedom (Qu, 2018) as subfactors of children's happiness.

TABLE 5 Heterotrait-Monotrait ratio of discriminant validity evidence.

Heterotrait-Monotrait ratio (HTMT)	1	2	3	4	5	6
Emotion	–					
Peer relationships	0.53	–				
Teacher relationships	0.63	0.54	–			
Family relationships	0.42	0.29	0.36	–		
Achievement	0.46	0.45	0.47	0.46	–	
Autonomy and freedom	0.34	0.37	0.43	0.35	0.35	–

TABLE 6 Age-invariance analyses and sex-invariance.

Model	χ^2	<i>df</i>	<i>P</i>	CFI	RMSEA	$\Delta\chi^2$	Δdf	ΔP	ΔCFI	$\Delta RMSEA$
Age invariance analysis										
Unconstrained	967.59	845	0.002	0.960	0.023					
Measurement weights	982.49	864	0.003	0.962	0.023	14.90	19	0.729	0.002	0.000
Structural covariances	1016.06	885	0.001	0.958	0.024	48.47	40	0.168	−0.002	0.001
Measurement residuals	1057.49	910	0.000	0.952	0.025	89.90	65	0.022	−0.008	0.002
Gender invariance analysis										
Unconstrained	599.74	520	0.009	0.960	0.023					
Measurement weights	624.44	539	0.006	0.962	0.023	24.70	19	0.171	0.002	0.000
Structural covariances	640.19	560	0.010	0.958	0.024	40.45	40	0.450	−0.002	0.001
Measurement residuals	676.84	585	0.005	0.952	0.025	77.10	65	0.145	−0.008	0.002

TABLE 7 Composition of subfactors in the final preschoolers' happiness scale.

Subfactor	Content	Item	Number of item
Emotion	Positive, negative emotion	1, 10*, 11*, 16*, 19*	5
Peer relationships	Close peer relationships and peer support	2, 3, 17, 18	4
Teacher relationships	Close teacher relationships and teacher support	4, 5, 20, 21*	4
Family relationships	Relationship with parents, parental care and love, support from family	7, 12, 13, 25*	4
Achievement	Happiness derived from achievement	8, 9, 14, 22	4
Autonomy and freedom	Happiness derived from freedom	6, 15, 23, 24	4
Total			25 items

*Items for reverse coding.

Furthermore, existing happiness measurement tools for preschoolers primarily used self-reporting by children (Kim and Kim, 2008; Wang and Yang, 2013; Jeon and Lim, 2014; Lee and Seo, 2015; Lee H, 2015; Lee S, 2015; Qu, 2018), teacher ratings (Lee, 2010, 2016; Lee and Seo, 2015), or maternal ratings (Dehghani et al., 2016). In this study, we opted for self-reporting by preschoolers as the measurement method. Happiness is subjective in nature (Diener, 1995), and individuals evaluate their happiness based on their own subjective criteria. Therefore, self-reporting by children is the most appropriate, truthful, and accurate method to assess an individual's happiness. Secondly, regarding the discussion on the validity and reliability of the happiness scale: At first, through literature review, preschooler interviews, and expert consultations, the subscales and evaluation criteria of the preschooler happiness scale were developed. Subsequently, discriminant validity and item-total correlations

confirmed that the scale was composed of distinct and internally consistent items. Exploratory factor analysis revealed that the happiness scale consisted of six subscales and 25 items. Confirmatory factor analysis was conducted to validate construct validity, and all fit indices indicated satisfactory model fit. Additionally, the reliability test of the happiness scale showed significant correlations ranging from 0.81 to 0.91, demonstrating strong internal consistency. In conclusion, this study not only contributes to the theoretical foundation of preschoolers' happiness but also provides valuable information for the development of future educational programs tailored to promoting happiness among preschoolers. The limitations of this study and suggestions for future research are also discussed. It is hoped that future research will address the limitations identified and further explore various factors that contribute to and maintain preschoolers' happiness through qualitative research methods.

6 Conclusion

This study was conducted to develop a scale measuring happiness in Chinese preschoolers and to validate the reliability and validity of the tool. The conclusions drawn from the results of this study are as follows. Firstly, existing research on happiness scales for preschoolers both domestically and internationally was analyzed, and based on interviews with preschoolers and two rounds of content validity verification by experts, the subfactors and items of the preschooler happiness scale were constructed. Subsequently, a pilot test was conducted to assess the understanding of the happiness scale items among 15 Chinese preschoolers aged 3–5 years. The main study was then carried out with 269 preschoolers to confirm the validity and reliability of the preschooler happiness scale items. It was confirmed that the items were composed of content with high discrimination and homogeneity through item discrimination analysis and item-total correlation analysis. Exploratory factor analysis revealed that the happiness scale consisted of six subfactors: emotion, peer relationships, teacher relationships, family relationships, achievement, autonomy, and freedom, with a total of 25 items. Confirmatory factor analysis and analysis of invariance by age and gender were conducted to verify construct validity, and all indices met the recommended levels of adequacy. The overall reliability of the preschooler happiness scale was 0.91, and by subfactor, it was 0.87 for emotion, 0.88 for peer relationships, 0.85 for teacher relationships, 0.81 for family relationships, 0.82 for achievement, and 0.81 for autonomy and freedom. Therefore, it was confirmed that the final developed preschooler happiness scale is a highly reliable tool. Happiness in young children is not just a fleeting aspect that affects personal development and social integration, but a crucial factor starting from an early age that continuously influences quality of life and human development into adulthood. Many countries recognize the importance of fostering children's happiness to promote future generations' progress and social stability. China, amidst rapid social and economic changes, has shown increasing interest in the growth and education of young children. However, research on happiness among Chinese children remains limited, with few studies focusing on parents or early childhood educators. Existing happiness scales developed for Chinese children have limitations, such as measuring only subjective happiness or assessing only 5-year-olds. In contrast, previous studies in other countries have separately measured psychological happiness, social happiness, and subjective well-being. Moreover, happiness is a highly subjective concept where individual cognitive and evaluative assessments of one's life impact happiness more than objective living conditions. Therefore, it is crucial to develop integrated happiness assessment tools suitable for young children that reflect their thoughts and perceptions. Recent studies indicate that Chinese children exhibit high levels of autonomy-related happiness but lower levels of autonomy itself. Hence, this study considers cultural factors and children's home environments in China. Continued research to assess happiness levels among young children, especially in China, should focus on developing

reliable and valid scales that can objectively and accurately measure children's happiness.

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 humans were approved by the ethics committee of Shinhan University. The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation in this study was provided by the participants' legal guardians/next of kin.

Author contributions

JX: Writing – original draft, Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Validation. JC: Writing – review & editing, Conceptualization, Supervision.

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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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EDITED BY

Martijn Burger,
Open University of the Netherlands,
Netherlands

REVIEWED BY

Joshua Ray Tanzer,
Lifespan, United States
Nidhi Kaushal,
Indian Institute of Technology Delhi, India

*CORRESPONDENCE

Yufei Mao
✉ maoyufei1990@126.com

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Digital technology and psychological happiness: the mediating roles of interpersonal relationships and employment situations

Wenxin Hu¹, Ziwen Zhang¹, Xinyue Qu¹ and Yufei Mao^{2*}

¹School of Economics and Management, Beijing Institute of Petrochemical Technology, Beijing, China, ²School of Labor Economics, Capital University of Economics and Business, Beijing, China

Psychological happiness represents the ultimate pursuit of human beings, and the impact of digital technology on psychological happiness is becoming increasingly significant in the era of the digital economy. Based on data from 2020 China Family Panel Studies (CFPS), this study constructs an empirical model that examines the effect and mechanism of digital technology on happiness. Additionally, this study investigates the heterogeneity and robustness of the impact of digital technology on happiness. The research conclusions are as follows: Firstly, digital technology can promote psychological happiness. When controlling for other factors, the marginal effect coefficient of digital technology is 0.031. Secondly, the effect of digital technology on personal happiness varies among different groups, particularly among women, young individuals, primary and college graduates, and rural residents. Furthermore, as absolute income increases, the happiness effect of digital technology diminishes. Thirdly, in terms of the influencing mechanism, digital technology indirectly affects individual happiness by influencing health status, interpersonal relationships, employment situations and income levels. Specifically, digital technology negatively impacts personal health, interpersonal relationships, and agricultural work, while positively impacting family relationships, non-agricultural employment, absolute income and relative income. Digital technology affects happiness through these channels indirectly. Based on the study results, it is proposed that efforts should be made to enhance the development of digital technology infrastructure in remote rural areas, reduce the financial burden associated with digital technology, and promote the digital technology ecosystem. Moreover, providing online services, such as e-commerce, travel reservations, and digital financial management, can improve access to digital technology in rural areas and contribute to increased happiness levels. Simultaneously, there is a need to strengthen digital skills training, particularly among vulnerable populations such as the elderly and rural residents, to improve their proficiency in digital technologies. This can be achieved through the integration of additional educational resources, thereby facilitating cost-free digital technology training and guidance. Meanwhile, it is essential to vigorously develop the new economy and innovative employment models, create job opportunities, foster entrepreneurial prospects, and improve income levels to enhance individual well-being.

KEYWORDS

psychological happiness, digital technology, influencing mechanism, interpersonal relationship, employment status

Introduction

Aristotle once said: “Happiness is the best,” that is, the ultimate goal of life is to seek happiness. With the development of social economy in the new era, residents’ pursuit has shifted from predominantly material and cultural desires to an ardent pursuit for life quality, and “improving people’s happiness” is becoming the main theme of people’s livelihood issues (Munene et al., 2022; Saida et al., 2021). In recent years, the word “happiness” frequently appears in various news, government reports and academic research. The enhancement of happiness is not only a primary objective of economic development and governmental initiatives, but also yields numerous tangible advantages for individuals (Srivastava et al., 2022; Yuan et al., 2021). The report of the 19th National Congress of the Communist Party of China in 2017 clearly pointed out that “people’s happiness should be more substantial, more secure and more sustainable.” In 2021, Premier Li Keqiang further pointed out that government should effectively implement livelihood projects and continuously enhance the “happiness index” of people’s livelihood. Subsequently, the term “happiness” gained prominence in the discourse of the Tenth Five-Year Plan and government reports and well-being of residents emerged as a key focal point in the government’s policy agenda. According to the United Nations Global Happiness Index Report 2020, the happiness index of China residents is 5.585, ranking 72nd in the world, which is lower than the global average happiness level. The World Happiness Report suggests that despite China’s rapid economic growth since the 1990s, there has been no significant increase in the country’s happiness index. Instead, there has been a fluctuation, with an initial decrease followed by an increase. This trend can be attributed to the changes in the employment and social security system during the economic transformation (Easterlin et al., 2017). How to enhance residents’ well-being and address their needs more effectively has become a crucial guarantee for fostering the harmonious and sustainable growth of the social economy.

In the era of digital economy, digital technology is assuming a growing significance in individuals’ daily lives, offering enhanced convenience and efficiency to support and assist them (Ai-Rawashdeh, 2021). Since the 21st century, digital technology and information technology have flourished around the world, and have penetrated into all areas of people’s daily lives, subtly changing people’s ways of study, work, social interaction and leisure (Karabacak and Gen, 2019). According to National Population Census of China Database, the proportion of urban population in China is 45.4%, and that of rural population is 54.6%. In rural areas of China, due to the lack of digital infrastructure and low education levels, the rural utilization rate of digital technology is relatively low. Meanwhile, the rural population in China accounts for 54.6% of the total population, resulting in national utilization rate of digital technology is not high. The network economy has emerged as a key driver of national development and digital technology applications such as instant messaging, social platforms, mobile payment and online entertainment are reshaping the lifestyle of residents. Based on the theories of technological progress and labor economics, the advancement of digital technology is expected to enhance the convenience of daily life and optimize work efficiency. Furthermore, it is projected to elevate social interaction and income levels, ultimately contributing to the overall increase in happiness and well-being (Krueger, 1993; Kuhn and Mansour, 2014). Considering the advancing digital economy and the expanding depth

and breadth of digital technology application, can digital technology improve personal happiness? What is the influence mechanism? In which groups is the happiness effect of digital technology more obvious? How to prevent internet addiction and maximize the benefits of online resources? These studies hold significant practical implications for improving personal happiness under the background of digital economy.

The study of happiness belongs to the interdisciplinary research field, which first started in psychology and sociology, and then gradually attracted the attention of economics (Hood et al., 2021; Rossouw et al., 2021). Happiness economics originated from the well-known “Easterlin Paradox,” which primarily examines the correlation between national income and happiness. It posits that happiness is influenced not only by increases in absolute income but also by comparisons of relative income and external factors beyond income. Based on the research from the perspective of economic income, this paper primarily explores the variations in happiness on absolute income, relative income, social status, values and consumption. Based on the research of non-income factors, it focuses on the demographic factors, such as gender, age, household registration, health, marriage and education, as well as variables such as work status, family factors and interpersonal factors on happiness (Mohammadi et al., 2022; Bucciol and Burro, 2022; Mackerron, 2012). The latest research also delves into the relationship between economic globalization, public services and other policy factors (Saida et al., 2021). Nevertheless, with the rapid advancement of digital technology, it is worth noting that scholarly attention towards the impact of digital technology on happiness is increasingly gaining favor (Graham and Nikolova, 2013), but the research conclusion is controversial, and there is a lack of analysis on the causal mechanism of digital technology’s impact on happiness, as well as the heterogeneity of individual happiness effects of digital technology.

Different from the existing literature, the contributions of this paper are as follows: Firstly, previous studies neglected the study of different mechanisms, and most of them only focused on interpersonal relationship. This paper discusses the indirect influence of digital technology on happiness from the perspectives of health status, family and interpersonal relationship, employment status and income levels. Secondly, previous studies have missed the heterogeneous influence of digital technology on their happiness in different situations. This paper investigates the happiness effect of digital technology among people varying ages, genders and academic qualifications. Thirdly, prior studies have overlooked the endogenous issue related to digital technology, consequently impacting the reliability of their research findings. In this paper, the CMP model is used to discuss the endogenous problems, and the robustness of the research conclusions is tested by 2018 CFPS data.

Literature review and theoretical framework

Direct impact of digital technology on psychological happiness

With the advancement of the digital economy and the enhancement of material living standards, the influence of digital technology on residents’ lives has garnered significant attention

(Zhu and Leng, 2018; Zuo, 2021). Scholars have conducted extensive discussions on digital technology and its impact on interpersonal communication and employment methods. Happiness, as one of the important indicators of subjective well-being in people's lives (Tella et al., 2003), understanding the mechanism of digital technology's impact on happiness is of great practical significance for building a harmonious society and promoting people's welfare. The study of digital technology and happiness first began from the perspectives of psychology and sociology (Lohmann, 2013). Research in psychology examines the correlation between digital technology and mental health, loneliness, and life satisfaction (Ulukan and Ulukan, 2021; Kraut and Burke, 2015). On the other hand, research in sociology delves into the connection between digital technology and factors like interpersonal communication, social networks, and social support, which subsequently influence personal happiness (Lee et al., 2011). Later on, economic research utilizing empirical models to examine the relationship between digital technology and happiness has been extensively discussed. It has been confirmed that digital technology enhances personal happiness. For example, using data from the 2008 European Values Survey, Pénard et al. (2013) found that digital technology had a positive impact on personal happiness, especially for young people or those with low incomes. Zhu and Leng (2018) demonstrated that the utilization of digital technology substantially enhanced residents' subjective well-being. This impact remained significant even after incorporating other control variables and considering regional disparities. Moreover, the positive effect on happiness among rural residents surpasses that of urban residents. The reason why digital technology can bring about happiness is twofold. Firstly, digital technology offers online entertainment like literature, music, videos, games, and various applications and services, which directly or indirectly benefit individuals. Secondly, digital technology provides new communication channels such as instant messaging, microblogging, social networking sites, which enhance interpersonal emotional communication, facilitate contact and alleviate life pressures. In addition, people obtain information by browsing online news and utilizing search engines. Online business activities such as online shopping, online payment, and travel booking bring convenience to life, which positively affects individual happiness.

Other studies pointed out that digital technology was a double-edged sword. Kraut and Burke (2015) noted that while connectivity can broaden access to information and enhance personal happiness, it can also have adverse effects. Excessive use of digital technology can lead to Internet addiction, social isolation and psychological stress. Graham and Nikolova (2013) used Gallup World Poll data to explore the impact of information technology access on well-being. They found that overall use of phones, television and digital technology had a positive impact on happiness, but this impact had diminishing marginal returns and also brought some negative psychological anxiety. Nie et al. (2016) found that digital technology has a negative effect on happiness. Weiser (2001) argued that utilizing the emotion regulation function of digital technology decreases happiness by reducing social integration. Utilizing the information gathering function of digital technology increases social integration and thus has a positive effect on happiness. A study showed that the duration of digital technology was negatively correlated with happiness. Information collection through digital technology has a positive effect on happiness, while using digital technology for emotional expression does not have a significant effect on happiness. Shen et al. (2014) concluded that access to information through digital

technology and online dating had a significant positive effect on happiness. Conversely, digital technology entertainment had a significant negative effect on happiness. Additionally, social support was found to play a mediating role between digital technology and happiness.

The indirect impact of digital technology on psychological happiness

The influence of digital technology on happiness is complicated. In addition to directly affecting happiness, numerous intermediary or moderating variables may play a role in indirectly affecting happiness. In the study of happiness economics, the factors that affect happiness are divided into economic factors and non-economic factors, among which, health status, family and interpersonal relationships, work factors and income factors are deemed crucial in determining personal happiness (Mackerron, 2012), and digital technology may indirectly affect happiness by influencing these intermediary variables.

Health status has a strong positive impact on happiness (Mohammadi et al., 2022), and digital technology will affect personal psychological and physical health, subsequently impacting their overall happiness. With regard to the relationship between digital technology and health status, early studies mainly focused on the problem of Internet addiction caused by excessive usage of digital technology. It is hypothesized that the utilization of digital technology may diminish individuals' mental health level, amplify feelings of social isolation, and potentially trigger psychological ailments such as depression (Kraut and Burke, 2015). At the same time, unhealthy digital technology habits and prolonged screen time are also likely to adversely affect physical well-being, for example, resulting in physical discomfort such as reduced visual acuity and neck pain (Zheng et al., 2016). However, some studies believe that using digital technology has a better mental health level and a higher sense of happiness than not using it. The interpersonal communication and mass communication functions of digital technology can interfere with personal health, and using digital technology can contribute to the promotion of health knowledge and improve health literacy, thus changing their own health attitudes and behaviors.

Interpersonal communication plays a pivotal role in fostering individuals' happiness (Doley and Anbarasan, 2021). Prior research has demonstrated that engaging in communication with friends and family or participating in group activities, can enhance the quality of social support and interpersonal connections, ultimately leading to heightened happiness (Diener et al., 2013). In reality, digital technology not only facilitates the expansion of weak ties by enabling the establishment of new connections through social media, but also aids in sustaining existing close relationships, thus enabling individuals to receive heightened emotional support (Ellison et al., 2014). Simultaneously, the openness and inclusivity of digital technology broaden the realm of interpersonal communication, enhancing its extensiveness and autonomy. Moreover, by concealing identity and lacking physical presence, it diminishes interpersonal trust and emotional connection in real life (Shen et al., 2014). Nevertheless, as individuals increasingly rely on digital technology and scholarly investigation deepens, researchers have observed that digital technology diminishes individuals' temporal time and availability in face-to-face interactions. The interpersonal network formed through digital means is often deemed unreliable, thus potentially impeding genuine communication. This phenomenon can be attributed to a substitution

dynamic between digital technology and authentic interpersonal communication. Specifically, digital technology consumption displaces the time allocated for face-to-face social engagements, while low-quality network connections supplant high-quality interpersonal relationships. These trends collectively exert a notable adverse influence on individuals' interpersonal connections. Additional studies have confirmed that despite visual communication can be achieved through the Internet, face-to-face interactions continue to hold significance in developing long-term relationships and mutual support (Lee et al., 2011).

Employment status is a crucial variable in determining happiness (Wolfe and Patel, 2021; Bucciol and Burro, 2022), and digital technology will significantly affect personal employment decisions, thereby impacting happiness. Feldman and Klaas (2002) found that managers and professionals are more inclined to utilize digital technology for job searches, and the efficiency of this search method exceeds that of traditional newspaper and telephone advertisements. Pierewan and Tampubolon (2014) used European Social Survey and found that employing digital technology to cope with unemployment amidst the financial crisis substantially enhanced individual happiness. Scholars have also conducted empirical studies to investigate the effects of digital technology on employment, highlighting that digital technology can notably enhance the job security and elevate the job quality of floating population. Further research has indicated that accessing professional and business information via digital technology can increase the likelihood of entrepreneurial ventures (Karabacak and Gen, 2019), particularly in the context of opportunistic entrepreneurship. This is because, on the one hand, using digital technology for online job applications helps to reduce market information asymmetry, enhances the efficiency of job seekers in submitting resumes and browsing recruitment websites (Kuhn and Mansour, 2014). On the other hand, digital technology skills also mean higher investment and accumulation of human capital, and the resulting signal function aids employers identify potential individuals with higher labor productivity. In addition, the digital technology platform not only alleviates physical job demands but also enhances employment flexibility by reducing commuting time and mitigating workplace disruptions (Bloom et al., 2015).

Income is recognized as a pivotal determinant of subjective well-being, with an extensive body of empirical literature exploring the intricate interplay between relative income, absolute income, and happiness (La et al., 2021), and it is posited that digital technology will have an impact on the absolute income and relative income. Judging from the relationship between digital technology and absolute income, existing studies have demonstrated a positive correlation between digital technology and individual wage income (Li and Xie, 2017). On the one hand, leveraging digital technology in the workplace has the potential to enhance operational efficiency and stimulate individuals to participate in more innovative and creative professional endeavors. On the other hand, the swift advancement of digital technology has led to a heightened requirement for specialized workforce, resulting in an amplified "complementary effect" between technological evolution and skilled labor. This synergy has subsequently led to elevated wage premiums for individuals proficient in these digital skills (Levy and Murnane, 1996). Several research studies have indicated that the wage premium associated with digital technology extends beyond its utilization in the workplace, as engaging with digital technology in domestic settings can also enhance individuals' earnings by fostering the development of information technology human capital (Krueger, 1993; Dimaggio and Bonikowski, 2008). In the context of the correlation

between digital technology and relative income, initial investigations have posited that television viewing represents an additional factor in elucidating the "happiness-income" paradox. This is attributed to the notion that television consumption may result in heightened exposure to information, leading to an increase in materialistic aspirations and anxiety levels, consequently diminishing the impact of income on personal happiness (Bruni and Luca, 2006). It is identified that digital technology broadens the sphere of income comparisons, subsequently influencing individuals' self-perception and evaluations of their socio-economic status, thus indirectly impacting their subjective happiness.

According to the literature review, based on the theory of happiness economics, the main factors affecting happiness are health status, family and interpersonal relationships, employment status, absolute income and relative income. The influence mechanism of digital technology on happiness is complicated. On the one hand, digital technology can directly contribute to individual happiness, including entertainment, information access, and life convenience, can directly enhance personal happiness. On the other hand, digital technology can indirectly affect happiness by changing personal health status, interpersonal relationship, employment status and income level. Therefore, when analyzing the influence of digital technology on happiness, it is necessary to not only consider the overall effect on happiness, but also to delve into the intermediary variables, in order to gain a more profound understanding of the mechanisms by which digital technology influences happiness. The theoretical framework constructed in this paper is shown in Figure 1.

Materials and methods

Data sources and variable descriptions

The empirical analysis utilizes data from the 2020 China Family Panel Studies (CFPS). The China Family Panel Studies (CFPS) is a large-scale comprehensive social science research project led by the Institute of Sociology, Chinese Academy of Social Sciences. The project aims to comprehensively understand China's social changes and their impact on family structure, population health, education level, economic status, and other aspects through long-term tracking surveys. The survey scope of CFPS includes a comprehensive sample of 32,669 adults, which covers 25 provinces and regions in China, striving to reflect the socio-economic characteristics and cultural diversity of different regions in China. The survey questions cover a wide range of areas, including but not limited to the basic information of family members, marriage and childbirth, education and occupation, health and medical care, social relations and networks, family income and property, living conditions and community environment, etc.

The cultural background of CFPS is that China is undergoing rapid socio-economic transformation, which not only changes the frequency of residents' use of digital technology, but also has an impact on residents' happiness and other aspects. Specifically, this study focuses on the working-age population (16–65 years old) as the sample. The missing samples of key variables such as digital technology and happiness were cleared, leading to a final sample size of 10,161 participants. The paper selects and provides explanations for the key research variables as follows:

- 1 Explained variable: psychological happiness. This article selects the indicator "How happy do you feel?" The measurement of

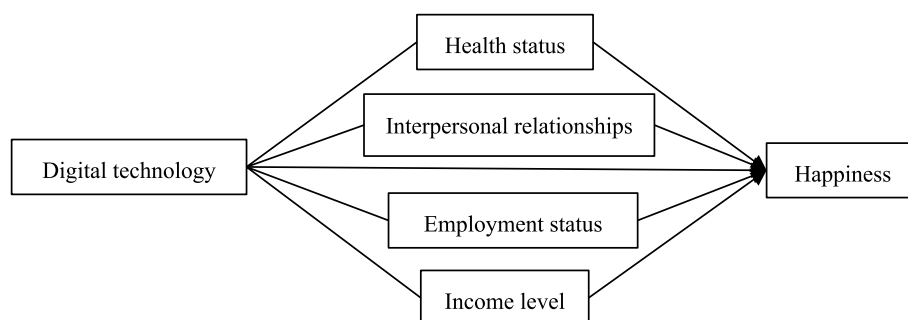


FIGURE 1
The theoretical framework.

happiness is based on a 5-point scale, where 1 represents very unhappy and 5 represents very happy. The higher the score, the higher the level of happiness.

- 2 Explanatory variable: digital technology. This article selects the indicator “Do you use the Internet in your daily life and work?” from the questionnaire as a variable for the digital technology status, where using digital technology is assigned a value of 1, otherwise it is 0.
- 3 Mediating variables: health status, interpersonal relationships, employment status, income level. Meanwhile, control variables such as personal characteristics and regional characteristics were also included in the study. “Gender,” “age,” “registered permanent residence,” “nation,” “marital status,” and “education level” were selected as variables to measure personal characteristics. The variables “urban/rural classification” and “province or municipality directly under the central government” were selected to measure regional characteristics. The specific variables selected and their meanings are shown in Table 1.

Econometric model

The impact of digital technology on psychological happiness

To examine the impact of digital technology on happiness, this paper utilizes an ordered Probit model for econometric analysis. The benchmark model is set as follows:

$$\text{Happiness} = \alpha + \beta \text{Digital Technology} + \gamma X_1 + \lambda X_2 + \varepsilon \quad (1)$$

In Equation 1, the variable *Happiness* represents the level of happiness, while the variable *Digital Technology* indicates whether or not digital technology is used. The control variables refer to the existing literature. X_1 represents personal characteristics such as gender, age, registered permanent residence, nation, marital status, and education level. X_2 represents regional characteristics such as urban and rural classification and province of residence. In this study, β represents the marginal effect of digital technology on happiness, while γ and λ represent the coefficients of influence for personal and regional characteristics. The term ε represents the random perturbation.

The impact of different digital technology applications on psychological happiness

According to the CNNIC report, individuals use digital technology for various purposes, mainly including online learning, online work, online socializing, online entertainment, and online business.

Relevant studies show that there are differences in the application of digital technology among different gender individuals, with men using digital technology more often for online office and online games, etc., while women are more inclined to use digital technology for social chatting, online shopping and learning and communication. In order to analyze the effect of different digital technology applications on happiness, this paper adds the interaction term of digital technology and the frequency use of different digital technology applications on the basis of the baseline model, and also distinguishes between the full sample and the different gender samples, and constructs the model as shown in Equation 2:

$$\text{Happiness} = \alpha + \beta_0 DT + \beta_i DT \times IU_i + \gamma X_1 + \lambda X_2 + \varepsilon \quad (2)$$

In Equation 2, IU_i denotes the usage frequency of different digital technology applications, such as digital technology for study, work, socialization, entertainment and business activities, etc., and β_i denotes the marginal effect of different digital technology applications on happiness.

The test of the influence mechanism of digital technology on psychological happiness

In order to further explore the influence mechanism of digital technology on happiness, this paper adding mediating variables in the benchmark model and test the influence mechanism of digital technology on happiness, and constructs the model as shown in Equation 3:

$$\text{Happiness} = \alpha + \beta_0 DT + \beta_i \text{mediator}_i + \gamma X_1 + \lambda X_2 + \varepsilon \quad (3)$$

Equation 3 defines *mediator_i* as mediating variables, such as self-assessed health status, family and interpersonal relationships, employment status, and income level. The symbol β_i represents the marginal effect of each mediating variable on happiness.

Descriptive statistics

Table 2 presents the descriptive statistics of the key variables. The research focuses on the working-age population aged 16–65. After

TABLE 1 Variables and descriptions.

Dimensions	Variables	Variable interpretation
Happiness	Psychological happiness	Very unhappy = 1, unhappy = 2, average = 3, happy = 4, very happy = 5
Digital technology	Whether or not you use the internet	Yes = 1, no = 0
Intermediary variable	Health status	Unhealthy = 1, Fair = 2, Fairly healthy = 3, Very healthy = 4, Very healthy = 5
	Family relations	Frequency of interaction and contact with relatives not living with the household (no interaction = 1, infrequent interaction = 3, occasional interaction = 3, frequent interaction = 4)
	Interpersonal relationship	Number of self-rating scores for personal relationships (minimum = 0, maximum = 10)
	Employment status	Non-farm jobs = 1, farming jobs = 2, unemployment = 3
	Absolute income	Logarithmic net <i>per capita</i> household income last year
	Relative income	Relative position of personal income in the locality (very low = 1, very high = 5)
Personal characteristic	Gender	Male = 1, female = 0
	Age	Actual age (in years)
	Registered permanent residence	Urban household registration = 1, Rural household registration = 0
	Nation	Han nationality = 1, non-Han nationality = 0
	Marital status	Married = 1, unmarried = 0
	Education level	Uneducated = 1, Primary education = 2, Junior high school education = 3, High school/technical secondary school = 4, College degree = 5, Bachelor degree = 6, Master degree or above = 7
Regional characteristics	Urban and rural classification	Urban = 1, rural = 0
	Province	Dummy variable for the province or municipality where the survey was conducted

excluding samples with missing key variables such as digital technology and happiness, 10,355 valid samples were obtained, with 6,544 (63.2%) of them have used digital technology applications. In rural areas of China, the low usage rate of digital technology among residents is mainly influenced by various factors. Firstly, inadequate infrastructure is one of the main obstacles restricting the popularization of digital technology in rural areas. Compared with urban areas, the broadband network coverage in rural areas is limited, and the Internet access speed is slow, leading to a greatly reduced experience of using digital devices. Secondly, economic conditions limit the ability of rural residents to purchase and maintain digital devices. The lower income level makes it difficult for many families to afford the cost of devices such as smartphones and computers, thereby limiting the scope of digital technology applications. Furthermore, differences in educational levels are also a major factor. Due to uneven distribution of educational resources, residents in rural areas generally lack digital skills training and information technology education, which directly affects their ability and willingness to use digital technology. In addition, cultural and social habits have also hindered the popularization of digital technology to some extent. Some rural residents may be more inclined to rely on traditional ways of communication and information acquisition, with relatively lower acceptance of new technologies.

The descriptive statistics reveal that individuals who use digital technology have an average happiness score of 4.124, while those who do not have an average score of 3.690. The data indicates that individuals who use digital technology report significantly higher levels of happiness than those who do not. Regarding health and interpersonal interactions, individuals who use digital technology tend to have better health and more frequent contact and communication with their families. However, their scores for interpersonal interactions are relatively lower. Individuals who utilize digital technology have a higher proportion of

non-farming jobs and a lower percentage of farming or unemployment. Their absolute and relative income levels are also significantly higher than those who do not use digital technology. Furthermore, a higher proportion of digital technology users are young, single, and urbanized.

Empirical analysis

The overall impact of digital technology on psychological happiness

Firstly, this section examines the influence of digital technology on happiness. Table 3 presents the estimation results of the benchmark model, and the Wald test of the equation is significant at the level of 1%, which confirms the rationality of the measurement model. After adding digital technology variables and provincial virtual variables to the equation in the first column, the marginal effect coefficient of digital technology is 0.071 and is significant at the level of 1%. The equations in column (2), column (3) and column (4) sequentially add individual characteristic variables such as gender, age, household registration, nationality, marital status and education level, regional characteristic variables such as urban–rural classification. The regression result of column 4 shows that the marginal effect coefficient of digital technology is 0.031, which is significant at the level of 1%, indicating that when other factors are controlled. This shows that digital technology exerts a notable and positive influence on happiness.

From the estimation results of individual characteristic variables, it can be seen that age and happiness show a U-shaped trend, indicating that as age increases, the probability of the happiest person decreases first and then increases. Gender exhibits a statistically significant negative effect on happiness, revealing that women tend to

TABLE 2 Descriptive statistics of variables.

Description of variables	Full sample	Digital technology	Non-digital technology	T-test
Happiness	3.845 (0.990)	4.125 (0.900)	3.690 (1.025)	0.435***
Health status	3.105 (0.008)	3.425 (0.012)	2.958 (0.010)	0.467***
Family relations	3.438 (0.005)	3.531 (0.008)	3.395 (0.007)	0.136***
Interpersonal relationship	7.242 (0.012)	7.203 (0.019)	7.260 (0.015)	−0.057**
Non-agricultural work	0.495 (0.003)	0.799 (0.005)	0.355 (0.004)	0.444***
Farming	0.365 (0.003)	0.099 (0.003)	0.488 (0.004)	−0.389***
Unemployed	0.139 (0.002)	0.102 (0.004)	0.156 (0.003)	−0.054***
Absolute income	9.144 (0.007)	9.491 (0.011)	8.982 (0.008)	0.509***
Relative income	2.529 (0.006)	2.549 (0.01)	2.520 (0.008)	0.029**
Gender	0.528 (0.500)	0.510 (0.478)	0.485 (0.502)	0.025***
Age	42.48 (12.37)	35.24 (10.02)	47.02 (11.28)	−11.78***
Registered permanent residence	0.402 (0.448)	0.641 (0.483)	0.312 (0.413)	0.329***
Nation	0.935 (0.263)	0.953 (0.235)	0.902 (0.285)	0.051***
Marital status	0.868 (0.347)	0.773 (0.426)	0.905 (0.292)	−0.132***
Uneducated	0.201 (0.417)	0.031 (0.136)	0.296 (0.466)	−0.265***
Primary education	0.235 (0.431)	0.141 (0.329)	0.281 (0.455)	−0.140***
Junior high school education	0.316 (0.463)	0.352 (0.472)	0.283 (0.458)	0.069***
High school/technical secondary school	0.151 (0.362)	0.263 (0.437)	0.103 (0.329)	0.160***
College degree	0.063 (0.248)	0.149 (0.352)	0.012 (0.118)	0.137***
Bachelor degree	0.047 (0.193)	0.102 (0.313)	0.002 (0.061)	0.100***
Master degree or above	0.004 (0.062)	0.008 (0.083)	0.0002 (0.014)	0.006***
Urban and rural classification	0.478 (0.501)	0.637 (0.478)	0.395 (0.603)	0.242***
Sample size	10,355	6,544	3,811	–

Data in the table are sample means and data in parentheses are standard deviations. ***, **, and * Indicate significant at the 1, 5, and 10% levels, respectively.

report higher levels of happiness compared to men. The negative coefficient associated with household registration implies that individuals with urban household registration are more likely to experience happiness than their rural counterparts. The coefficient of marital status is significantly positive, indicating that the happiness of married groups is higher than that of unmarried groups. Using those

TABLE 3 Benchmark model of the influence of digital technology on happiness.

Variable	(1)	(2)	(3)	(4)
Digital technology	0.071*** (0.004)	0.048*** (0.006)	0.039*** (0.005)	0.031*** (0.006)
Gender		−0.036*** (0.004)	−0.030*** (0.003)	−0.030*** (0.003)
Age		−0.019*** (0.003)	−0.018*** (0.004)	−0.019*** (0.003)
Age squared/100		0.024*** (0.001)	0.026*** (0.003)	0.023*** (0.003)
Registered permanent residence		0.045*** (0.005)	0.036*** (0.006)	0.029*** (0.005)
Nation		−0.016 (0.011)	−0.018 (0.013)	−0.018 (0.011)
Marital status		0.157*** (0.009)	0.160*** (0.007)	0.161*** (0.008)
Primary education			0.027*** (0.010)	0.024*** (0.009)
Junior high school education			0.037*** (0.007)	0.035*** (0.009)
Senior high school/Technical secondary school			0.040*** (0.010)	0.042*** (0.011)
College degree			0.078*** (0.013)	0.079*** (0.012)
Bachelor degree			0.067*** (0.013)	0.063*** (0.012)
Master degree or above			0.054 (0.037)	0.053 (0.036)
Urban and rural classification				0.012* (0.005)
Virtual variables of provinces	Control	Control	Control	Control
Wald χ^2	1788.09***	2643.80***	2359.04***	2336.20***
Observed value	10,355	10,355	10,355	10,355

The standard error in brackets in the table is robust, and ***, **, and * indicate significant at 1, 5, and 10% levels, respectively. The reported value is the average marginal effect of each variable on happiness (the happiest = 5) and the corresponding robust standard error.

who have not attended school as a reference group, the probability of happiness is significantly higher for individuals with primary, junior high, high school/technical secondary, college, and undergraduate education. However, a master’s degree has no significant impact on individual happiness. Interestingly, the attainment of a master’s degree does not yield a significant impact on individual happiness levels. The coefficient of urban–rural classification is significantly positive, indicating that the probability of happiness of urban residents is significantly higher than that of rural residents.

Heterogeneity of the impact of digital technology on individual happiness

In the previous paper, we analyzed the impact of digital technology on happiness and determined that it can improve individual happiness. However, this analysis only represents the average impact of digital

technology on happiness and does not take into account individual differences. For this purpose, this paper examines the heterogeneity of the impact of digital technology on happiness by incorporating interaction terms of digital technology with gender, age, education level.

The results in Table 5 indicate that the coefficient of the interaction term between digital technology and gender in column 1 is significantly negative. This suggests that the use of digital technology has a greater impact on women’s happiness than on men’s, implying that women can gain more happiness by using digital technology. Possible reasons for this are that women’s utilization of digital technology for learning, work, and entertainment activities can enhance happiness. Studies have also confirmed that the application and popularization of digital technology have a significant effect on promoting women’s employment and income, indirectly increasing their sense of well-being. The interaction term coefficient between digital technology and age in Equation 2 is significantly negative. This

TABLE 4 Influence of digital technology on intermediate variables.

Variable	(1)	(2)	(3)	(4)		(5)	(6)
	Health condition	Family relations	Interpersonal relationship	Non-farming employment	Farming employment	Absolute income	Relative income
Digital technology	−0.007* (0.004)	0.053*** (0.008)	−0.069** (0.032)	0.142*** (0.007)	−0.118*** (0.007)	0.246*** (0.017)	0.003** (0.001)
Control variable	Control	Control	Control	Control	Control	Control	Control
F value/Wald χ^2	4499.26***	3780.76***	11.05***	14281.16***		200.99***	3802.43***
Observed value	23,465	23,358	23,446	23,465		21,397	22,662

Models (1), (2), and (6) use probit model, and the table reports the marginal effects of digital technology on very healthy = 5, frequent interaction = 4, and high income = 5, respectively. Models (3) and (5) use OLS model. Model (4) uses mlogit model, and the marginal effects of digital technology on non-farming employment and farming employment are reported in the table. Control variables in our study conclude personal characteristics and regional characteristics. Among them, “Gender,” “age,” “registered permanent residence,” “nation,” “marital status,” and “education level” were selected as variables to measure personal characteristics. The variables “urban/rural classification” and “province or municipality directly under the central government” were selected to measure regional characteristics. Due to space limitations in the paper, this table list the results for the core variables, do not list the results for the control variables.

suggests that digital technology has a greater impact on improving the happiness of young people. This may be due to the fact that young people are exposed to digital technology at an early age, possess advanced digital technology skills, and can enhance and enjoy their lives through its utilization. The coefficient of the interaction term in Equation 3 is significantly positive for digital technology with primary school education and tertiary education and above, but the coefficient of digital technology with secondary school education is not significant, indicating that the use of digital technology significantly enhances the well-being of those with primary school and college degree and above. The interaction term coefficient between digital technology and rural–urban categorization in column 4 is significantly negative. This suggests that the use of digital technology has a greater impact on the happiness of rural residents than on urban residents. The delayed development of digital technology in rural areas results in a delayed start for accessing information, online socializing and e-commerce. Once implemented, these technologies can bring greater satisfaction and fulfillment to rural residents. In column 5, the coefficient of the interaction term between digital technology and absolute income is significantly negative. This suggests that as income increases, the happiness promotion effect of digital technology is decreasing, and digital technology diminishes the positive effect of absolute income on happiness, which is consistent with previous research (Table 5).

Robustness tests for 2018 CFPS data

To ensure the robustness of the conclusions drawn from the analysis above, this paper utilizes the 2018 CFPS data to retest the impact mechanism. Equation 1 shows the baseline model, which includes personal and regional characteristics as control variables, yields a coefficient of 0.032 for the impact of digital technology on happiness, which is significant at the 1% level. The coefficient of Equation 2 is positive after adding the health status variable, and the coefficient of digital technology increases. This suggests a negative relationship between digital technology and health status, which is consistent with previous findings. The coefficients in Equation 3 are positive after adding the family relationship variable. Additionally, the coefficients of digital technology have

decreased, which confirms that digital technology can enhance the frequency of communication with family members. The coefficient of digital technology in column 4 decreases after adding the interpersonal variable, indicating that digital technology favors the improvement of interpersonal relationships, which is contrary to the previous conclusion. The penetration rate of mobile digital technology was still low, and people’s use of digital technology devices such as computers and cell phones for communication and contact contributed to the establishment of interpersonal networks, and has not yet had a negative impact on interpersonal interactions in reality. Equations 5–7 add variables for employment status, absolute income and relative income. The coefficients for digital technology have decreased, consistent with previous findings. This suggests that digital technology has a significant impact on personal employment decisions and income levels. After adding absolute income variables, the coefficient for digital technology decreased the most, indicating that absolute income plays an important role as a mediating variable between digital technology and happiness (Table 8).

Endogeneity testing of instrumental variables

To address the potential endogeneity issue caused by omitted variables or reverse causality between digital technology and happiness, this paper employs the instrumental variable method. The selection of instrumental variables should adhere to the principles of relevance and exogeneity. This paper selects the digital technology penetration rate at the level of the individual’s community or village, whether there is a computer in the household, and the cost of household communication as instrumental variables, respectively. The estimation results of the two stages of the CMP model are reported in Table 7. From a correlation perspective, the digital technology penetration rate of the location indirectly mirrors the current state of the network infrastructure in the area and impacts an individual’s network usage through “group effect.” The household communication cost indirectly signifies the individual’s digital technology status, while the presence of a computer at home directly decided an individual’s digital technology usage. This paper utilizes the instrumental variable

TABLE 5 Heterogeneity analysis of the impact of digital technology on happiness.

Variable	(1)	(2)	(3)	(4)	(5)
Digital technology	0.025*** (0.009)	0.067*** (0.023)	−0.042 (0.034)	0.026*** (0.01)	0.182*** (0.053)
Digital technology* gender	−0.021** (0.010)				
Digital technology* age		−0.001** (0.001)			
Digital technology* Primary education			0.065* (0.037)		
Digital technology* Secondary school education			0.050 (0.035)		
Digital technology* College and above			0.099** (0.04)		
Digital technology* Urban and rural classification				−0.022* (0.011)	
Digital technology* Absolute income					−0.018*** (0.006)
Control variable	Control	Control	Control	Control	Control
Wald χ^2	4635.09***	4635.25***	4649.84***	4649.84***	4637.96***
Observed value	20,666	20,666	20,666	20,666	20,666

Mediating and control variables are added to the analysis. ***, **, and * indicate significant at the 1, 5, and 10% levels, respectively. Control variables in our study conclude personal characteristics and regional characteristics. Among them, “Gender,” “age,” “registered permanent residence,” “nation,” “marital status,” and “education level” were selected as variables to measure personal characteristics. The variables “urban/rural classification” and “province or municipality directly under the central government” were selected to measure regional characteristics. Due to space limitations in the paper, this table list the results for the core variables, do not list the results for the control variables.

TABLE 6 Analysis of the influence mechanism.

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Digital technology	0.020*** (0.007)	0.022*** (0.007)	0.016** (0.007)	0.026*** (0.007)	0.014* (0.007)	0.011 (0.008)	0.014* (0.007)	0.013* (0.007)
Health status		0.066*** (0.002)						0.047*** (0.002)
Family relations			0.026*** (0.003)					0.009*** (0.003)
Interpersonal relationship				0.087*** (0.001)				0.081*** (0.002)
Non-agricultural work					0.028*** (0.008)			−0.0005 (0.009)
Farming					−0.007 (0.009)			−0.028*** (0.010)
Absolute income						0.025*** (0.003)		0.011*** (0.003)
Relative income							0.063*** (0.003)	0.031*** (0.003)
Control variable	Control	Control	Control	Control	Control	Control	Control	Control
Wald γ^2	2364.2***	3324.5***	2429.1***	4454.8***	2375.8***	2290.7***	2550.2***	4636.1***
Observed value	23,465	23,465	23,358	23,446	23,465	21,397	22,662	20,666

The brackets in the table are robust standard errors, and personal characteristics and regional characteristics variables are added to the analysis. ***, **, and * mean significant at 1, 5, and 10% levels, respectively. Control variables in our study conclude personal characteristics and regional characteristics. Among them, “Gender,” “age,” “registered permanent residence,” “nation,” “marital status,” and “education level” were selected as variables to measure personal characteristics. The variables “urban/rural classification” and “province or municipality directly under the central government” were selected to measure regional characteristics. Due to space limitations in the paper, this table list the results for the core variables, do not list the results for the control variables.

conditional mixed process estimation method (CMP method) to perform the regression analysis. The first-stage regression results of each equation indicate that the impacts of digital technology penetration, household communication costs, and owning a computer at home on digital technology are all significantly positive at the 1% level, satisfying the correlation of instrumental variables. The second-stage regression results reveal that even after adjusting for potential endogeneity bias in digital technology, the impact on happiness remains significant at the 1% level. The effect on happiness is still significantly positive at the 1% level, and the coefficient is significantly larger. This indicates that even after using the CMP method, it is still concluded that digital technology enhance happiness.

Influence mechanism of digital technology on happiness

In order to substantiate the indirect influence of digital technology on happiness, this study examines its impact on various mediating variables. Table 4 presents the regression coefficients of digital technology in each model, controlling both personal and regional characteristics. In Equation 1, health status is the dependent variable, and the findings indicate that digital technology has a significant negative impact on health status, that is, compared with people who do not use digital technology, digital technology will cause personal health status to deteriorate. Equation 2 takes family relationship as a dependent variable, revealing a significant positive influence of digital technology on family relationships. Through bridging spatial gaps and enhancing connections between individuals and distant relatives or friends via online networks, digital technology fosters harmonious communication among family members, consequently leading to an indirect enhancement of happiness. Equation 3 examines the influence of digital technology on interpersonal relationships, and the outcomes show that digital technology has a significant negative impact on interpersonal relationships. It suggests that digital technology may make interpersonal relationships worse in reality, compared with

people who do not use the Internet. Column 4 explores the impact of digital technology on individual employment status, using unemployment as reference group. The results indicate that digital technology actually promotes the probability of individuals engaging in non-farming employment while decreasing the possibility of engaging in farming production. This phenomenon stems from the enhanced job search efficiency and reduced search costs facilitated by online networks. These factors contribute to securing self-employment or wage-based positions, consequently bolstering personal happiness. column 5 examines absolute income as the dependent variable, showing that the regression coefficient of digital technology to absolute income is significantly positive. Specifically, using the network can bring about a significant increase in the *per capita* income of families. This outcome is attributed to the ability of digital technology to lower information processing costs, enhance productivity, and facilitate the accumulation of human capital in the realm of information technology. As a result, individuals can command higher wages, thereby elevating their happiness. Column 6 employs relative income as the dependent variable, showing a significant positive association between digital technology usage and relative income. This means that individuals who engage with the internet tend to possess a favorable economic standing within their local community, leading to heightened levels of happiness.

There may be several influence channels for digital technology to influence happiness. To further elucidate the mechanisms, this study incorporates intermediary variables into the benchmark model to investigate the pathways through which digital technology influences happiness. The results of the regression analysis are presented in Table 6. Equation 1 represents the benchmark model. After adjusting for variables such as individual characteristics and regional traits, the coefficient for digital technology is 0.020. Equation 2 adds health status variables to the benchmark model, and reveals a significant positive association between health status and happiness. Subsequently, the marginal effect of digital technology increases by 10%, with the coefficient rising to 0.022 and achieving statistical significance at the 1% level. This suggests that, upon controlling health

TABLE 7 Estimates of the CMP model.

Variable	(1) Digital Technology Penetration Rate		(2) Household communication costs		(3) Availability of a computer at home	
	Phase I	Phase II	Phase I	Phase II	Phase I	Phase II
Digital technology		0.075*** (0.017)		0.086*** (0.028)		0.080*** (0.024)
Digital technology penetration	0.595*** (0.015)					
Household communication costs			0.044*** (0.003)			
Availability of a computer At home					0.114*** (0.005)	
Control variable	Control	Control	Control	Control	Control	Control
Wald χ^2	5820.34 ***	4107.02 ***	6018.88 ***	4087.22 ***	5940.80 ***	4020.90 ***
Observed value	20,664	20,664	20,664	20,664	20,664	20,664

Robust standard errors are in parentheses in the table. Mediating and control variables are added to the analysis. ***, **, and * indicate significant at the 1, 5, and 10% levels, respectively. Control variables in our study conclude personal characteristics and regional characteristics. Among them, "Gender," "age," "registered permanent residence," "nation," "marital status," and "education level" were selected as variables to measure personal characteristics. The variables "urban/rural classification" and "province or municipality directly under the central government" were selected to measure regional characteristics. Due to space limitations in the paper, this table list the results for the core variables, do not list the results for the control variables.

status variables, the impact of digital technology on happiness intensifies, hinting at a possible negative relationship between personal health status and digital technology, indicating that engagement with digital technology may affect individual health outcomes. In the baseline model, the inclusion of family relationship variables in the third column of equations results in a significant positive impact of family relationships on happiness, while the marginal effect of digital technology decreases to 0.016 but remains significant. This suggests a positive correlation between family relationships and digital technology, as communication means such as networks increase the frequency of interaction with non-cohabiting family members, thereby promoting harmony in family relationships and then increasing happiness. Adding interpersonal variables to the fourth equation shows that the interpersonal relationship coefficient is significantly positive, that is, the improved interpersonal connections can boost happiness. However, the coefficient for digital technology also rises, indicating a negative association between interpersonal relationships and digital technology. This implies that digital technology may hamper real-life interpersonal communication, subsequently impacting happiness adversely. The variable of employment status is introduced into the fifth equation.

The results show that if the unemployed are taken as the reference group, the probability of happiness of individuals with non-agricultural jobs is obviously higher, while farming has no significant effect on happiness. Increasingly, the marginal effect of digital technology decreases by 30% in this scenario, with the coefficient dropping to 0.014 and maintaining significance at the 10% level. This means that digital technology influences individual employment statuses, subsequently impacting happiness levels. Adding the variable of absolute income to the column 6, the coefficient of absolute income is significantly positive, while the coefficient of digital technology decreases to 0.011 and is not

significant. This indicates that absolute income mediates the relationship between digital technology and happiness, as digital technology positively affects happiness by increasing individuals' absolute income. When the variable of relative income is introduced into the column 7, the coefficient of relative income is also significantly positive, that is, individuals with higher relative income within their local area tend to report higher happiness levels. Meanwhile, the marginal effect of digital technology diminishes, implying a positive correlation between digital technology and relative income. This suggests that individuals with access to digital technology often possess relatively higher incomes within their local regions, contributing to their heightened happiness. After controlling the intermediate variables in the eighth equation, the marginal effect coefficient of digital technology becomes 0.013, retaining significance at the 10% level. This signifies that digital technology can directly enhance happiness, apart from its influence through various intermediary channels. Based on the above analysis, the inclusion of interpersonal relationships, employment status, absolute income, and relative income in the benchmark model leads to a significant alteration in the digital technology coefficient of over 30%. This underscores the notion that digital technology can indirectly impact happiness by influencing interpersonal communication, employment, income dynamics, and especially by affecting individuals' absolute income, thereby exerting a substantial influence on overall happiness levels.

Conclusion and discussion

This article reviews the relevant literature on digital technology and happiness. Based on the 2020 China Family Panel Studies (CFPS) data, an ordered probit model is constructed to test the impact of

TABLE 8 Robustness tests of 2018 CFPS data.

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Digital technology	0.032*** (0.007)	0.035*** (0.007)	0.027*** (0.007)	0.023*** (0.007)	0.027*** (0.008)	0.017** (0.008)	0.021*** (0.008)	0.011* (0.006)
Health status		0.072*** (0.002)						0.049*** (0.003)
Family relations			0.019*** (0.002)					0.009*** (0.002)
Interpersonal relationship				0.155*** (0.003)				0.142*** (0.003)
Non-farming job					0.036*** (0.006)			−0.008 (0.006)
Farming job					0.011* (0.006)			−0.003 (0.006)
Absolute income						0.053*** (0.003)		0.027*** (0.003)
Relative income							0.066*** (0.002)	0.037*** (0.003)
Control variable	Control	Control	Control	Control	Control	Control	Control	Control
Wald χ^2	1934.4***	2663.5***	2047.5***	4496.8***	1971.1***	2135.4***	2480.5***	4821.5***
Observed value	26,654	26,654	26,569	26,621	26,654	24,819	25,272	23,556

Robust standard errors are in parentheses in the table, ***, **, and * indicate significant at the 1, 5, and 10% levels, respectively. Control variables in our study conclude personal characteristics and regional characteristics. Among them, “Gender,” “age,” “registered permanent residence,” “nation,” “marital status,” and “education level” were selected as variables to measure personal characteristics. The variables “urban/rural classification” and “province or municipality directly under the central government” were selected to measure regional characteristics. Due to space limitations in the paper, this table list the results for the core variables, do not list the results for the control variables.

digital technology on happiness, and explores the robustness of the happiness effect and use CMP model to test the endogeneity. Then, the analysis includes an exploration of the heterogeneity of “happiness effect” across various demographic characteristics such as gender, age, education and registered population status. Finally, the paper selects health status, interpersonal relationship, employment status and income level as intermediary variables to explore the influence mechanism of digital technology on happiness.

Based on empirical analysis, the results show that: Firstly, digital technology can improve personal happiness. The marginal effect coefficient of digital technology is 0.031. Secondly, this paper use the CMP model of instrumental variables to confirm the substantial positive relationship between digital technology and happiness. Thirdly, digital technology has a heterogeneous effect on personal happiness, especially for women, young people, primary school and college graduates and rural residents. With the increase of absolute income, the happiness effect of digital technology is decreasing. It can also be said that digital technology reduces the promotion of absolute income to happiness. Fourthly, in terms of influencing mechanism, digital technology can indirectly affect individual happiness by influencing health status, interpersonal relationship, employment situation and income level. Specifically, digital technology is found to have a negative effect on personal health, interpersonal relationships and agricultural work, while positively affecting family relationships, non-farming employment, absolute income, and relative income. This leads to an increase in the likelihood of individuals engaging in non-farming employment and a decrease in the likelihood of farming activities. Overall, the study suggests that digital technology can indirectly influence happiness by affecting these intermediary variables. Empirical tests further reveal that digital technology has the most pronounced effect on happiness through its impact on increasing absolute income.

Digital technology not only directly impacts happiness by enhancing entertainment options, broadening information access, and facilitating convenience in daily life, but also has an indirect effect on happiness by influencing personal health, family dynamics, interpersonal communication, work status, and income levels. Although the penetration rate of digital technology increasing year by year, there are still problems with weak network infrastructure in rural areas and weak network skills among rural residents. According to the report of *China Internet Network Information Center* (CNNIC), the Internet penetration rate in rural areas of China in 2020 is 55.9%, which is significantly lower than 79.8% in urban areas, and 51.5 and 13.3% residents, respectively, indicate that the reason for not going online is because they do not understand the network and do not have Internet access equipment. It is of great significance to increase network technology training and strengthen network infrastructure construction to increase the penetration rate of digital technology. Based on the above analysis, this paper proposes that: On the one hand, it is crucial to strengthen the capacitation of digital skills, particularly among vulnerable demographics such as the elderly and rural inhabitants, in order to elevate their proficiency in digital technologies. This can be achieved through the integration of additional educational resources, thereby facilitating the provision of cost-free digital technology training and guidance. By doing so, a broader spectrum of individuals will be able to partake in the happiness dividends entailed by the era of the network economy. On the other hand, it is worth noting that the improvement in digital infrastructure is often related to regional economic and social factors,

such as government projects specifically for the purpose of increasing access to digital technology or related digital industry policies. The digital infrastructure discussed in this paper focusing on the equipment that can directly affect the Internet access of rural residents in remote areas, such as high-speed Internet broadband, network signal towers, PC computers or mobile communication equipment, etc. The investment of these facilities can increase the use rate of digital technology for rural residents in remote areas. According to the analysis above, government should improve the construction of digital infrastructure and provide digital technology access equipment for rural residents in remote areas, such as high-speed Internet broadband, network signal towers, PC computers or mobile communication equipment, these facilities can directly enhance their digital technology usage. At the same time, it is necessary to combine industrial policies, give full play to the employment effect of digital infrastructure, establish Internet manufacturing factories in the urban–rural fringe or distant suburbs, and provide more high-quality jobs with high incomes for rural workers to improve their happiness.

In summary, the low utilization rate of digital technology is the result of multiple factors such as lack of digital infrastructure and digital skills training, solving these problems requires joint efforts from the government and all sectors of society, gradually narrowing the digital divide between urban and rural areas through various measures such as improving infrastructure, enhancing education levels, and promoting digital skills training. It is worth noting that in reality, individual happiness is influenced by health status and interpersonal relationships, and is also closely related to personal employment, income level and job satisfaction. Therefore, emphasis should be placed on promoting network education and values, cultivating healthy online habits, mitigating excessive internet usage which may adversely impact physical and mental well-being, and fostering positive life and interpersonal communication practices. Such efforts will enable digital technology to serve as a vital tool for enhancing personal welfare and fostering happiness in the digital economy era.

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 [patients/ participants OR patients/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

WH: Conceptualization, Formal analysis, Investigation, Supervision, Visualization, Writing – original draft. ZZ: Writing – review & editing, Visualization. XQ: Writing – review & editing,

Visualization, YM: Data curation, Funding acquisition, Methodology, Project administration, Resources, Software, Validation, Writing – review & editing.

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EDITED BY

Martijn Burger,
Open University of the Netherlands,
Netherlands

REVIEWED BY

Eugene Boon Yau Koh,
Universiti Putra Malaysia, Malaysia
Benedict Francis,
University of Malaya, Malaysia

*CORRESPONDENCE

Haoyan Huang
✉ haoyan.huang@helsinki.fi

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To save the saver: facilitating school counselors' occupational well-being through multi-dimensional support and basic psychological needs

Lina Feng¹, Yi Liu² and Haoyan Huang^{3*}

¹Moral Education Research Center, Beijing Institute of Educational Sciences, Beijing, China, ²Faculty of Education, Beijing Normal University, Beijing, China, ³Faculty of Educational Science, University of Helsinki, Helsinki, Finland

School counselors play an increasingly crucial role in protecting students' mental health. However, many of them have experienced poor well-being in their occupations, which undermines their efficacy in mental protection. To identify the most significant well-being facilitators, this study examined associations between school counselors' occupational well-being and situational, inter-individual and intra-individual supports, as well as further explored their dynamics. A total of 1,443 Chinese school counselors (66.6% part-time) from a regionally representative dataset were selected, and their work engagement, pressure and satisfaction were surveyed as well-being indicators. Dominance analysis revealed that (1) organizational support and occupational empowerment were consistently robust facilitators for most psychological needs and well-being indicators, (2) students were the most critical supporters for occupational well-being, particularly for part-time counselors; and (3) autonomy and competence were more central needs than relatedness in transferring supports to occupational well-being. Findings implied the most effective strategies to benefit school counselors' occupational well-being, both in general and across different work cohorts.

KEYWORDS

school counselors, occupational well-being, situational support, inter-individual support, basic psychological needs

1 Introduction

Children and adolescents face increasing mental health risks in contemporary society. Recent survey revealed that over 25% of school-age students have suffered from depression or other mental health problems (Racine et al., 2021). To tackle this increasingly serious risk, school counselors have been widely employed in the educational system and have become increasingly crucial, and play vital roles in students' mental health care (Dimmitt and Wilkerson, 2012; Kang-Yi et al., 2018). Nonetheless, the working efficacy of school counselors has been dramatically undermined by insufficient occupational well-being. The substantial time spent addressing students' mental health issues may unconsciously exacerbate school counselors' occupational well-being. The increasing demand for their services and the lack of supporting resources further exacerbate this mental risk (Watson, 2024); consequently, studies have indicated that numerous school counselors have suffered from mental health problems

in their occupation (Tay et al., 2018). As such, how to effectively support school counselors' occupational well-being has become a crucial research topic that remains under-examined.

To fulfill the research gaps, this study aimed to identify the prominent facilitators of school counselors' occupational well-being by examining the contributions of situational, inter-individual, and intra-individual (i.e., focusing on basic psychological needs) supports, based on the Demand-resource Model. It further explored the mediating role of three basic psychological needs from Self-determination Theory (i.e., autonomy, competence, and relatedness) and investigated the distinctive patterns of these results between full-time and part-time school counselors. A survey was conducted with 1,443 school counselors from a regionally representative dataset in Beijing, China, as they may face more serious mental risks in their occupation than school counselors in developed countries (Yu and Zhang, 2021; Zhang and Gan, 2018).

1.1 The contexts of Chinese school mental health service and counselors

Mental health service is increasingly crucial in school education, which aims to monitor students mental health conditions and provide timely intervention (Green et al., 2013; Sanchez et al., 2018). School mental counselors, the primary service providers in school, play a frontline role in the early identification and prevention of students' mental issues, thereby protecting their mental well-being (Green et al., 2013; Sanchez et al., 2018). Despite its significance, mental health service has long received insufficient attention in Chinese school education until recent years, with unclear boundaries regarding school mental counselors' occupational responsibilities and related management (Yu and Zhang, 2021; Zhang and Gan, 2018). For instance, numerous Chinese schools allocate heavy and ambiguous tasks to school counselors (e.g., attributing students' moral education to their responsibility) and offer few opportunities for their professional development (e.g., with fewer promotion prospects than school teachers; Kang and Wan, 2017). These challenges exacerbate the occupational well-being of Chinese school counselors, further threatening their capabilities to support children's mental health.

Moreover, due to the shortage of professional counselors, many schools have to require their subject teachers to undertake counseling tasks part-time (Kang and Wan, 2017; Yu and Zhang, 2021; Zhang and Gan, 2018). This phenomenon commonly exists in most regions of China, including the capital [i.e., in this regionally-representative survey, 961 (66.6%) schools in Beijing only have part-time counselors]. As a consequence, these part-time school counselors often bear much heavier workloads and suffer from more severe mental health risks in their occupation, necessitating specific attention in research.

1.2 Theoretical framework

To comprehensively understand the factors affecting school counselors' occupational well-being, this study employed the Demand-resources Model as the basis of theoretical framework. The Demand-resource Model posits two distinct processes that impact occupational well-being. The "demand" relates to an effort-driven energetic process that exhaust one's energy and lead to stress, burnout

and diminished mental health, whereas the "resource" refers to a motivational process where the availability of resources promotes work engagement and satisfaction (Salmela-Aro et al., 2016; Salmela-Aro and Upadaya, 2014). This model underscores that the balance between demands and resources is a key determinant of occupational well-being, in which sufficient resources or supports can compensate for the detriments due to heavy work demands (Salmela-Aro et al., 2022). Considering the difficulties in reducing working demands for school counselors in Chinese schools, this model implies that providing more abundant resources is a more feasible approach to achieve demand-resource balance, and consequently protect their well-being in occupation.

Moreover, the Demands-resources Model proposes that supporting factors (resources) for well-being are present at multiple levels, including situational (or environmental), inter-individual, and intra-individual levels (Salmela-Aro et al., 2016; Salmela-Aro et al., 2022). Since these supporting factors jointly influence school counselors' well-being in occupation, the present study comprehensively examined their associations with occupational well-being indicators, to identify the most effective well-being facilitators.

1.3 Associations of situational support with school counselors' occupational well-being

Situational support for school counselors is represented by organizational support, occupational empowerment, and occupational values in this study, as these factors are more malleable in the workplace. Organizational support is defined as a comprehensive supportive environment in which employees' contributions are valued, and their development and well-being needs are addressed (Eisenberger et al., 1986; Rhoades and Eisenberger, 2002). It can provide work autonomy, development opportunities and appraisal feedback, which are crucial facilitators of occupational well-being (Chen et al., 2022). Perceiving this support is also beneficial to employees' positive emotional experience, stress resilience and occupational commitment (Nong et al., 2022; Singh et al., 2018). Given these benefits, prior studies have identified organizational support in schools as key driver of staff well-being (Lauermann and König, 2016).

Apart from organizational support, it is also crucial for school counselors to perceive their work as influential and valuable; thus, perceived occupational empowerment and value from the environment are important. Occupational empowerment means that school counselors have the freedom of choice in their occupation, participate in school decision-making, and influence goal achievement (Skår, 2010; Van Bogaert et al., 2016). When perceiving robust occupational empowerment, school counselors tend to feel that their work makes sense and generate stronger feelings of satisfaction and achievement in their occupation (Leggat et al., 2010; Smith et al., 2010). Furthermore, they are more likely to be highly motivated and dedicate themselves to their work with fewer negative emotions (e.g., stress and depression; Papathanasiou et al., 2014; Tajvar et al., 2015).

Similarly, occupational value also benefits school counselors' well-being by enhancing their occupational motivation and sense of achievement (Fute et al., 2022). Known as the perceived significance

and meaningfulness of one's occupation (Jin and Rounds, 2012), occupational value serves as a key motivational factor in school counselors' work selection, engagement, and satisfaction (Balsamo et al., 2013; Sortheix et al., 2015; Sortheix et al., 2013). School counselors with high perceived occupational value also generate more positive affect which is beneficial to their occupational satisfaction and well-being (Caricati et al., 2014; Moniarou-Papaconstantinou and Triantafyllou, 2015).

1.4 Associations of inter-individual support with school counselors' occupational well-being

Regarding inter-individual support, the Demands-resources Model indicates that significant others (e.g., leaders, colleagues, students, and family members) play crucial roles in occupational well-being (Salmela-Aro et al., 2016; Salmela-Aro et al., 2022; Song et al., 2023). Leaders usually have more power than other significant others to reduce work demands (e.g., workloads and burdens) and provide abundant resources in schools (e.g., nurturing opportunities, autonomy and, collaborative leadership). Thus, their support directly enhances school counselors' occupational well-being (Richards et al., 2018; Wong and Zhang, 2014). However, as leader support is typically hierarchical, it can sometimes trigger work demands and pressure, especially when leaders' expectations overwhelm school counselors' capabilities (Brackett et al., 2010; Richards et al., 2018; Wang et al., 2016).

In contrast, support from colleagues benefits well-being in a different way due to its more equal and collaborative nature. Specifically, colleague support can help school counselors acquire more occupational experience, better cope with professional tasks, and perceive a stronger sense of relatedness. These benefits, in turn, diminish school counselors' stress and burnout and improve self-efficacy and satisfaction in their occupations (Collie et al., 2012; Skaalvik and Skaalvik, 2011; Yin et al., 2019).

Aside from leaders and colleagues, students play an irreplaceable role in school counselors' well-being, as they provide the most direct feedback on counselors' work and efforts. Perceiving student support signifies that school counselors and their work are valued, respected, and appreciated by students, which is usually central to counselors' professional identity and goals (Butler, 2012; van der Want et al., 2015). The insufficiency of this support can lead to higher stress and reduced well-being in the occupation (Aldrup et al., 2018; Jo, 2014). Unfortunately, despite its significance, student support has often been neglected in studies of teachers' and school counselors' well-being (Aldrup et al., 2018).

Family support is also crucial, as it creates a mental refuge for school counselors to escape from occupational burdens and stress. Prior studies have shown that family support can boost school counselors' positive psychological capital (e.g., optimism, self-efficacy, and resilience), thereby improving their job engagement, satisfaction and overall well-being (Chan et al., 2020; Huang et al., 2021; Kwok et al., 2015). Moreover, support from family members also alleviates the housework burden, especially for female counselors. As most Chinese school counselors are female and are usually expected to shoulder more household responsibilities, family support can help them better achieve work-family balance (Judge and Livingston, 2008; Xiang et al., 2023).

1.5 Basic psychological needs in occupation as significant mediators

In addition to situational and inter-individual supports, intra-individual resources also play a crucial part in protecting occupational well-being (Salmela-Aro et al., 2016; Salmela-Aro et al., 2022). Although numerous key personal resources affect occupational well-being (e.g., social-emotional skills, stress resilience), our study particularly focused on basic psychological needs (i.e., autonomy, competence, and relatedness). Exploring these needs can help us understand the dynamics between external supports and internal well-being for school counselors. In other words, these needs might serve as key mediators between situational or inter-individual supports and occupational well-being.

On the one hand, the Self-determination Theory proposes that individuals can only achieve a state of well-being when their basic psychological needs are satisfied (Deci and Ryan, 2000). Autonomy refers to the sense of freedom in individuals' actions, while competence and relatedness refer to confidence in one's abilities and feelings of connection with significant others, respectively (Deci and Ryan, 2000; Huang et al., 2024). These needs effectively enhance occupational positive affect, self-actualization, engagement, and satisfaction (Abós et al., 2018; Skaalvik and Skaalvik, 2014). Specifically, strong autonomy improves school counselors' sense of ownership in their work, making them more motivated and self-initiated, which results in fewer occupational mental health problems (Neufeld and Malin, 2020; Stiglbauer and Kovacs, 2018). Similarly, school counselors with a strong sense of competence are likely to be more confident and less likely to experience burnout and negative affect (Klaeijns et al., 2018; Salmela-Aro and Upadaya, 2014). In addition, relatedness support is central to school counselors' emotional and social adaptation, which is also essential for occupational well-being (Klassen et al., 2012; Zimmermann et al., 2018).

On the other hand, such basic psychological needs are largely influenced by situational and inter-individual supports in schools (Bakker and Demerouti, 2007). Situational supports create a supportive environment to nurture basic psychological needs (Ni et al., 2023), while social supports provide school counselors with feedback, guidance, and emotional support, which also help fulfill these needs (Bakker and Demerouti, 2017). Given these previous findings, it is expected that occupational autonomy, competence, and relatedness act as key mediators between multiple supporting factors and school counselors' occupational well-being (Wang et al., 2022; Xiang et al., 2023). However, to date, what remains largely unexplored is which need satisfaction is more crucial to school counselors' occupational well-being and which supporting factors can better satisfy these needs in the workplace.

1.6 The present study

In summary, although prior studies have investigated a wide scope of supporting factors for school counselors' occupational well-being, few of them have attempted to identify the most effective strategies, limiting the practical efficacy of well-being facilitation. Moreover, part-time school counselors face more significant risks to their occupational well-being yet receive inadequate attention in existing literature. To address these research gaps, the present study aimed to

comprehensively explore the associations among situational supports, inter-individual supports, basic psychological needs (i.e., as intra-individual resources), and school counselors' occupational well-being. Furthermore, we explored the differences between full-time and part-time counselors. Based on the Demand-resource Model, we conducted the theoretical framework with the following research questions (see [Figure 1](#)):

- (1) Which supporting factors are robust and unanimous facilitators of all school counselors' basic psychological needs and occupational well-being?
- (2) Which supporting factors have targeted benefits for part-time school counselors' basic psychological needs and occupational well-being?
- (3) Which basic psychological needs play more prominent roles in school counselors' occupational well-being, both in general and across different cohorts?

2 Method

2.1 Participants

The sample in this study comes from regional-representative datasets in Beijing, China. In total, 1,443 school counselors from

primary schools to high schools were surveyed, including 482 full-time counselors and 961 part-time counselors (i.e., those also bearing teaching responsibilities). Among these participants, 459 (93.3%) full-time counselors and 876 (91.2%) part-time counselors are female.

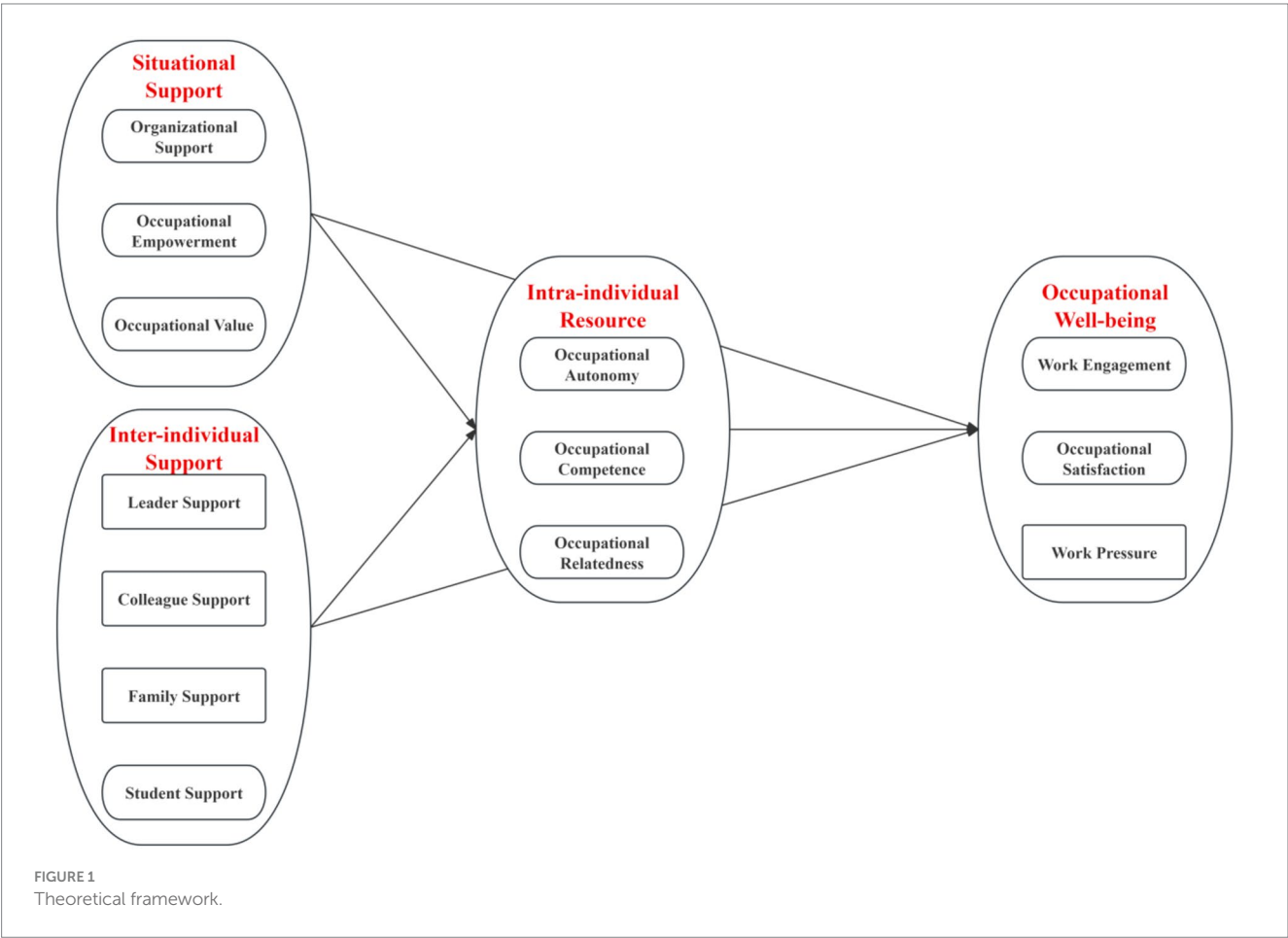
Participation was fully voluntary, and informed consent forms were collected from both adolescents as well as their guardians and school teachers. The study was granted ethical permission by the research institute.

2.2 Measurement

All variables were reported by counselors themselves with good reliability and validity (Cronbach's $\alpha > 0.75$; in Confirmation Factor Analysis, CFI=0.93, TLI=0.92, RMSEA=0.05, SRMR=0.06; see factor loadings in [Appendix](#)).

Organizational Support was measured using a revised version of Perceived Organizational Support consisting of 11 items ([Eisenberger et al., 1986](#); [Liu et al., 2015](#)), and demonstrated good reliability with Cronbach's $\alpha = 0.96$. An example item is: "Help is available from the organization when I have a problem at work."

Occupational Value was assessed using the Chinese School Teachers' Professional Identity Scale with four items (i.e., example item: I believe that school counselor is important to promote students' holistic development; [Wei et al., 2013](#)). Good reliability was observed with Cronbach's $\alpha = 0.94$.



Occupational Empowerment was measured using the revised Psychological Empowerment Scale (Li et al., 2006; Spreitzer, 1995) with three items (i.e., example item is “My impact on what happens in my department is large”). Results showed good reliability (i.e., Cronbach’s $\alpha=0.87$).

Inter-individual Support includes support from school leaders, colleagues, students and family members. *Leader, Colleague and Family Supports* were reported by single items of “School leaders value my work in mental health counseling,” “Other school teachers support your work in mental health counseling” and “My family members support my work in mental health counseling,” respectively. *Student support* was measured using two items with good reliability (Cronbach’s $\alpha=0.83$): (1) “Students like the activities related to mental health,” and (2) “Compared with other teachers, students like me (as a school counselor) more.”

Basic Psychological Needs include autonomy, competence and relatedness needs.

Autonomy and competence were measured by the revised Psychological Empowerment Scale (Li et al., 2006; Spreitzer, 1995) with three and two items, respectively. The example items are “I have significant autonomy in determining how I do my job” and “I am confident about my ability to do my job in mental health counseling.” Relatedness was assessed using three items Chinese School Teachers’ Professional Identity Scale, with the example items of “I care about how others perceive my occupation as a school counselor.” Good reliability was observed in all three variables (i.e., Cronbach’s $\alpha=0.84, 0.89$, and 0.83).

Work Engagement was assessed using the Utrecht Work Engagement scale (Schaufeli and Bakker, 2003), which consists of eight items with good reliability (Cronbach’s $\alpha=0.95$). An example item is “I feel strong and vigorous when I’m studying or going to work.” The Demands-resources Model conceptualizes engagement (in contrast to burnout) as a positive aspect of school-related well-being and psychological functioning (Salmela-Aro et al., 2022).

Work Satisfaction was measured using three items from the Job Satisfaction Scale (Schaffer, 1953) (Cronbach’s $\alpha=0.79$). Example item includes: “How much are you satisfied with the content of your job?”

Work Pressure was measured using a single item: “I feel stressful for my work in mental health counseling.”

Covariants included demographic variables of gender (0 = male, 1 = female), location, years of teaching experience, and education background.

2.3 Analysis

As the various independent variables and comparatively strong inter-correlation effects might contribute to the multicollinearity-related analytical bias, the authors adopted dominance analysis (DA) to ensure the reliability of the results, using Stata 17.0. Dominance analysis is a relative-importance determination method that estimates the general dominance weight (or Standardized Dominance Statistics, SDS) of independent variables and provides rank of importance. The dominance weight of variables is analyzed in a comparatively independent situation, and thus, this method can better address the bias due to multicollinearity and co-explained variations, compared with linear regression and structural equation models (Luchman, 2021). This survey was conducted by an online questionnaire without missing data since all items are compensatory to fulfill. The data and analytical methods (e.g., codes) are available for replication by contacting the research institute.

3 Results

3.1 Demographic information, descriptive analysis and correlation

First, the demographic information was introduced (see Table 1), and descriptive analysis and correlation were conducted (see Tables 2, 3). The results revealed that in both full-time and part-time school counselor cohorts, most of the independent variables and dependent variables showed moderate to strong correlations ($r=0.11-0.85$), implying potential multicollinearity. As such, using dominance analysis was more advisable than linear regression and structural equation modeling to reduce statistical bias (Table 4).

3.2 Relative importance of supporting factors for basic psychological needs and occupational well-being

To identify the most effective facilitators for basic psychological needs and occupational well-being, dominance analysis was adopted to compare the relative importance of different supporting factors. The factors with strong standardized dominance statistics (i.e., SDS >10%) were highlighted. After controlling for gender, location, years of teaching experience, and educational background, the results in

TABLE 1 Demographic information of school counselors.

Variable	Full-time (N = 482)	Part-time (N = 961)
Gender	Male = 23; Female = 459	Male = 85; Female = 876
Teaching year	≤5 years = 164; 6–10 years = 131; 11–15 years = 105; 16–20 years = 61; ≥21 years = 21	≤5 years = 477; 6–10 years = 236; 11–15 years = 147; 16–20 years = 56; ≥21 years = 45
Education background	college or lower = 2; bachelor = 251; master or higher = 229	college or lower = 26; bachelor = 818; master or higher = 117
School type	primary school = 119; lower secondary school = 86; high school = 30; middle & high school = 127; school for 9- or 12-years education = 120	primary school = 651; lower secondary school = 140; high school = 12; middle & high school = 37; school for 9- or 12-years education = 121
School location	rural area = 45; small city = 51; suburbs of megalopolis = 70; center of megalopolis = 316	rural area = 323; small city = 81; suburbs of megalopolis = 151; center of megalopolis = 406

TABLE 2 Descriptive analysis and correlation of full-time school counselors.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Gender																		
2. Location	−0.08																	
3. Teaching year	0.00	−0.01																
4. Education background	0.07	−0.21***	−0.20***															
5. Training support	−0.07	0.00	0.00	−0.14***														
6. Family support	−0.02	−0.01	−0.05	−0.05	0.25***													
7. Leader support	−0.08	−0.08	−0.08	−0.05	0.37***	0.36***												
8. Colleague support	−0.04	−0.05	−0.02	−0.11*	0.36***	0.41***	0.61***											
9. Student support	−0.03	0.01	0.01	−0.14**	0.19***	0.38***	0.29***	0.32***										
10. Organizational support	−0.07	−0.09	−0.13**	−0.09	0.40***	0.31***	0.70***	0.58***	0.37***									
11. Occupational empowerment	−0.06	−0.131**	−0.07	0.00	0.32***	0.28***	0.54***	0.48***	0.41***	0.78***								
12. Occupational value	0.03	−0.08	−0.07	−0.01	0.15***	0.23***	0.11*	0.12***	0.43***	0.18***	0.25***							
13. Work autonomy	−0.02	−0.06	−0.08	−0.04	0.32***	0.35***	0.51***	0.49***	0.45***	0.78***	0.79***	0.32***						
14. Work competence	0.06	−0.15**	0.04	0.11*	0.08	0.25***	0.16***	0.22***	0.40***	0.25***	0.50***	0.38***	0.45***					
15. Work relatedness	−0.11*	−0.04	−0.18***	0.01	0.16***	0.08	0.13**	0.07	0.27***	0.27***	0.32***	0.30***	0.27***	0.23***				
16. Occupational satisfaction	−0.09	−0.05	−0.08	−0.09*	0.35***	0.25***	0.61***	0.51***	0.29***	0.84***	0.75***	0.06	0.66***	0.20***	0.26***			
17. Occupational engagement	−0.04	−0.06	−0.08	−0.04	0.24***	0.42***	0.32***	0.30***	0.57***	0.49***	0.54***	0.46***	0.56***	0.53***	0.31***	0.44***		
18. Work pressure	−0.08	−0.05	0.05	0.06	−0.05	−0.12***	−0.05	−0.12***	−0.01	−0.14***	−0.15**	0.06	−0.13**	−0.09	0.02	−0.18***	−0.15***	
M	1.95	1.64	2.26	2.48	3.98	4.46	3.89	3.95	0.29	−0.07	0.06	0.20	0.15	0.48	0.07	−0.14	0.30	3.64
SD	0.21	1.00	1.18	0.52	0.92	0.61	0.91	0.73	0.70	0.91	0.88	0.81	0.79	0.65	0.95	0.90	0.80	0.99

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

TABLE 3 Descriptive analysis and correlation of part-time school counselors.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Gender																		
2. Location	−0.12***																	
3. Teaching year	−0.01	0.00																
4. Education background	0.10**	−0.14***	−0.11**															
5. Training support	0.05	−0.10**	0.01	0.06														
6. Family support	0.04	−0.09**	0.07*	0.04	0.43***													
7. Leader support	0.02	−0.15***	−0.06	−0.03	0.40***	0.44***												
8. Colleague support	−0.02	−0.11**	0.00	−0.01	0.39***	0.55***	0.72***											
9. Student support	0.08**	−0.10**	0.14***	0.00	0.47***	0.62***	0.40***	0.49***										
10. Organizational support	0.01	−0.11**	−0.05	0.00	0.43***	0.48***	0.74***	0.65***	0.50***									
11. Occupational empowerment	0.00	−0.15***	0.02	0.04	0.37***	0.47***	0.59***	0.54***	0.51***	0.80***								
12. Occupational value	0.08*	−0.03	0.06	−0.05	0.30***	0.43***	0.26***	0.33***	0.54***	0.37***	0.39***							
13. Work autonomy	0.05	−0.10**	0.02	0.03	0.42***	0.52***	0.58***	0.56***	0.60***	0.81***	0.84***	0.50***						
14. Work competence	0.01	−0.17***	0.17***	0.13***	0.28***	0.47***	0.26***	0.32***	0.54***	0.40***	0.59***	0.29***	0.53***					
15. Work relatedness	−0.01	0.00	0.00	0.06	0.20***	0.29***	0.23***	0.26***	0.36***	0.35***	0.41***	0.35***	0.38***	0.32***				
16. Occupational satisfaction	0.01	−0.08*	−0.06	0.01	0.36***	0.41***	0.63***	0.55***	0.41***	0.85***	0.76***	0.25***	0.68***	0.38***	0.33***			
17. Occupational engagement	0.01	−0.05	0.06	0.06	0.48***	0.66***	0.38***	0.45***	0.74***	0.58***	0.59***	0.51***	0.65***	0.62***	0.40***	0.52***		
18. Work pressure	0.03	0.04	0.03	−0.04	−0.04	−0.10**	−0.04	−0.06	−0.02	−0.13***	−0.13***	0.02	−0.10***	−0.14***	0.00	−0.19***	−0.13***	
M	1.91	2.33	1.91	2.09	3.93	4.10	3.92	3.96	−0.15	0.03	−0.03	−0.10	−0.08	−0.24	−0.04	0.07	−0.15	3.66
SD	0.28	1.32	1.14	0.37	1.00	0.84	0.99	0.84	0.99	1.02	0.98	1.03	1.01	1.00	0.95	0.95	1.03	0.95

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

TABLE 4 Relative importance of supporting factors for basic psychological needs.

	Work autonomy				Work competence				Work relatedness			
	Full-time		Part-time		Full-time		Part-time		Full-time		Part-time	
	SDS	Rank	SDS	Rank	SDS	Rank	SDS	Rank	SDS	Rank	SDS	Rank
Gender	0.1%	11	0.2%	10	0.9%	11	0.1%	12	4.5%	7	0.3%	11
Location	0.2%	10	0.2%	9	2.6%	8	2.3%	11	0.2%	12	1.1%	10
Teaching year	0.2%	9	0.1%	11	1.3%	10	3.7%	5	11.3%	5	0.2%	12
Education background	0.1%	12	0.1%	12	3.2%	6	2.8%	9	0.3%	11	1.8%	9
Training support	2.8%	8	3.7%	8	0.8%	12	2.8%	10	4.6%	6	2.8%	8
Organizational support	31.6%	2	25.5%	2	7.8%	4	8.5%	4	12.8%	4	13.6%	4
Occupational value	4.1%	6	7.6%	5	16.8%	2	3.3%	7	24.2%	1	20.1%	2
Occupational empowerment	34.8%	1	31.9%	1	41.5%	1	36.3%	1	20.9%	2	28.3%	1
Leader support	8.4%	3	8.2%	4	1.9%	9	2.9%	8	2.6%	9	4.2%	7
Colleague support	7.3%	4	6.9%	6	2.9%	7	3.3%	6	3.3%	8	5.0%	6
Family support	3.5%	7	5.8%	7	4.7%	5	13.0%	3	1.2%	10	7.0%	5
Student support	6.9%	5	10.0%	3	15.7%	3	20.9%	2	14.2%	3	15.8%	3
Total R ²	72.4%		79.7%		42.4%		50.3%		21.4%		23.1%	

SDS ≥ 10% are highlighted by bold.

Table 5 indicated that occupational empowerment was the most robust and unanimously beneficial factor for all psychological needs in both full-time and part-time counselors (SDS = 34.8 and 31.9% for autonomy, 41.5 and 36.3% for competence, and 12.8 and 13.6% for relatedness in full-time and part-time counselors, respectively). Student support was also unanimously constructive (SDS = 10.0% for part-time counselors' autonomy, and 15.7 and 20.9% for competence, 14.2 and 15.8% for relatedness in full-time and part-time counselors), except for the work autonomy of full-time school counselors (SDS = 6.9%). This support was more effective for part-time school counselors. Furthermore, the study found that organizational support was crucial to work autonomy (SDS = 31.6 and 25.5%)¹ and relatedness (SDS = 12.8 and 13.6%) for both cohorts. Occupational value was critical for the work competence of full-time school counselors (SDS = 16.8%), as well as for work relatedness for both cohorts (SDS = 24.2 and 20.1%). Additionally, family support was only effective in the competence of part-time counselors (SDS = 13.0%).

Then, this study included both supporting factors and basic psychological needs as independent variables to examine their contributions to occupational well-being. Regarding situational support, organizational support (SDS = 34.1 and 34.7% for occupational satisfaction, 11.3 and 16.6% for work pressure, but SDS scores were lower 10% in work engagement) and occupational empowerment (SDS = 10.8% for full-time counselors' occupational satisfaction, 22.5 and 20.4% for occupational satisfaction, and 11.1 and 10.6% for work pressure) were comparatively unanimous facilitators of multiple well-being indicators for both full-time and part-time counselors, whereas occupational value only had a strong effect on

full-time counselors' work engagement (SDS = 12.1%). For inter-individual supports, we found that family support was important for work pressure (SDS = 12.6 and 11.3%) and part-time counselors' work engagement (SDS = 15.1%), while student support was more effective for work engagement (SDS = 18.2 and 21.3%) and occupational satisfaction (SDS = 11.3 and 10.3%).

In terms of basic psychological needs, the study observed that work autonomy was crucial to work engagement (SDS = 11.9 and 10.0%) and occupational satisfaction (SDS = 13.6 and 12.7%) for both cohorts, and work competence was critical to part-time school counselors' work pressure (SDS = 22.1%), as well as to work engagement for both full-time and part-time counselors (SDS = 17.3 and 13.7%). Therefore, factors satisfying these two needs could further facilitate these occupational well-being indicators. In contrast, the need for relatedness was less effective for all indicators.

4 Discussion

To effectively improve students' well-being during school days, it is essential to first protect school counselors' occupational well-being. Aiming to identify the most important well-being facilitators, the present study comprehensively examined the effects of situational, inter-individual, and intra-individual resources, as well as basic psychological needs, on full-time and part-time school counselors' occupational well-being. In summary, the study found out that organizational support and occupational empowerment were unanimously robust facilitators for most psychological needs and well-being indicators, followed by student support, which particularly benefited part-time counselors. It also discovered that autonomy and competence support were potential mediators in transferring the benefits of supporting resources to occupational well-being. These findings extend the existing literature by highlighting the most effective occupational well-being facilitators both in general and specifically for

¹ In this section, the left-hand score represents the SDS results for full-time counselors, while the right-hand score is the SDS results for part-time counselors.

TABLE 5 Relative importance of supporting factors and basic psychological needs for occupational well-being indicators.

	Work engagement				Occupational satisfaction				Work pressure			
	Full-time		Part-time		Full-time		Part-time		Full-time		Part-time	
	SDS	Rank	SDS	Rank	SDS	Rank	SDS	Rank	SDS	Rank	SDS	Rank
Gender	0.1%	15	0.1%	15	0.2%	13	0.0%	14	9.3%	5	1.9%	11
Location	0.2%	14	0.4%	12	0.1%	15	0.2%	13	4.0%	12	1.2%	14
Teaching year	0.4%	12	0.2%	13	0.2%	14	0.3%	12	3.7%	13	2.2%	10
Education background	0.2%	13	0.2%	14	0.3%	12	0.0%	15	4.1%	11	1.5%	13
Training support	1.4%	11	6.0%	8	2.8%	6	2.3%	9	0.6%	15	0.6%	15
Organizational support	9.7%	6	8.3%	5	34.1%	1	34.7%	1	11.3%	2	16.6%	2
Occupational value	12.1%	3	7.1%	7	1.5%	10	1.5%	11	9.7%	4	6.3%	7
Occupational empowerment	10.8%	5	7.4%	6	22.5%	2	20.4%	2	11.1%	3	10.6%	4
Leader support	2.8%	9	2.8%	11	11.3%	4	10.3%	4	7.8%	6	7.0%	6
Colleague support	2.4%	10	3.6%	10	6.9%	5	6.8%	5	6.9%	7	1.6%	12
Family support	9.1%	7	15.1%	2	1.2%	11	2.8%	8	12.6%	1	11.3%	3
Student support	18.2%	1	21.3%	1	1.7%	8	2.8%	7	4.4%	10	7.0%	5
Work autonomy	11.9%	4	10.0%	4	13.6%	3	12.7%	3	6.0%	8	5.6%	8
Work competence	17.3%	2	13.7%	3	1.6%	9	2.9%	6	5.7%	9	22.1%	1
Work relatedness	3.5%	8	3.8%	9	2.1%	7	2.2%	10	2.6%	14	4.7%	9
Total R ²	56.3%		71.6%		75.6%		75.9%		8.3%		5.7%	

SDS ≥ 10% are highlighted by bold.

part-time counselors, who often experience poorer occupational well-being, and thus imply targeted supporting strategies for their flourishing in their careers.

4.1 Organizational support and occupational empowerment as universally essential situational supports

This study first found that organizational support and occupational empowerment were universally prominent facilitators for both full-time and part-time school counselors’ well-being across multiple indicators, whereas occupational value only enhanced a few indicators. Although these three types of situational supports can stimulate school counselors’ motivation, engagement, and satisfaction in their occupation, their distinct functioning dynamics contribute to their varying effectiveness. Organizational support and occupational empowerment provide immediate resources and support, enabling school counselors to access requisite development opportunities and appraisal guidance, while allowing them to have a say in deciding their work schedules and counseling strategies (Chen et al., 2022; Skår, 2010; Van Bogaert et al., 2016). These substantive supports and empowerment directly influence school counselors’ working conditions, thereby effectively promoting their occupational well-being (Lauermann and König, 2016; Skår, 2010; Van Bogaert et al., 2016). In contrast, occupational value can only affect counselors’ occupational well-being through its indirect impacts on their beliefs and motivation. As the perceived significance and meaningfulness of occupation, occupational value is a macro-perspective on school counseling occupation, with less immediate linkage to counselors’ daily work (Fute et al., 2022; Jin and Rounds, 2012). Consequently, it is less

sensitive to fluctuations in daily occupational well-being. However, a strong perceived occupational value is also related to greater emphasis on and richer support from schools (Balsamo et al., 2013; Sortheix et al., 2015; Sortheix et al., 2013). This explains its comparatively robust associations with work competence, relatedness, and engagement.

4.2 Students as the vital supporters, especially for part-time school counselors

Results also indicated that student played the most critical roles in satisfying school counselors’ basic psychological needs and benefiting their occupational well-being, especially for those working part-time. This finding is meaningful since their valuable support has been largely overlooked in the prior studies (Aldrup et al., 2018). Specifically, student support particularly fosters school counselors’ occupational competence, relatedness, and engagement. Students usually provide support through interaction and first fulfill the needs for relatedness. Furthermore, when school counselors feel their work is valued and appreciated by recipients (i.e., students), they are more inclined to generate a sense of competence, and to be more motivated to engage in their work (Butler, 2012; van der Want et al., 2015). However, as students can hardly impact school counselors’ work conditions and burdens, their support is less influential on counselors’ occupational autonomy, satisfaction and pressure. Nonetheless, why is student support more targeted to benefit part-time counselors? Due to the lack of research comparing the effectiveness of support in different types of school occupations, we can only speculate. On the one hand, part-time school counselors often bear teaching tasks, thereby giving them more opportunities to interact with and be affected by students. On the other hand, many of them may

be less professional in mental counseling and may fear doubts or criticism regarding their capabilities. In this situation, appreciation and recognition from students (i.e., as consultees) become more valuable and influential for their confidence and self-efficacy at work, thus impacting their well-being more constructively.

Besides student support, we found that family support was beneficial to reducing work pressure and enhancing part-time counselors' competence and engagement. This result is understandable, since family members can buffer the burden of housework for school counselors, which helps them achieve a work-life balance and reduce related pressure (Judge and Livingston, 2008; Xiang et al., 2023). This support is more necessary for part-time counselors, as they usually carry heavier school workloads.

In addition, the results revealed that the leader and colleague support acted less effectively to facilitate school counselors' occupational well-being. One explanation is that receiving support from colleagues or leaders may be interpreted as a sign of incompetence and this fear may yield diminishing returns for school counselors' occupational well-being (Shin et al., 2020; Tews et al., 2013). Moreover, these supports may also contribute to mental burdens for school counselors, as they usually feel obligated to reciprocate (Poortvliet et al., 2009; Shin et al., 2020). These side effects may counteract the benefits of leader and colleague support, making them less constructive for school counselors' occupational well-being.

4.3 Autonomy and competence as more central needs to occupational well-being

While all three needs were influenced by situational and inter-individual supports, only the satisfaction of autonomy and competence needs can effectively translate these supports into school counselors' occupational well-being. This result partly aligns with the early assumptions of Self-determination Theory, in which autonomy and competence are more central needs for individuals than relatedness is (Deci and Ryan, 2000; Kashdan and Fincham, 2004).

On the one hand, the crucial roles of autonomy and competence are understandable. High autonomy allows school counselors to flexibly adopt individualized strategies for different students and arrange their workloads and schedules, which directly improves their work engagement and satisfaction (Neufeld and Malin, 2020; Stiglbauer and Kovacs, 2018). Meanwhile, strong perceived competence boosts school counselors' confidence in their work, so they are more engaged and can better handle work pressure (Klaeijnsen et al., 2018; Salmela-Aro and Upadaya, 2014). Competence is particularly essential to part-time counselors' work well-being, who often lack sufficient training and feel less self-efficient about their work. Thus, satisfying their needs for competence can effectively prevent this well-being risk.

Nonetheless, why is relatedness a less central need to school counselors' occupational well-being? A possible explanation is that relatedness is a more general need in life, whereas autonomy and competence can be occupation-specific needs that directly impact school counselors' occupational well-being (Deci and Ryan, 2000; Kashdan and Fincham, 2004). In other words, despite the significance of relatedness (as a need), it could hardly affect the specific aspects of well-being immediately, especially in the school counselors'

occupation, which involves comparatively independent work (i.e., most of the time they only interact with students in one-on-one counseling). However, as few prior studies have compared the effectiveness of school counselors' different basic psychological needs, this result and the related explanation need further examination.

4.4 Implications

The findings in this study have several implications for benefiting school counselors' occupational well-being. First, given the universally constructive roles of organizational support and occupational empowerment, school managers should create a supportive organizational environment with clear communication channels, regular feedback sessions, and recognition programs to acknowledge the contributions of school counselors. They are also expected to involve school counselors in school decision-making processes, particularly on issues that directly affect their work.

Second, as students provide the most critical inter-individual support, especially for part-time counselors, it is essential to strengthen positive interactions between counselors and students, such as providing opportunities for school counselors to interact with students outside of formal counseling sessions and encouraging communication and feedback from students.

Finally, the study identified a greater priority to satisfy school counselors' autonomy and competence needs, and thus, schools should grant counselors greater flexibility in their work, ensure they have the necessary tools and resources, and offer specialized training to enhance their occupational competence.

4.5 Limitations and future directions

There are some limitations in our study. First, since few previous studies have been conducted in this field, our study is only exploratory; it is necessary to re-examine and explore the results and their underlying dynamics in further studies. Second, the cross-sectional nature of our data prevents us from establishing causal relationships among situational and inter-individual supports, basic psychological needs, and occupational well-being. Future studies are expected to identify the most prominent well-being predictors through longitudinal surveys. Finally, to reduce respondent burden, some variables were measured by single items (i.e., leader, colleague, family supports, and work pressure), which might contribute to some bias in the results.

5 Conclusion

By comprehensively examining the associations among situational supports, inter-individual supports, basic psychological needs, and school counselors' occupational well-being, this study identified the most effective situational supports (i.e., organizational support and occupational empowerment), vital supporters (i.e., students) and the most central psychological needs (i.e., autonomy and competence) in promoting their occupational well-being. The findings imply effective supporting strategies to improve school counselors' work conditions and address

well-being risks, helping guarantee their work efficacy in protecting children's mental health.

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 humans were approved by the Ethics Committee of Beijing Normal University (BNU202404100022). The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

LF: Data curation, Methodology, Writing – original draft, Writing – review & editing. YL: Writing – original draft, Writing – review & editing. HH: Methodology, Supervision, Writing – original draft, Writing – review & editing.

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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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Appendix

TABLE A1 Factor loadings of latent variables.

Variable	Factor loadings	Item
Organizational support	0.82	The organization values my contribution to its well-being
	0.77	The organization cares about my general satisfaction at work
	0.87	Help is available from the organization when I have a problem in work
	0.85	Help is available from the organization when I have a problem in life
	0.64	The organization would understand a long absence due to my personal reasons
	0.88	The organization strongly considers my goals and values.
	0.88	The organization really cares about my well-being
	0.86	The organization is willing to extend itself in order to help me perform my job to the best of my ability
	0.82	The organization would grant a reasonable request for a change in my working conditions
	0.86	The organization takes pride in my accomplishments at work
	0.90	The organization wishes to give me the best possible job for which I am qualified
Leader support	/	School leaders value my work in mental health counseling
Colleague support	/	Other school teachers support your work in mental health counseling
Student support	0.87	Students like the activities related to mental health
	0.81	Compared with other teachers, students like me (as a school counselor) more
Family support	/	My family members support my work in mental health counseling
Training support	/	The school training for mental health counseling is helpful for my work
Occupational value	0.92	I believe that school counselor is important to promote students' holistic development
	0.91	I believe that school counselor is important for school education
	0.92	I believe that school counselor is beneficial to students' academic progress
	0.80	I believe that every school should have at least one school counselor
Occupational empowerment	0.83	My impact on what happens in my department is large
	0.81	I have a great deal of control over what happens in my department
	0.86	I have significant influence over what happens in my department
Autonomy	0.85	I have significant autonomy in determining how I do my job
	0.86	I can decide on my own how to go about doing my work
	0.70	I have considerable opportunity for independence and freedom in how I do my job
Competence	0.86	I am confident about my ability to do my job in mental health counseling
	0.95	I can professionally help student improve their mental health
Relatedness	0.71	I care about how others perceive my occupation as a school counselor
	0.75	I feel insulted when someone makes unwarranted accusations about the school counselor group
	0.94	I care about how others perceive the community of school counselors
Work engagement	0.85	When I'm doing my work as a school counselor, I feel bursting with energy.
	0.86	I feel strong and vigorous when I'm studying or going to work
	0.91	I am enthusiastic about my work
	0.90	I find my work full of meaning and purpose
	0.85	I am proud of my work
	0.68	I feel happy when I am working intensely
	0.86	When I am working, I forget everything else around me
	0.82	Time flies when I am working
Work satisfaction	0.81	How much are you satisfied with your salary?
	0.87	How much are you satisfied with the promotion opportunities in your organization?
	0.59	How much are you satisfied with the content of your job?
Work pressure	/	I feel stressful for my work in mental health counseling



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EDITED BY

Nicholas Pang,
Universiti Malaysia Sabah, Malaysia

REVIEWED BY

Elham Rouhi,
University of Tehran, Iran
Zhen-Dong Wang,
Shanghai University of Traditional Chinese
Medicine, China
Xinyu Tan,
East China University of Science and
Technology, China

*CORRESPONDENCE

Robert Rudolf
✉ rrudolf@korea.ac.kr

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Predictors of adolescent well-being around the globe: are students from Confucian East Asia different?

Robert Rudolf *

College of International Studies, Korea University, Seoul, Republic of Korea

Purpose: Using rich data from nearly 400,000 15-year-olds across 70 middle- and high-income countries and economies participating in PISA 2018, this study investigates (1) global predictors of adolescent subjective well-being (SWB), and (2) differences in adolescent life satisfaction, its predictors and endowments with predictors across world regions and cultures. A particular focus lies on comparing Confucian East Asia (CEA) with other world regions.

Methods: Data were analyzed using multiple linear regressions and Blinder-Oaxaca decomposition. As measures of adolescent well-being, this study employs life satisfaction, affective well-being, and meaning in life.

Results: Globally, adolescent well-being outcomes are found to be most strongly linked to gender, personality, relative SES, relationship quality, peer SWB, autonomy and the learning environment, as well as local cultural factors. Estimations by world region reveal several culture-specific explanations for interregional well-being gaps. In particular, notoriously low levels of life satisfaction among students from CEA countries are found to be associated with low self-efficacy, low peer well-being, as well as with high emotional interdependence compared to other world regions. Emotional interdependence is more strongly experienced among CEA adolescents compared to adolescents from any other world region. Moreover, it is found to be more strongly associated with life satisfaction in the CEA region than in any other region. In line with the former, CEA students show stronger links between other relational factors (parents' emotional support; sense of belonging at school) and life satisfaction compared to most other regions.

Implications: This study suggests that among the environmental factors that shape the experience of adolescent lives, relationship and cultural factors play key roles and are closely intertwined. Parents, educators and policymakers around the world should focus on creating a positive school environment that promotes well-being, student self-efficacy, a sense of belonging, and a safe space in which failure is accepted as part of the learning process. This is particularly needed in Confucian East Asian countries.

KEYWORDS

subjective well-being, adolescents, culture, peer well-being, Confucian Asia, collectivism

1 Introduction

Over the past two decades, subjective well-being (SWB) measures have increasingly been used in the study of child and youth well-being. Following Diener (1994), SWB refers to individuals' evaluation of the quality of their lives in general. It is a multidimensional construct that includes affective and cognitive components. In particular, it is cognitive component—overall satisfaction with one's life—has become a key comprehensive measure of adolescent well-being across countries and cultures (Diener and Diener, 1995; Gilman and Huebner, 2003, 2006; Antaramian et al., 2008; Bradshaw et al., 2013; Lee and Yoo, 2015). Besides being important in its own right, adolescent SWB is known to contribute to a variety of positive youth outcomes while buffering against negative ones. Low life satisfaction in adolescence has been found to be associated with psychological, social and behavioral problems. In contrast, high life satisfaction has proven to mitigate the negative effects of stressful life events, to reduce participation in risky behaviors, and to be conducive to good mental health (Park, 2004; Suldo and Huebner, 2004; Mahmoud et al., 2012; Sun and Shek, 2013). Life satisfaction has further been found to be positively correlated with a variety of desirable psychological characteristics (Park, 2004). Within the school environment, students with higher life satisfaction have shown stronger cognitive engagement and have been found to be more resilient to school-related stress (Lewis et al., 2011; Moksnes et al., 2016; Shek and Li, 2016). Adolescent SWB further matters for the transition to adulthood and many long-run life outcomes including adult life satisfaction (Fredrickson, 2001; Coffey et al., 2015). Related adult studies further suggest that happier people are more likely to get married (Stutzer and Frey, 2006), may be more successful on the job (Zelenski et al., 2008), and enjoy healthier and longer lives (Diener and Chan, 2011).

Studies among children and youth have consistently found that demographic and socio-economic variables can only explain a small portion of the variation in life satisfaction (Gilman and Huebner, 2003, 2006). Indeed, most of its variance can be ascribed to intrapersonal and interpersonal environmental variables (Levin and Currie, 2010; Morgan et al., 2012; Lee and Yoo, 2015; Coupe and Obrizan, 2018). First, similar to adults, the largest fraction of life satisfaction differences across adolescents can be explained by intrapersonal differences, i.e., differences in personality traits (e.g., extraversion, neuroticism, locus of control, self-esteem, self-efficacy, independent vs. interdependent) (Diener and Lucas, 1999; Park, 2004; Steel et al., 2008; Li et al., 2019). Second, interpersonal environmental factors such as relations with family and friends account for another large fraction. Among school-related factors, peer relationships, a sense of belonging, and academic stress have been found to be associated with student well-being (Lee and Yoo, 2015; Chiu et al., 2016; Lemma et al., 2015; Moksnes et al., 2016). Generally, research suggests that adolescent life satisfaction can be enhanced by supportive parenting, engagement in challenging activities, positive life events, and high-quality interactions with significant others.

Since Diener and Diener (1995) found substantial cross-country differences in subjective well-being, many studies have attempted to contribute to the explanation of such differences. Early studies showed cross-country SWB to correlate strongly with countries' levels of income (e.g., Diener and Biswas-Diener, 2002). However, even after controlling for material wealth and other macro factors, substantial SWB differences remain across countries and world regions (e.g.,

Deaton, 2008; Inglehart et al., 2008; Senik, 2014; Helliwell et al., 2018; Rudolf, 2020). In particular, given their income levels, average reported SWB among members of Confucian East Asian countries such as Japan, Korea, and China has been found to be notoriously low, while that of most Latin American countries was found to be surprisingly high. Studies further have shown that cross-country differences in SWB are not just an artifact of language issues or varying levels of modesty in interview situations, but are correlated with related measures of mental health such as vitality and the absence of depressive symptoms (Senik, 2014; Casas and Rees, 2015; Chen et al., 2015). Therefore, it is now widely acknowledged that *cultural factors*—the norms, values, and practices shared by a group of people—play a key role in explaining SWB differences across countries. Social values, norms, and beliefs set the boundaries in which emotions are permitted and expressed in a given group, thereby framing emotional experience (Fulmer et al., 2010). Culture has further been found to influence how much *importance* people place on various aspects of their lives when making life satisfaction judgments. Most studies in this field have focused on comparisons between Americans and (Confucian) East Asians¹, often using university student samples, and have employed Hofstede's classification of cultures into individualistic and collectivistic (Diener and Suh, 2000; Park and Huebner, 2005; Oishi and Diener, 2009; Suh and Choi, 2018). In these studies, people from Western/individualistic cultures have been found to weigh self-esteem and emotions more when making life satisfaction judgments, while members of Confucian East Asian/collectivist cultures have shown to place greater importance on relational factors, particularly on family and friends (Diener and Diener, 1995; Suh et al., 1998; Park and Huebner, 2005; Uchida and Ogiwara, 2012). Suh and Choi (2018), in a recent review of the literature, posit that “East Asians' excessive concern of other's view might be a key psychological reason for why their happiness level is lower than expected by economic indices.”

In a recent study, Rudolf and Bethmann (2023) use PISA 2018 data from 72 middle- and high-income countries to show that *adolescent* SWB is negatively related with a country's per-capita GDP, the opposite of what can be found for *adult* data. The authors point to higher learning intensity and school-related stress in advanced countries as a potential mechanism that drives this apparent paradox. Focusing on the case of South Korea, and also using PISA 2018 data, Rudolf and Lee (2023) show that a more competitive school climate induces higher academic performance in mathematics, reading, and science. Student competition, however, comes at the cost of reduced individual life satisfaction. Stankov (2010) shows that high academic achievement of students from Confucian Asian countries is accompanied by high levels of anxiety and self-doubt. He argues that an “unforgiving” Confucian culture, coupled with the belief that effort rather than ability is the primary source of success, might be causing this phenomenon. Fwu et al. (2017), using data from Taiwan, argue that in a Confucian cultural context, students are trapped in a dilemma

1 This study uses the term “Confucian East Asia” when referring to countries that have been largely influenced by Confucianism throughout their history. This includes China and its offshoots (Singapore, Hong Kong, Taiwan/Taipei, Macao), as well as Korea, Japan, and Vietnam. Non-Confucian East Asia are countries located in Southeast Asia other than Vietnam and Singapore.

between “feeling bad” (emotional distress) for exerting excessive effort and “being bad” (negative view of others) for making little effort.

Cultures can also differ in their desirability judgments about happiness. Western cultures often hold that happiness is an inalienable right and a product of an individual's action. On the contrary, such belief is less prevalent in East Asian or Islamic cultures (Joshani et al., 2014). Bastian et al. (2014) show that in cultures where positive emotions are highly valued, people report higher life satisfaction and report more positive emotions. At the same time, collectivist East Asian cultures are currently undergoing a gradual shift away from collectivism and toward individualism (Uchida and Ogihara, 2012).

Additional contributions on the cultural making of well-being have recently come from self-determination theory (SDT). According to SDT, individuals reach higher levels of well-being when satisfying their basic psychological needs of autonomy, relatedness, and competence (Ryan and Deci, 2000, 2017). Conzo et al. (2017) provide an empirical test of SDT and find for 27 European countries that lack of trust, high obedience, and low respect constrain the satisfaction of basic psychological needs, and thus in turn lower individual well-being. Chen et al. (2015) apply SDT to a sample of university students across four countries with different cultural backgrounds (USA, China, Peru, and Belgium). The authors show that Chinese students score lowest in self-reported autonomy and relatedness, and report lowest vitality and life satisfaction. On the contrary, Peruvian students score highest in their satisfaction with all three psychological needs, and report highest vitality and life satisfaction, as well as lowest depressive symptoms. The study finds a strong statistical association between psychological need satisfaction and life satisfaction. Among all three needs, it shows that autonomy satisfaction is the strongest predictor of life satisfaction.

Past studies on the cultural making of life satisfaction have focused on a limited number of countries/cultures and have often been sparse in terms of explanatory variables included. In addition, given that most earlier studies have used university student samples, little is known about the cultural factors that explain *adolescent* well-being differences across countries/cultures. The present article aims to expand the understanding of adolescent well-being by using OECD's PISA 2018 data for 70 countries from 10 major world regions.² In particular, this study strives to (1) identify global predictors of adolescent subjective well-being; (2) examine cross-regional/cross-cultural differences in both endowments with predictors and in their relationship with adolescent life satisfaction; and (3) explain the gap in adolescent well-being between Confucian East Asia and other world regions.³

The present study contributes to the existing literature in the following ways. First, the present study uses one of the largest adolescent samples employed in the literature to date, both in terms of countries (70 from 10 world regions) and individuals ($N = 398,609$ 15-year-old students). Moreover, while past studies have often relied on small-scale student samples, this study uses nationally representative student survey data. Second, this study focuses on the

gap between Confucian East Asia and nine other world regions in the generation of well-being. Past studies have often only compared East Asians with one or two other cultural groups (often with European Americans), and there are only very few recent studies that have started using a larger number of countries and nationally representative survey data (Lee and Yoo, 2015; Marquez and Main, 2020; Rudolf and Bethmann, 2023). Third, this study makes use of a broad set of well-being outcomes and predictors. Life satisfaction, happiness, positive affect, negative affect, and meaning in life will be employed as outcome variables in order to provide a holistic picture of adolescent well-being. Moreover, predictors used include a comprehensive set of variables related to demographics, personality, socio-economic background, autonomy and home learning environment, peer characteristics, relationship quality, school atmosphere, and location. Lastly, as a methodological innovation, I employ a Blinder-Oaxaca decomposition technique in order to disentangle mean life satisfaction differences between Confucian East Asia and all other world regions into endowment and coefficient effects. In a nutshell, this technique allows disentangling region-specific differences in *endowments* that foster/constrain adolescent well-being from cultural differences in the *importance* that adolescents place on various aspects of their lives when making life satisfaction judgments. While commonly used in gender or racial gap analysis, Blinder-Oaxaca decomposition techniques have only recently been introduced to SWB analysis (Senik, 2014).

The remainder of this article is organized as follows. Section II introduces the data set, variables used in the analysis, and the empirical strategy. Section III presents estimation results by (1) examining global predictors of adolescent SWB, (2) conducting a region-specific analysis, and (3) decomposing mean life satisfaction differences between CEA and other world regions. Section IV summarizes and discusses the findings and concludes.

2 Data and methodology

2.1 Data set

This study uses data from the 2018 round of the Program of International Student Assessment (PISA). PISA is a triennial survey of 15-year-old students around the world that assesses knowledge and skills considered essential for full participation in social and economic life (OECD, 2019). PISA 2018 collected data from a total of 79 participating countries and economies, making it the largest cross-country student assessment to date. While the main focus of PISA is on conducting internationally comparable tests in reading, mathematics, and science, it also collects broad information on each participating student's individual and family background, as well as teacher and school-related information. Some 600,000 students completed the assessment in 2018, representing about 32 million 15-year-olds in the schools of the 79 participating countries and economies.⁴ In 2018, comprehensive subjective well-being questions

² PISA 2018 data is preferred over PISA 2022 data, since affective well-being and meaning in life were not measured in PISA 2022.

³ Due to space limitations, this paper's analysis will focus on the cognitive aspect of SWB, i.e., life satisfaction.

⁴ According to PISA's survey design, 150 schools were surveyed in each country. Countries taking the computer-based assessment were supposed to sample 42 students from each of the 150 sampled schools, while countries

have been part of the PISA student questionnaires in 72 countries/economies, which allow for an in-depth analysis of adolescent well-being and its predictors across countries. This study uses data from up to 398,609 students from 70 countries/economies for which full information on all variables used in the analysis is available.

2.2 Variables

Following Diener (1994), subjective well-being refers to individuals' evaluation of the quality of their lives in general. It is a multidimensional construct that includes affective and cognitive components. SWB traditionally consists of three components: relatively high levels of positive affect, relatively low levels of negative affect, and the overall satisfaction with one's life. Researchers have often preferred measures of life satisfaction because these are more stable over time compared to affective measures which capture rather momentary feelings. Life satisfaction can be considered a comprehensive measure of adolescent psychological well-being (Park, 2004). In addition to these traditional SWB measures, meaning in life has received increasing attention lately as a measure of eudaimonic well-being (Steger et al., 2008; OECD, 2013; Yang et al., 2017).

Table S1 in the electronic supplementary file a detailed description of all variables and indexes used in this study. Five standard SWB outcomes (life satisfaction, happiness, positive affect, negative affect, meaning in life) will be employed. A student's life satisfaction is a single-item variable measured by asking students "Overall, how satisfied are you with your life as a whole these days?" It has a response scale from "0" indicating "not at all satisfied" to "10" indicating "completely satisfied." PISA 2018 also asked students about their usual positive and negative emotions. Student "happiness" is the response to the question "Thinking about yourself and how you normally feel: how often do you feel happy?" where the response scale has four categories ("1" = "never," "2" = "rarely," "3" = "sometimes," "4" = "always"). In the same fashion, the questionnaire asks students about other positive and negative emotions. Individual averages across all four positive emotions (happy, joyful, cheerful, lively) were used to construct a measure of "positive affect," while averages across the four negative emotions (afraid, scared, sad, miserable) were used to construct a measure of "negative affect." Lastly, meaning in life is measured using a 3-item index of perceived meaning in life.^{5,6}

Several variables have been included to control for students' individual characteristics. These include a female dummy, a single child dummy, a migration background dummy, as well as two personality-related measures. Several earlier studies have found girls to experience lower SWB than boys during their teen years, even in relatively

gender-equal cultures (see for example Coupe and Obrizan, 2018). More importantly, personality traits play a key role in explaining interpersonal differences in subjective well-being (Diener and Lucas, 1999; Steel et al., 2008). This study therefore includes a 5-item index of self-efficacy/resilience and a single-item measure of emotional interdependence. Self-efficacy can be defined as the perceived ability "to deal with prospective situations" (Bandura, 1982) and has regularly be found to correlate with SWB (e.g., Tong and Song, 2004). I define emotional interdependence as the level of agreement to the statement "When I am failing, I worry about what others think of me." The latter variable can be expected to play a larger role in collectivistic compared to individualistic cultures (Tsai and Lau, 2013).

Three variables control for family characteristics, i.e., parental education, an index of home possessions, and a 3-item index accounting for the level of parents' emotional support perceived by the adolescent. Moreover, a set of dummy variables accounts for the level of adolescent autonomy and a domestic environment that facilitates learning (own room, desk to study, quiet place to study).

Besides the family realm, adolescent well-being is largely influenced by the interactions with peers and the school environment (Park and Huebner, 2005; Raboteg-Saric and Sakic, 2014; Marquez and Main, 2020). Therefore, this study includes controls for peer well-being, peer socio-economic background, and school atmosphere. Controlling for peer well-being can account for potential interpersonal spillover effects in well-being, as some studies claim that happiness might be contagious (Lundqvist and Dimberg, 1995; Tumen and Zeydanli, 2015). Moreover, controlling for peer-averages might help to mitigate the effect of unobservable factors that may otherwise bias cross-sectional estimates (Altonji and Mansfield, 2014). I further control for relative socio-economic status (SES) by including peer averages of home possessions and parental education.⁷ In adult studies it is usually found that SWB rises with own income and wealth, while it falls with peer income and wealth (Clark and Oswald, 1996; Clark et al., 2008).

In order to account for school atmosphere, this study includes four additional variables: a 4-item index of student competition, a 4-item index of student cooperation, and a 4-item index of teacher support. All indexes are provided by the OECD/PISA team, and are scaled so that a value of zero indicates the OECD average. A detailed description of each index item can be obtained from Table S1. Lastly, a student's sense of belonging at school is measured using a 6-item index.

This study further controls for location effects with five dummies indicating the level of urbanization in which a student resides, and a full set of district dummies. Controlling for district fixed effects helps to control for within-country, local differences in culture and use of language that might influence the way well-being is experienced and expressed.

2.3 Summary statistics

Table 1 presents summary statistics for the sample of 67 countries and $N = 376,641$ 15-year-old students for which information on all

taking the paper-based assessment were supposed to sample 35 students from each school. Each student of age 15 in each classroom had a real probability of participation (OECD, 2016).

⁵ Students were asked to report the extent to which they agree with the statements: "My life has clear meaning or purpose"; "I have discovered a satisfactory meaning in life"; and "I have a clear sense of what gives meaning to my life."

⁶ Supplementary Table S2 presents mean values for all five well-being outcomes by country.

⁷ It should be noted that each time a peer average is constructed in this study the focus individual was excluded from the calculation to avoid reverse causality.

TABLE 1 Summary statistics.

Variable	Mean	Std. dev.	Min	Max
Subjective well-being				
Life satisfaction	7.05	2.61	0	10
Happiness	3.39	0.67	1	4
Positive affect	3.31	0.58	1	4
Negative affect	2.42	0.60	1	4
Meaning in life index	0.19	0.97	−2.15	1.74
Individual characteristics				
Female	0.51		0	1
Single child	0.25		0	1
Migrant background	0.06		0	1
Self-efficacy/resilience index	0.01	0.98	−3.17	2.77
Emotional interdependence	2.65	0.93	1	4
Family characteristics				
Parents max years of schooling	13.04	3.27	3	18
Home possessions index	−0.78	1.27	−9.49	5.92
Parents' emotional support index	−0.02	1.00	−2.45	1.03
<i>Autonomy/learning environment at home</i>				
Own room	0.80		0	1
Desk to study	0.84		0	1
Quiet place to study	0.82		0	1
Peer characteristics				
Life satisfaction (peer avg.)	7.05	0.90	0	10
Happiness (peer avg.)	3.38	0.21	1	4
Positive affect (peer avg.)	3.30	0.20	1	4
Negative affect (peer avg.)	2.42	0.22	1	4
Meaning in life index (peer avg.)	0.18	0.35	−2.15	1.74
Home possessions index (peer avg.)	−0.80	0.95	−4.67	2.66
Parents max years of schooling (peer avg.)	13.02	1.96	3	18
School atmosphere				
Student competition index (school avg.)	0.12	0.36	−1.99	2.04
Student cooperation index (school avg.)	0.02	0.37	−2.14	1.68
Teacher support index (school avg.)	0.24	0.35	−2.15	1.31
Sense of belonging index	−0.11	0.93	−3.29	3.23
Level of urbanization				
Village	0.09		0	1
Small town	0.19		0	1
Town	0.29		0	1
City	0.27		0	1
Large city	0.16		0	1
World region				
Western Europe	0.06		0	1
Eastern Europe	0.03		0	1
Northern Europe	0.03		0	1
Southern Europe	0.05		0	1

(Continued)

TABLE 1 (Continued)

Variable	Mean	Std. dev.	Min	Max
United States	0.15		0	1
Confucian East Asia	0.14		0	1
Non-Confucian East Asia	0.26		0	1
Latin America	0.15		0	1
Middle East and North Africa	0.07		0	1
CIS	0.07		0	1

N = 376,641. Population means calculated using official PISA 2018 survey weights.

variables is available.⁸ Statistics have been adjusted using sampling weights, thus they represent population means and population standard deviations. Across the adolescent population, 51% are female, 25% are single children, and 6% have a migrant background. At home, 80% of students have access to an own room, 84% have a desk to study, and 82% report to have a quiet place for study. Forty-three percent of students live in cities, 48% in towns, and 9% in rural areas. Mean life satisfaction is 7.05 (SD 2.62). Happiness, positive affect, and negative affect have mean values of 3.39, 3.31, and 2.42 (SD 0.67, 0.58, and 0.60), respectively. Moreover, the average meaning in life index score is 0.19 (SD 0.97).

Given that multi-item indexes accounting for personality traits and relationships have been standardized by PISA with means of zero (= OECD average) and standard deviations of one, for illustration purposes it can be useful to discuss statistics of selected items included in these indexes. As one of the measures of self-efficacy/resilience, approximately four out of five adolescents agree (66.1%) or strongly agree (19.3%) to “usually manage one way or the other.” Emotional interdependence is measured by the survey item “When I am failing, I worry about what others think of me.” This statement is agreed to by 40.5% of adolescents, while 16.3% strongly agree. With regard to meaning in life, approximately three quarters of students agree (49.7%) or strongly agree (25.3%) to the statement “My life has clear meaning or purpose.” Furthermore, as one of the items in the “sense of belonging index,” 73.1% of students feel like they belong at school. Lastly, with regard to school atmosphere, 53.3 (62.8)% of students responded that it is “very true” or “extremely true” that students at their school are competing (cooperating) with each other.

2.4 Methodology

In order to analyze the predictors of well-being, W_{isd} , of student i who is attending school s in district d , the following empirical model will be employed:

$$W_{isd} = \alpha + Family'_{isd}\beta + GenderPersonality'_{isd}\gamma + Relation'_{isd}\delta + School'_{sd}\zeta + Urban'_{sd}\theta + \mu_d + \varepsilon_{isd} \quad (1)$$

⁸ This is the regression sample that will be used for the life satisfaction regression. The samples for other well-being outcomes may slightly differ. The focus of this paper's analysis will be on life satisfaction.

where $Family_{isd}$ represents a vector of family background variables, $GenderPersonality_{isd}$ a vector of gender and personality traits, $Relation_{isd}$ a vector of relationship variables, $School_{sd}$ a vector of school atmosphere variables, and $Urban_{sd}$ is a vector of location dummies accounting for the level of urbanization. Lastly, μ_d represents district (or in some models world region) fixed effects, and ε_{isd} is the error term which is assumed to be well-behaved. Life satisfaction is measured on a 11-point scale from 0 to 10. Many studies have applied linear regression techniques to models similar to the one in Equation 1 (Ferrer-i-Carbonell and Frijters, 2004; Rudolf and Kang, 2015). I follow this strategy and estimate Equation 1 using OLS while correcting standard errors for clustering at the school level. Most variables in Equation 1 can be considered exogenous and thus determinants of well-being. However, one should be cautious with the interpretation of some of the RHS variables, in particular personality traits, relationship indexes, as well as peer well-being; these should be regarded as predictors rather than determinants since reverse causality cannot be ruled out.

Equation 1 can be estimated over the global PISA student sample in order to see how each set of factors predicts adolescent well-being globally. Moreover, two strategies will be employed to examine differences in the predictors of well-being across world regions. First, Equation 1 can be estimated separately for each world region, providing an indication of how the predictors of student well-being differ across groups of countries. Second, a Blinder-Oaxaca type decomposition will be used in order to account for life satisfaction differences between Confucian East Asia (CEA) and other world regions (Blinder, 1973; Senik, 2014).⁹

Students from CEA countries are of particular interest since they are usually found to excel in PISA, while at the same time ranking poorly with regards to subjective well-being. Differences in SWB between world regions can be due to (1) differences in endowments with SWB predictors such as individual characteristics, family characteristics, autonomy, peer characteristics, school atmosphere, etc.; (2) differences in how these predictors are related to SWB; and (3) the interactions between (1) and (2). Suppose we are interested in decomposing

⁹ The CEA region includes the following countries/economies: B-S-J-Z (China), Chinese Taipei, Hong Kong, Japan, South Korea, and Macao. Not all variables were available for Vietnam and Singapore. For China, PISA 2018 was conducted in the following four high-income provinces/municipalities: Beijing, Shanghai, Jiangsu and Zhejiang.

the mean life satisfaction difference Δ between CEA students and students from all other countries [for simplicity denoted as “rest of the world” (RW)] as in Equation (2)

$$\Delta = E(LS_{CEA}) - E(LS_{RW}) \quad (2)$$

Following Jann (2008), substituting the linear model $E(LS) = E(X'\beta + \varepsilon)$ into (2) and rearranging the equation, one obtains¹⁰

$$\begin{aligned} \Delta = & \{E(X_{CEA}) - E(X_{RW})\}' \beta_{RW} + E(X_{RW})' (\beta_{CEA} - \beta_{RW}) \\ & + \{E(X_{CEA}) - E(X_{RW})\}' (\beta_{CEA} - \beta_{RW}) \end{aligned} \quad (3)$$

Equation 3 is the Blinder-Oaxaca threefold decomposition that allows dividing the life satisfaction difference between two groups of countries into three components: contributions of differences in endowments ($\{E(X_{CEA}) - E(X_{RW})\}' \beta_{RW}$), contributions of differences in coefficients ($E(X_{RW})' (\beta_{CEA} - \beta_{RW})$), and contributions of interactions between endowments and coefficients ($\{E(X_{CEA}) - E(X_{RW})\}' (\beta_{CEA} - \beta_{RW})$).

3 Results

3.1 Predictors of well-being among 15-year-olds

Table 2 presents estimation results of Equation 1 across the global sample for life satisfaction, happiness, positive affect, negative affect, and meaning in life. Estimations were run over up to 398,609 students from up to 70 countries and explain between 18.7 and 27.6% of the variation in the five well-being measures.¹¹

3.1.1 Individual characteristics

Results indicate that being female significantly reduces life satisfaction and meaning in life for girls, while it increases affect. This is in line with earlier studies (e.g., Bergman and Scott, 2001; Lee and Yoo, 2015; Rudolf and Bethmann, 2023). In particular, being a girl reduces life satisfaction by 0.433 ($p = 0.000$) or 16.6% of a standard deviation, while it raises negative affect by 0.250 ($p = 0.000$) or 41.7% of a standard deviation. Positive affect does not differ by gender, except for the feeling of happiness which is slightly more reported by girls. Being a girl further reduces perceived meaning in life by -0.0831 ($p = 0.000$). Moreover, being

a single child and having migration background both reduce adolescent well-being, although effects are not particularly large. With regard to personality traits, higher levels of self-efficacy and lower levels of emotional interdependence are found to be associated with higher well-being among sample participants. Both variables' effects are large in size and highly statistically significant [e.g., $+0.395$ ($p = 0.000$) and -0.207 ($p = 0.000$) association with life satisfaction].

3.1.2 Family characteristics

Parental education is found to exert small, but statistically significant negative effects on adolescent well-being, holding everything else constant. On the contrary, the level of home possessions and parents' emotional support are both positively related to the well-being of adolescents. The latter in particular shows a large and highly significant effect indicating the key importance of the child–parent relationship.

3.1.3 Autonomy/learning environment at home

Having an own room, a desk to study, and a quiet place to study at home all show significant positive impacts on student well-being. All effects are statistically significant at the 1-percent significance level. Remarkable are the large coefficient magnitudes of having a quiet place to study; e.g. it increases life satisfaction by 0.642 ($p = 0.000$) or 24.6% of a standard deviation.

3.1.4 Peer characteristics

Peer effects play important roles for individual well-being. Peer averages of the outcome variables are all statistically significant at the 1-percent level. Given that all models control for district dummies which should capture cultural and language differences across space, significant peer well-being effects suggest spillovers in well-being across school peers. Besides peer well-being, adolescent's well-being is influenced by peers via relative SES. Table 2 results confirm that higher education and wealth of peer families reduce individual well-being among adolescents. This expresses itself in lower life satisfaction, less frequent experiences of positive emotions, more frequent experiences of negative emotions, as well as lower levels of meaning and purpose perceived in life. The finding that the (negative) effect of peer home possessions is larger than the (positive) effect of own home possessions suggests that relative wealth is more important than absolute wealth also for adolescents, a common finding in adult SWB studies (e.g., Clark et al., 2008). Moreover, that SWB is reduced in schools with students from wealthier and more educated backgrounds is in line with Rudolf and Lee (2023) who show that when the average education level of parents is high, within-school competition increases which adversely affects adolescent life satisfaction.

3.1.5 School atmosphere

Although featuring rather small coefficient magnitudes, competition among students is found to reduce well-being, while cooperation increases it. Students are further found to benefit from higher levels of teacher support. In addition, large effects are found for the association between sense of belonging at school and students' well-being which is in line with Chiu et al. (2016).

¹⁰ $E(LS)$ denotes the expected value of life satisfaction, X is a vector containing all predictors and a constant, and β contains the slope parameters and the intercept.

¹¹ I started out with a broader set of variables first which resulted in a significant loss in observations. Subsequently, I dropped the variables that were not regularly significant, increasing the sample size. There is usually a tradeoff involved in survey data in that model parsimony results in a larger sample size and vice versa.

TABLE 2 Predictors of subjective well-being among adolescents.

	(1)	(2)	(3)	(4)	(5)
	Life satisfaction	Happiness	Positive affect	Negative affect	Meaning in life
Individual characteristics					
Female	−0.433*** (0.00806)	0.00429** (0.00214)	−0.000269 (0.00182)	0.250*** (0.00198)	−0.0831*** (0.00289)
Single child	−0.105*** (0.00909)	−0.0198*** (0.00241)	−0.0342*** (0.00202)	0.0135*** (0.00210)	−0.0843*** (0.00337)
Migrant background	−0.136*** (0.0160)	−0.0131*** (0.00418)	−0.0116*** (0.00344)	−0.000641 (0.00369)	0.0230*** (0.00551)
Self-efficacy/resilience index	0.395*** (0.00498)	0.120*** (0.00134)	0.130*** (0.00114)	−0.0527*** (0.00123)	0.333*** (0.00179)
Emotional interdependence	−0.207*** (0.00462)	−0.0221*** (0.00123)	−0.0188*** (0.00103)	0.122*** (0.00111)	−0.0111*** (0.00172)
Family characteristics					
Parents max years of schooling	−0.00988*** (0.00158)	−0.00416*** (0.000415)	−0.00350*** (0.000343)	0.00109*** (0.000359)	−0.00391*** (0.000529)
Home possessions index	0.849*** (0.00558)	0.00906*** (0.00150)	0.0106*** (0.00127)	0.0132*** (0.00131)	0.00551*** (0.00188)
Parents' emotional support index	0.383*** (0.00477)	0.0890*** (0.00123)	0.0755*** (0.00104)	−0.0254*** (0.00103)	0.139*** (0.00167)
Autonomy/learning environment at home					
Own room	0.131*** (0.0112)	0.0221*** (0.00292)	0.0150*** (0.00240)	−0.0203*** (0.00247)	0.0102*** (0.00385)
Desk to study	0.133*** (0.0160)	0.0386*** (0.00409)	0.0350*** (0.00331)	−0.0105*** (0.00345)	0.0234*** (0.00502)
Quiet place to study	0.642*** (0.0147)	0.119*** (0.00380)	0.0964*** (0.00309)	−0.0628*** (0.00314)	0.0858*** (0.00454)
Peer characteristics					
Outcome variable (peer avg.)	0.219*** (0.00861)	0.142*** (0.00980)	0.178*** (0.00871)	0.150*** (0.00850)	0.143*** (0.00819)
Home possessions index (peer avg.)	−0.222*** (0.0146)	−0.0109*** (0.00401)	−0.0288*** (0.00325)	0.0175*** (0.00346)	−0.0755*** (0.00510)
Parents max years of schooling (peer avg.)	−0.0202*** (0.00506)	−0.00416*** (0.00139)	−0.00365*** (0.00114)	0.00624*** (0.00119)	−0.0124*** (0.00180)
School atmosphere					
Student competition index (school avg.)	−0.0380** (0.0160)	−0.00831* (0.00437)	−0.00800** (0.00357)	0.0228*** (0.00387)	0.0132** (0.00586)
Student cooperation index (school avg.)	0.0687*** (0.0153)	0.0256*** (0.00419)	0.0241*** (0.00350)	−0.00321 (0.00348)	−0.000958 (0.00555)
Teacher support index	0.112***	0.00979***	0.00427	−0.0146***	0.0377***

(Continued)

TABLE 2 (Continued)

	(1)	(2)	(3)	(4)	(5)
	Life satisfaction	Happiness	Positive affect	Negative affect	Meaning in life
(school avg.)	(0.0139)	(0.00375)	(0.00313)	(0.00321)	(0.00512)
Sense of belonging index	0.436***	0.130***	0.131***	−0.108***	0.117***
	(0.00461)	(0.00119)	(0.00106)	(0.00115)	(0.00176)
Level of urbanization					
Village	Reference	Reference	Reference	Reference	Reference
Small town	−0.0592***	−0.00255	−0.00365	0.00693*	−0.00466
	(0.0173)	(0.00471)	(0.00385)	(0.00400)	(0.00576)
Town	−0.0769***	−0.00458	−0.0103***	0.00895**	−0.00987*
	(0.0171)	(0.00467)	(0.00386)	(0.00397)	(0.00579)
City	−0.138***	−0.0153***	−0.0207***	0.0181***	−0.0294***
	(0.0176)	(0.00485)	(0.00398)	(0.00414)	(0.00601)
Large city	−0.109***	−0.00768	−0.0219***	0.00965**	−0.0323***
	(0.0205)	(0.00563)	(0.00464)	(0.00481)	(0.00703)
District FE	Yes	Yes	Yes	Yes	Yes
Constant	5.832***	2.938***	2.680***	1.567***	0.268***
	(0.119)	(0.0421)	(0.0364)	(0.0320)	(0.0408)
Observations	376,641	387,079	388,054	387,195	398,609
No of countries	67	68	68	68	70
R-squared	0.217	0.187	0.246	0.239	0.276

OLS estimation. Robust standard errors in parentheses (corrected for clustering at the school level); *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

3.1.6 Location

Regarding urbanization effects, *ceteris paribus*, a higher level of urbanization is associated with lower levels of well-being, although effect sizes are rather moderate. Lastly, district fixed effects included were found significant in many cases indicating important differences in well-being and its expression across space.

3.2 Life satisfaction among 15-year-olds by world region

3.2.1 Regional differences in well-being and in the endowment with its predictors

Table 3 presents mean values of the variables used in the prior analysis, yet now disaggregated by 10 major world regions.¹² Mean life satisfaction among adolescents is found to be highest in CIS¹³ countries (7.52 [SD 2.62]), Latin America (7.45 [SD 2.64]) and

Non-Confucian East Asia (7.40 [SD 2.50]), while it is lowest in the Middle East and North Africa (MENA; 6.29 [SD 3.11]), Northern Europe (6.42 [SD 2.63]), and Confucian East Asia (6.44 [SD 2.55]). While not presented in the table, most of these regional differences are highly statistically significant.

Table 3 results suggest that students in MENA countries show on average the lowest levels of life satisfaction, happiness, and positive affect across all country groups. Interestingly, they also report the second lowest level of negative emotions. Average happiness and positive affect are highest among students in non-Confucian East Asia (NCEA), followed by Latin America. Interestingly, CEA, which shows low levels of life satisfaction and the highest level of negative affect, is in the upper half of world regions when it comes to the feeling of happiness and positive affect. Average reported happiness is lowest in Northern Europe and the MENA region. Lastly, perceived meaning in life is lower in high-income countries (columns 1–6) compared to middle-income countries (columns 7–10).

The endowment with the factors associated with well-being can also differ markedly across world regions, partly explaining differences in SWB. Socio-economic characteristics such as home possessions and facilities for study at home are higher in high-income regions compared to middle-income regions. These factors are known to be positively correlated with SWB. However, high-income regions also face a higher share of students with migrant background and higher levels of parental education, both of which tend to decrease personal well-being according to Table 2.

With regards to personality factors, self-efficacy is found to be highest among students in the MENA region, as well as in the US

12 Given the nature of PISA data, high-income and middle-income regions are covered. High-income regions include four European regions, the United States, and Confucian East Asia. Middle-income regions include non-Confucian East Asia, Latin America, Middle East and North Africa, and the CIS region. For the country composition of each region see Supplementary Table S2.

13 The Commonwealth of Independent States (CIS) comprises former Soviet Union countries.

TABLE 3 SWB and endowments with its predictors by world region.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Western Europe	Eastern Europe	Northern Europe	Southern Europe	United States	Confucian East Asia	Non-Confucian East Asia	Latin America	Middle East and North Africa	CIS
Subjective well-being										
Life satisfaction	7.20	7.11	6.42	7.21	6.76	6.44	7.40	7.45	6.29	7.52
Happiness	3.40	3.28	3.28	3.38	3.35	3.40	3.49	3.43	3.17	3.30
Positive affect	3.31	3.27	3.14	3.24	3.18	3.30	3.47	3.37	3.11	3.24
Negative affect	2.35	2.33	2.51	2.36	2.40	2.66	2.53	2.33	2.23	2.13
Meaning in life index	0.07	−0.01	−0.20	0.04	0.11	−0.13	0.48	0.28	0.25	0.17
Individual characteristics										
Female	0.50	0.51	0.53	0.50	0.50	0.50	0.52	0.52	0.51	0.52
Single child	0.33	0.31	0.29	0.36	0.24	0.32	0.06	0.40	0.38	0.25
Migrant background	0.15	0.01	0.15	0.09	0.21	0.01	0.01	0.01	0.06	0.06
Self-efficacy/resilience index	−0.05	0.00	−0.12	0.11	0.16	−0.30	0.00	0.16	0.33	−0.24
Emotional interdependence	2.40	2.52	2.73	2.51	2.66	2.97	2.72	2.49	2.61	2.48
Family characteristics										
Parents max years of schooling	14.13	13.57	14.20	13.74	14.16	13.36	11.73	12.79	11.63	14.63
Home possessions index	0.09	−0.18	0.32	−0.09	0.07	−0.42	−1.79	−1.19	−1.08	−0.43
Parents' emotional support index	0.09	−0.20	0.06	−0.02	0.09	−0.10	0.01	−0.02	−0.01	−0.30
Autonomy/learning environment at home										
Own room	0.92	0.87	0.90	0.79	0.88	0.88	0.75	0.68	0.72	0.83
Desk to study	0.97	0.96	0.91	0.96	0.80	0.95	0.77	0.74	0.77	0.97
Quiet place to study	0.95	0.94	0.91	0.92	0.90	0.89	0.66	0.79	0.86	0.90
Peer characteristics										
Life satisfaction (peer avg.)	7.20	7.11	6.45	7.20	6.75	6.43	7.38	7.46	6.32	7.53
Happiness (peer avg.)	3.39	3.27	3.27	3.38	3.35	3.40	3.48	3.43	3.16	3.29
Positive affect (peer avg.)	3.31	3.26	3.14	3.23	3.18	3.30	3.45	3.37	3.10	3.23
Negative affect (peer avg.)	2.34	2.33	2.49	2.37	2.40	2.65	2.53	2.32	2.24	2.13
Meaning in life index (peer avg.)	0.07	−0.02	−0.20	0.03	0.11	−0.13	0.47	0.27	0.24	0.16
Home possessions index (peer avg.)	0.07	−0.19	0.29	−0.10	0.05	−0.42	−1.80	−1.23	−1.10	−0.43
Parents max years of schooling (peer avg.)	14.12	13.56	14.20	13.74	14.16	13.36	11.75	12.67	11.59	14.60

(Continued)

TABLE 3 (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Western Europe	Eastern Europe	Northern Europe	Southern Europe	United States	Confucian East Asia	Non-Confucian East Asia	Latin America	Middle East and North Africa	CIS
School atmosphere										
Student competition index (school avg.)	−0.26	0.03	0.25	−0.07	0.39	0.05	0.17	0.03	0.32	−0.10
Student cooperation index (school avg.)	−0.12	−0.04	−0.10	−0.14	−0.16	0.16	0.30	−0.22	−0.04	0.01
Teacher support index (school avg.)	−0.29	−0.10	0.27	0.07	0.14	0.19	0.40	0.40	0.30	0.23
Sense of belonging index	0.13	−0.15	−0.16	0.20	−0.23	−0.02	−0.16	−0.08	−0.10	−0.33
Level of urbanization										
Village	0.02	0.18	0.08	0.03	0.06	0.02	0.18	0.06	0.04	0.16
Small town	0.25	0.18	0.23	0.20	0.18	0.10	0.30	0.13	0.08	0.14
Town	0.47	0.35	0.35	0.45	0.36	0.21	0.26	0.27	0.22	0.21
City	0.19	0.22	0.25	0.23	0.27	0.38	0.20	0.32	0.28	0.31
Large city	0.06	0.08	0.10	0.09	0.13	0.29	0.06	0.22	0.38	0.17
Observations	23,299	31,856	36,050	82,422	4,018	38,525	33,763	41,050	45,988	39,670

Population means calculated using official PISA 2018 survey weights.

and in Latin America. Emotional interdependence is lowest among Western European students, while it is found to be highest among Confucian East Asians, confirming earlier literature (Suh and Choi, 2018). Being fully aware of the potential of reverse causality, earlier literature has suggested that the endowment with personality-related factors, that are likely to be a product of East Asian cultural norms and values, puts CEA students at a disadvantage when it comes to the generation of well-being (Stankov, 2010; Suh and Choi, 2018). Table 3 shows that indeed, students from this region show *lowest* average levels of self-efficacy (−0.300), and *highest* average levels of emotional interdependence (2.971) across all 10 world regions.

Turning to relationship factors, CIS countries show lowest parental emotional support (−0.301) and sense of belonging at school (−0.327). Parents' emotional support is also perceived relatively low in Eastern Europe and CEA, while sense of belonging at school is surprisingly low in the US (−0.233). With regard to school atmosphere, competition levels among students are perceived to be highest among adolescents in the US (0.387) and Northern Europe (0.253), and lowest among students in Western Europe (−0.261). Cooperation is perceived to be highest in East Asia, and lowest in Latin America. Finally, levels of teacher support are perceived to be higher in middle-income regions compared to high-income regions.

3.2.2 Region-specific associations between predictors and adolescent well-being

As found in earlier literature, the importance that people place on various aspects of their lives when making life satisfaction judgments

differs across cultures (Chen et al., 2015; Suh and Choi, 2018). Table 4 presents the results of estimating Equation 1 by world region. Regression models explain between 15.3% (NCEA) and 29.0% (Northern Europe) of the variation in adolescent life satisfaction.¹⁴ Regional models largely confirm earlier findings from Table 2, yet reveal interesting region-specific differences. Several observations can be made in particular:

- **Gender and migrant background:** Across all world regions, girls show lower life satisfaction compared to boys at the age of 15. Interestingly, the gender gap in adolescent life satisfaction is largest in Europe [e.g., −0.574 ($p = 0.000$) for Western Europe], while it is lowest in East Asia [e.g., −0.166 ($p = 0.000$) for NCEA; −0.240 ($p = 0.000$) for CEA]. These findings stand in opposition to global rankings of gender equality. Yet, they may imply that girls in East Asia experience less school-related stress in teen age given that they are not expected to prepare for the breadwinner role in later life. Moreover, results indicate that being a single child has a stronger negative effect on adolescent life satisfaction in countries with higher fertility rates. In contrast, in Europe and Confucian East Asia, where fertility rates are among the lowest in the world, being a single child seems to be more

¹⁴ Estimations for the other four well-being measures produce similar results, but are not presented here for space reasons. They are, however, available from the author upon request.

TABLE 4 Predictors of subjective well-being among adolescents—estimations by world region.

Outcome variable: life satisfaction										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Western Europe	Eastern Europe	Northern Europe	Southern Europe	United States	Confucian East Asia	Non-Confucian East Asia	Latin America	Middle East and North Africa	CIS
Individual characteristics										
Female	−0.574*** (0.0290)	−0.461*** (0.0280)	−0.504*** (0.0235)	−0.555*** (0.0165)	−0.429*** (0.0762)	−0.240*** (0.0243)	−0.166*** (0.0262)	−0.456*** (0.0232)	−0.406*** (0.0281)	−0.362*** (0.0238)
Single child	−0.0449 (0.0292)	−0.0606** (0.0285)	−0.0742*** (0.0282)	−0.106*** (0.0177)	−0.166** (0.0740)	−0.0835*** (0.0276)	−0.149*** (0.0498)	−0.143*** (0.0253)	−0.115*** (0.0348)	−0.143*** (0.0288)
Migrant background	−0.0963** (0.0403)	−0.252* (0.129)	−0.0682 (0.0454)	−0.212*** (0.0329)	−0.111 (0.101)	−0.0992** (0.0459)	−0.122 (0.0992)	−0.0216 (0.0642)	−0.154*** (0.0375)	−0.0127 (0.0528)
Self-efficacy/ resilience index	0.505*** (0.0169)	0.479*** (0.0180)	0.580*** (0.0150)	0.418*** (0.0105)	0.375*** (0.0421)	0.373*** (0.0157)	0.313*** (0.0175)	0.431*** (0.0131)	0.239*** (0.0149)	0.284*** (0.0143)
Emotional interdependence	−0.228*** (0.0147)	−0.263*** (0.0162)	−0.284*** (0.0140)	−0.194*** (0.00943)	−0.265*** (0.0353)	−0.337*** (0.0165)	−0.154*** (0.0166)	−0.152*** (0.0125)	−0.151*** (0.0142)	−0.115*** (0.0150)
Family characteristics										
Parents max years of schooling	−0.0111* (0.00605)	0.00139 (0.00587)	−0.00334 (0.00585)	−0.00262 (0.00286)	−0.00605 (0.0161)	−0.00545 (0.00511)	−0.0126** (0.00500)	−0.0170*** (0.00389)	−0.0174*** (0.00503)	−0.0240*** (0.00858)
Home possessions index	0.0585*** (0.0214)	0.0834*** (0.0207)	0.0652*** (0.0174)	0.0723*** (0.0120)	0.0920** (0.0428)	0.0136 (0.0171)	0.0833*** (0.0165)	0.0666*** (0.0162)	0.168*** (0.0170)	0.110*** (0.0176)
Parents' emotional support index	0.386*** (0.0173)	0.363*** (0.0168)	0.391*** (0.0138)	0.382*** (0.00993)	0.510*** (0.0436)	0.449*** (0.0148)	0.292*** (0.0166)	0.428*** (0.0128)	0.420*** (0.0158)	0.284*** (0.0135)
Autonomy/learning environment at home										
Own room	0.00269 (0.0582)	0.151*** (0.0393)	0.0158 (0.0410)	0.158*** (0.0252)	−0.0338 (0.120)	−0.0295 (0.0330)	0.124*** (0.0311)	0.0962*** (0.0278)	0.146*** (0.0328)	0.283*** (0.0339)

(Continued)

TABLE 4 (Continued)

Outcome variable: life satisfaction										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Western Europe	Eastern Europe	Northern Europe	Southern Europe	United States	Confucian East Asia	Non-Confucian East Asia	Latin America	Middle East and North Africa	CIS
Desk to study	0.211**	0.212**	0.260***	0.189***	−0.0488	0.0603	0.163***	0.0611*	0.128***	0.0272
	(0.0854)	(0.0844)	(0.0561)	(0.0481)	(0.0972)	(0.0545)	(0.0383)	(0.0321)	(0.0386)	(0.0782)
Quiet place to study	0.868***	0.707***	0.828***	0.768***	0.758***	0.601***	0.206***	0.696***	0.798***	0.835***
	(0.0808)	(0.0586)	(0.0535)	(0.0377)	(0.137)	(0.0394)	(0.0299)	(0.0354)	(0.0432)	(0.0517)
Peer characteristics										
Life satisfaction (peer avg.)	0.158***	0.150***	0.0920***	0.215***	0.178**	0.171***	0.349***	0.119***	0.301***	0.223***
	(0.0335)	(0.0266)	(0.0262)	(0.0183)	(0.0769)	(0.0300)	(0.0298)	(0.0246)	(0.0247)	(0.0264)
Home possessions index (peer avg.)	−0.111	−0.127**	−0.0123	−0.238***	−0.267**	−0.0799	−0.280***	−0.246***	−0.220***	−0.309***
	(0.0728)	(0.0558)	(0.0538)	(0.0359)	(0.115)	(0.0497)	(0.0350)	(0.0377)	(0.0380)	(0.0471)
Parents max years of schooling (peer avg.)	−0.0112	−0.0431**	−0.0106	−0.0100	0.0508	−0.0417***	−0.00906	−0.0154	−0.0324**	−0.0560**
	(0.0237)	(0.0193)	(0.0224)	(0.00982)	(0.0564)	(0.0143)	(0.0144)	(0.0134)	(0.0152)	(0.0275)
School atmosphere										
Student competition index (school avg.)	−0.0379	−0.0744	−0.0169	−0.0108	−1.17e-05	−0.285***	−0.0337	−0.00517	0.0453	−0.0363
	(0.0598)	(0.0583)	(0.0496)	(0.0325)	(0.172)	(0.0482)	(0.0597)	(0.0450)	(0.0590)	(0.0477)
Student cooperation index (school avg.)	−0.0173	0.121**	0.130***	0.0159	0.179	0.172***	0.0418	0.118***	0.0385	0.0343
	(0.0589)	(0.0486)	(0.0482)	(0.0308)	(0.167)	(0.0611)	(0.0596)	(0.0386)	(0.0569)	(0.0475)
Teacher support index (school avg.)	0.105**	0.179***	0.0389	0.0515*	0.224	0.0557	0.0463	0.0695*	0.202***	0.226***
	(0.0494)	(0.0404)	(0.0404)	(0.0269)	(0.149)	(0.0588)	(0.0516)	(0.0397)	(0.0499)	(0.0519)
Sense of belonging index	0.413***	0.465***	0.505***	0.364***	0.628***	0.641***	0.494***	0.391***	0.377***	0.388***
	(0.0157)	(0.0161)	(0.0141)	(0.00872)	(0.0422)	(0.0158)	(0.0188)	(0.0120)	(0.0156)	(0.0145)

(Continued)

TABLE 4 (Continued)

Outcome variable: life satisfaction										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Western Europe	Eastern Europe	Northern Europe	Southern Europe	United States	Confucian East Asia	Non-Confucian East Asia	Latin America	Middle East and North Africa	CIS
Level of urbanization										
Village	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference
Small town	−0.162*	0.00234	−0.116**	−0.140***	−0.112	−0.118	0.00538	0.0706	0.0146	−0.0871*
	(0.0887)	(0.0535)	(0.0457)	(0.0428)	(0.136)	(0.0879)	(0.0400)	(0.0536)	(0.0557)	(0.0464)
Town	−0.168*	−0.0136	−0.137***	−0.163***	−0.182	0.0141	0.00420	0.0279	−0.0408	−0.126***
	(0.0891)	(0.0534)	(0.0462)	(0.0431)	(0.123)	(0.0812)	(0.0407)	(0.0526)	(0.0566)	(0.0450)
City	−0.183**	−0.0717	−0.176***	−0.217***	−0.307**	−0.0956	−0.0232	−0.0750	−0.0622	−0.205***
	(0.0906)	(0.0598)	(0.0497)	(0.0449)	(0.138)	(0.0815)	(0.0421)	(0.0549)	(0.0553)	(0.0419)
Large city	−0.164	−0.137*	−0.297***	−0.203***	−0.284**	−0.0475	0.0371	−0.122**	−0.000388	−0.143***
	(0.108)	(0.0780)	(0.0900)	(0.0558)	(0.143)	(0.0828)	(0.0515)	(0.0577)	(0.0571)	(0.0546)
District FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Constant	5.942***	7.323***	7.131***	6.007***	5.580***	7.032***	5.289***	8.289***	3.791***	6.574***
	(0.482)	(0.396)	(0.389)	(0.351)	(1.035)	(0.357)	(0.305)	(0.301)	(0.257)	(0.505)
Observations	23,299	31,856	36,050	82,422	4,018	38,525	33,763	41,050	45,988	39,670
R-squared	0.227	0.195	0.290	0.209	0.263	0.217	0.153	0.208	0.172	0.194

OLS estimation. Robust standard errors in parentheses (corrected for clustering on the school level); *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

socially accepted. Having a migration history in the family reduces life satisfaction most strongly in Eastern and Southern Europe, as well as in MENA countries.

- *Personality traits*: Both traits are highly significant across all regions. Among all regions, CEA adolescents' life satisfaction appears to be most responsive to emotional interdependence [-0.337 ($p = 0.000$)]. Moreover, self-efficacy is most strongly linked to life satisfaction for European adolescents.
- *Family characteristics*: Home possessions have positive and statistically significant effects in all regions except for CEA. Moreover, region-specific estimations reveal that parental education is significantly and negatively linked to adolescent life satisfaction only for middle-income regions, yet not for high-income regions. Being part of the education elite in middle-income countries might imply a stronger pressure on adolescents compared to students in high-income countries, since more is at stake for the former.
- *Autonomy/learning environment at home*: Both having an own room and a desk to study at home are positively and significantly linked to life satisfaction in the majority of world regions. CEA and the United States are the only two regions in which these two variables are statistically insignificant. The most salient factor, however, is having access to a quiet place to study at home. The latter increases life satisfaction significantly across all regions, has large effects, and can be linked to earlier literature on autonomy and self-determination (Chen et al., 2015; Ryan and Deci, 2017).
- *Relationships*: Parents' emotional support and the sense of belonging at school are both strongly associated with life satisfaction across all world regions. These findings stand in opposition to earlier literature that suggested emotional support to be more relevant to East Asian students compared to European Americans (e.g., Uchida et al., 2008). Instead, I find that both US and CEA students show the highest links between relational factors (parents' emotional support; sense of belonging at school) and life satisfaction across all world regions. This suggests that a too simple individualistic/collectivistic classification is not able to capture the complexities of cultural differences.
- *Peer characteristics*: School peers' average life satisfaction positively affects individual life satisfaction across all world regions, *ceteris paribus*. With regard to relative SES, peer wealth and peer parental education affect adolescent well-being negatively and statistically significantly in many world regions. Again, CEA stands out; it is the only region in which peer wealth does not affect individual well-being significantly.
- *School atmosphere*: Student competition has a statistically significant negative effect only for students in CEA, but in no other world region. Student cooperation also matters most for CEA students, confirming earlier literature on East Asian "collectivistic" cultures.
- *Urbanization*: Except for MENA and East Asia (both CEA and NCEA), the degree of urbanization shows a negative relationship with life satisfaction. The negative association between living in a city and life satisfaction is strongest for adolescents residing in the United States.

3.3 Decomposing the adolescent life satisfaction gap between Confucian East Asia and all other regions

Blinder-Oaxaca decomposition techniques can be employed to shed additional light on mean life satisfaction differences between world regions. I use a threefold decomposition adjusting for sampling weights (Jann, 2008). The region of particular interest, Confucian East Asia (CEA), tends to rank high in academic performance, yet low in SWB (Helliwell et al., 2018; OECD, 2019). Table 5 shows the results of a Blinder-Oaxaca decomposition of mean differences in life satisfaction (cp. Equation 3).

The total life satisfaction difference between students from all other countries (hereafter: rest of the world) and CEA is 0.717 ($p = 0.000$). Most of this difference can be explained by differences in endowments [0.664 ($p = 0.000$)] and coefficients [0.323 ($p = 0.000$)], while interactions of endowments and coefficients work in favor of students from CEA countries [-0.269 ($p = 0.023$)]. Two major groups of predictors drive the endowment effect. First, endowments in personality (lower self-efficacy, higher emotional interdependence in CEA) collectively account for 34.6% of the entire life satisfaction gap. That is, if CEA countries had the same levels of self-efficacy and emotional interdependence as all other countries, their predicted life satisfaction would rise significantly. Second, endowments in environmental factors such as peer life satisfaction, peer home possessions, and country effects jointly account for 74.3% of the life satisfaction gap. The latter figure suggests that besides socio-economic factors, cultural factors play a large role in shaping the playing field of adolescent well-being.

With regard to coefficient differences, emotional interdependence plays another important role. As seen in Table 4, worrying about what other's think in case of one's failure (emotional interdependence) only reduces life satisfaction in CEA countries, yet not in any other world region. Decomposition results suggest that in the absence of this unique effect, CEA adolescents' life satisfaction would increase by 0.347, or 48.4% of the entire life satisfaction gap between CEA and the rest of the world. Another variable that matters for coefficient effects is urbanization. Living in urban areas is not associated with negative well-being effects for CEA adolescents, yet it is in most other world regions. This effect tends to reduce the life satisfaction gap between CEA and the rest of the world.

4 Discussion and conclusion

This study used 2018 PISA data from 70 countries across 10 world regions. The estimation sample employed is one of the largest used in the literature to date. New evidence to at least three rapidly growing threads of literature is provided: adolescent well-being, the cultural making of subjective well-being, and self-determination theory. This study's findings on the global predictors of adolescent well-being largely confirm the findings of earlier research, in particular the important roles played by gender, personality and relationships (Levin and Currie, 2010; Morgan et al., 2012; Lee and Yoo, 2015; Coupe and Obrizan, 2018; Rudolf and Lee, 2023). Being a girl reduces life satisfaction significantly at

TABLE 5 Blinder-Oaxaca decomposition of the adolescent life satisfaction gap between Confucian East Asia and the rest of the world.

	LS (Rest of world) - LS (Conf. East Asia)		
Total gap	= 7.154–6.436 = 0.717***		
Explained by:			
Endowments	0.664***		
Coefficients	0.323***		
Interactions	–0.269**		
	Endowments	Coefficients	Interaction
	(1)	(2)	(3)
Individual characteristics			
Female	–0.00313*	–0.0818***	–0.00266
Single child	0.00143	–0.0322*	0.00744*
Migrant background	–0.00799	–0.000159	–0.00142
Self-efficacy/resilience index	0.135***	–0.00505	0.00610
Emotional interdependence	0.113***	0.347***	–0.0434***
Family characteristics			
Parents max years of schooling	0.00254	–0.0594	0.00166
Home possessions index	0.00308	–0.0439***	–0.0444***
Parents’ emotional support index	0.0357***	0.00312	–0.00268
Autonomy/learning environment at home			
Own room	0.00887*	0.158***	–0.0171***
Desk to study	0.00231	0.0791	–0.0110
Quiet place to study	–0.0523***	–0.172***	0.0150***
Peer characteristics			
Life satisfaction (peer avg.)	0.172***	0.572*	0.0644*
Home possessions index (peer avg.)	0.0850***	0.0122	0.0128
Parents max years of schooling (peer avg.)	0.00961	0.262	–0.00776
School atmosphere			
Student competition index (school avg.)	–0.0252***	0.00956*	0.0183**
Student cooperation index (school avg.)	–0.0170	–0.00707	0.00724
Teacher support index (school avg.)	0.00553	–0.00786	–0.00235
Sense of belonging index	–0.0751***	0.00561**	0.0256***
Level of urbanization			
Small town	–0.00147	–0.0111	–0.0108
Town	0.0109	–0.0601**	–0.0260*
City	–0.00493	–0.0932*	0.0314*
Large city	–0.00991	–0.0922**	0.0475**
Sum of country FE	0.276***	0.276***	–0.337***
Constant		–0.737	
Total	0.664***	0.323***	–0.269**

N = 376,641. Blinder-Oaxaca threefold decomposition of mean life satisfaction differences (population means using official PISA 2018 survey weights). Standard errors are corrected for clustering at the school level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Estimations use country FE since district FE did not converge.

age 15 (–0.166 SD), while being emotionally independent and having high self-efficacy are associated with significantly higher levels of adolescent SWB. With regards to relationship quality, parents' emotional support and sense of belonging at school show strong and highly significant links with adolescent SWB. Results further indicate that socio-economic factors matter primarily *relative* to peers, confirming findings from adult SWB research that relative income matters more for individual well-being than absolute income (Clark et al., 2008). This study finds surprisingly strong effects of the predictors related to adolescent autonomy and

the home learning environment, contributing new evidence in favor of self-determination theory (Ryan and Deci, 2000, 2017; Chen et al., 2015). In particular, having access to a quiet place to study at home is associated with a particularly high increase in life satisfaction (+0.246 SD). Having an own room and a desk to study at home are also significant predictors of adolescent SWB. This study further finds that peer well-being matters even after controlling for district fixed effects, suggesting spillovers in adolescent well-being. Lastly, student well-being is negatively related to living in cities.

The present study extends the literature on cultural differences in the factors that determine life satisfaction to 10 major world regions, focusing on the numerous particularities of Confucian East Asian countries. Low levels of life satisfaction among students from CEA are found to be associated with low self-efficacy, low peer well-being, as well as with high emotional interdependence compared to other world regions. CEA students exhibit the highest average levels of worry about peer reactions to individual failure. Moreover, these worries are more strongly linked to life satisfaction in CEA than in any other world region. In addition, findings indicate that competition and cooperation among students matters most strongly for adolescent life satisfaction in CEA countries. Findings further indicate that both US and CEA students show stronger links between relational factors (parents' emotional support; sense of belonging at school) and life satisfaction compared to all other world regions. These findings mostly confirm earlier research suggesting that members of Confucian East Asian /collectivist cultures place more importance on relational factors, particularly family and friends (Diener and Diener, 1995; Suh et al., 1998; Park and Huebner, 2005). Especially my findings on emotional interdependence are a strong empirical test for Suh and Choi's (2018) hypothesis that "East Asians' excessive concern of other's view might be a key psychological reason for why their happiness level is lower than expected by economic indices." This study's results further confirm Stankov (2010) who argued that high academic achievement of students from Confucian Asian countries is accompanied by high levels of anxiety and self-doubt. According to him, an "unforgiving" Confucian culture, coupled with the belief that effort rather than ability is the primary source of success, might be causing this phenomenon.

This paper's findings, however, stand in opposition to earlier literature that suggested emotional support to be more relevant to East Asian students compared to European Americans in the generation of student well-being (Uchida et al., 2008). Instead, I find that relational factors play similarly important roles in both CEA and the US. Results further indicate that CEA is the only region in which neither own nor peer wealth affect adolescent life satisfaction. This suggests that a too simple individualistic/collectivistic classification is not able to capture the real complexities of cultural differences.

While the author is confident that this study adds significant new evidence to the existing literature, it does not come without limitations. Firstly, personality traits covered in PISA are not all-encompassing. This could lead to an overestimation of the effects of the two traits included in the model. To the extent that data allows, future studies should therefore control for a more complete list of personality traits. Secondly, estimated effects for some variables present correlations rather than causal effects.

This is particularly true for personality and relationship variables. Thus, these effects should strictly be interpreted as predictors rather than determinants of well-being. Future research could from improvements in the quality of data by (1) collecting internationally harmonized longitudinal survey data, and (2) by conducting internationally harmonized in-school student experiments.

This study's findings suggest that parents, educators and policymakers around the world should focus on creating a positive school environment that promotes well-being, student self-efficacy, a sense of belonging, and a safe space in which failure is accepted as part of the learning process. Such efforts are particularly needed in Confucian East Asian countries where students often face very high performance expectations. Moreover, extra support should be given to girls given their relatively lower SWB levels compared to boys.

Data availability statement

Publicly available datasets were analyzed in this study. This data can be found at: <https://www.oecd.org/pisa/data/2018database/>.

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 patients/participants or patients/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

RR: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, 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/fpsyg.2024.1446301/full#supplementary-material>

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EDITED BY

Martijn Burger,
Open University of the Netherlands,
Netherlands

REVIEWED BY

Muhammad Shahid,
University of International Business and
Economics, China
Jiang Nengzhi,
Shandong Second Medical University, China

*CORRESPONDENCE

Lu Yu

✉ lu.yu@polyu.edu.hk

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Everyone is searching for it and those who acquired it enjoy better mental health: a latent profile analysis of Chinese adolescents' meaning in life

Xiaohua Zhou¹, Lu Yu^{2*}, Chen Deng², Yaoxiang Ren² and Meng Du²

¹Teaching and Learning Centre, Lingnan University, Kowloon, Hong Kong SAR, China, ²Department of Applied Social Sciences, The Hong Kong Polytechnic University, Kowloon, Hong Kong SAR, China

Objective: One factor associated with rising rates of depression and anxiety among youth is a lack of meaning in life (MIL). The importance of living a meaningful and purposeful life cannot be overstressed, especially for adolescents who are in a critical life stage and have recently experienced a 3-year-long global health crisis, namely the COVID-19 pandemic. Although previous studies have examined adolescents' MIL, the majority of them adopted a variable-centered approach. The present study adopts a person-centered approach to investigate the updated MIL among Chinese adolescents in the aftermath of the COVID-19 pandemic, the demographic factors related to profile classification, and the differences in mental health among adolescents in different MIL classes.

Methods: A questionnaire assessing MIL, depression, anxiety, stress, and demographic information was administered to 1,196 Chinese adolescents (mean age = 13.07 ± 0.58; 44.73% were female individuals). A three-step latent profile analysis was conducted.

Results and discussion: This study revealed that (1) adolescents can be categorized into three classes: high MIL, medium MIL, and low and searching MIL. (2) Adolescents from intact families with higher educated mothers were more likely to be classified as high MIL class rather than low MIL class. Furthermore, (3) adolescents with high MIL experienced the best mental health outcomes, those with medium MIL experienced moderate mental health, and those with low MIL, who were still searching for MIL, exhibited the poorest mental health. External support may be necessary in the search process for Chinese adolescents. Future research could explore the process of searching for MIL and identify the challenges adolescents encounter when developing their sense of MIL.

KEYWORDS

meaning in life, adolescents, mental health, latent profile analysis, China

1 Introduction

A recent survey conducted by Harvard Graduate School revealed that 36% of young adults felt anxious and 29% felt depressed, with a major contributing factor being a lack of meaning and purpose in their lives (Making Caring Common, 2023). More than half of the young adults (58%) reported that there was a lack of “meaning or purpose” in their lives. “Many are ‘achieving to achieve’ and find little meaning in either school or work” (Making Caring Common, 2023, p. 2). A survey in China reported that 40% of university students felt their lives had no meaning (Xu, 2017). This phenomenon raises concerns that meaning in life (MIL) may not be a default state for youth. It has been reported that more than 80% of 10th graders in China are constantly seeking meaning and purpose in their lives (Lin et al., 2021). It is unclear whether they will ultimately find their MIL.

MIL is formed by a network of insights and interpretations of our life experiences, desires, and plans for future achievements. It serves as an integrating factor in our lives, connecting the threads between our efforts to pursue happiness, withstand distress, and attain transcendence (Steger, 2009). It instills in us the belief that our lives have significance and that we are not merely passing time. It has long been recognized as central to human life and existence (Emmons, 1999; Hicks and King, 2009; Frankl, 1990; Steger, 2013). On the one hand, MIL is positively associated with subjective wellbeing (Arslan and Allen, 2022), especially life satisfaction (Li et al., 2022; Lin and Shek, 2019). On the other hand, a lack of MIL leads to psychological distress, including anxiety (Jing and Ding, 2024), health-risk behaviors such as illicit drug use (Brassai et al., 2011), and suicidal tendencies (Lew et al., 2020).

To be more specific, MIL has two dimensions: the presence of MIL (PMIL) and the search for MIL (SMIL; Steger, 2009). The presence dimension reflects ‘the degree to which people experience their lives as comprehensible and significant and feel a sense of purpose or mission in their lives that transcends the mundane concerns of daily life’ (Steger et al., 2008, p. 661). The SMIL refers to an individual’s desire and efforts to search for and explore the meaning of life. It encourages people to seek new opportunities and challenges, and motivates them to understand and organize their experiences (Steger, 2009). The two dimensions represent distinct but interrelated aspects of MIL. The former emphasizes experiencing meaning in the present moment, while the latter focuses on actively searching for meaning to live a purposeful life.

The PMIL is more consistently reported as a protective factor against mental health issues, including anxiety and depression (Chen et al., 2021; Yu and Chang, 2021). However, the association between SMIL and mental health is less consistent (for a comprehensive review, see Li et al., 2022). Kiang et al. found that SMIL was negatively associated with wellbeing (e.g., self-esteem) because it is often accompanied by internal turmoil among adolescents from Latin, Asian, and European American backgrounds (Kiang and Fuligni, 2010; Kiang and Witkow, 2015). Li J. B. et al. (2019) found that SMIL was positively related to internalizing problems among Italian adolescents, but not Chinese adolescents. Lin et al. (2021) focused exclusively on Chinese adolescents and found that SMIL was positively associated with life satisfaction, self-esteem, and positive affect. However, it was negatively associated with negative affect only for adolescents who exhibited low levels of PMIL. More research into the roles of the PMIL and SMIL in relation to the mental health of Chinese adolescents is warranted.

Adolescence is a critical life transitional stage from childhood to adulthood. During this critical developmental stage, individuals explore their identities (Dahl et al., 2018), seek to understand the self and the world (Erikson, 1968), and typically experience changes in various domains of their lives, such as physiological, psychological, family, school, and peer domains (Erikson, 1968). During this transitional stage, the majority of adolescents are in the process of searching for MIL (Lin et al., 2021). However, we cannot assume that searching for MIL necessarily leads to the presence of MIL. This highlights the need for empirical studies on adolescents’ SMIL and PMIL.

Apart from internal developmental factors, the external environment can also influence adolescents’ MIL. For example, the uncertain state of the world has been identified as a contributing factor to the lack of meaning in life among young adults (Making Caring Common, 2023). Over the past few years, the COVID-19 pandemic has emerged as a global public health crisis and a stressful event. The fear and uncertainty caused by the COVID-19 pandemic have heightened concerns about health and the potential death of oneself and others (Trzebiński et al., 2020), which may impact adolescents’ MIL. While negative effects (e.g., anxiety and depression) were common during the pandemic among adolescents worldwide (Panchal et al., 2023), some scholars have reminded us of the possibility of a delayed impact of the pandemic. They argued that post-traumatic stress, the long-term consequences of social restrictions, and maladaptive responses to the “new normal” are worth the attention of researchers (Min et al., 2021). From this perspective, the impact of the pandemic on MIL may have continued after its conclusion. Therefore, it is necessary to examine MIL among adolescents in the post-pandemic period to gain an updated understanding of adolescents’ MIL in the aftermath of the pandemic.

Regarding the factors influencing adolescents’ MIL, sociodemographic factors are important. Previous research has identified several sociodemographic factors that are related to MIL. For instance, a study on Brazilian adults (mean age = 33 ± 15.01) found that sex is related to MIL. Male adults are more likely to be in the existential indifference group, which is characterized by a lack of meaningfulness and an experience of a crisis of meaning (Damásio and Koller, 2015). A study among Ghanaian adults (mean age = 40.84 ± 11.20) found that living standards predicted the PMIL (Fadiji et al., 2023). However, not many studies have focused on adolescents’ sociodemographic factors in terms of MIL, especially among Chinese adolescents. This is another gap that the present study aimed to fill. Although we acknowledge the importance of other contributing factors (e.g., prosocial behavior, Xie et al., 2023), investigating which sociodemographic factors are related to MIL could provide a quick screening tool to help identify adolescents who are experiencing low MIL and need support.

Another gap that the present study aimed to fill was methodological. In the decades of research on MIL, the majority of the studies have been variable-centered (Li et al., 2021). However, MIL is a personal framework. There is no universal concept of MIL that applies to everyone. One’s life meaning is individually constructed (Frankl, 1990) and is determined by one’s value system that gives purpose and meaning to one’s being (Wong, 1998). Recently, more studies on MIL have adopted a person-centered approach using latent profile analysis. He et al. (2024) and Zhao et al. (2023) conducted latent profile analyses among medical college students and nursing

students in China. [Ma et al. \(2023\)](#) classified high school students into four classes based on their level of meaning in life: high meaning in life, medium meaning in life, low meaning in life, and searching for meaning in life. The last group scored high in searching for meaning in life but low in the presence of meaning in life. However, their study (2023) did not include sociodemographic factors when classifying the profiles. The present study used a three-step latent profile analysis ([Asparouhov and Muthén, 2014](#)) to analyze the profiles of MIL among Chinese adolescents, examine the related sociodemographic factors, and explore the relationship between MIL and mental health based on profile membership.

In summary, considering the critical stage of adolescence and the possible impact of the aftermath of the pandemic, the present study aimed to examine the profiles of MIL, the related sociodemographic factors, and the differences in mental health classes among Chinese adolescents. The specific research questions included the following:

- 1 What are the categories of MIL among Chinese adolescents?
- 2 Which sociodemographic factors are related to the classification of Chinese adolescents' MIL?
- 3 Does Chinese adolescents' mental health differ across different MIL classes?

2 Materials and methods

2.1 Participants and procedures

Participants were recruited from four secondary schools in the Greater Bay Area of South China through convenience sampling between April and June 2023. All students studying in Secondary 1 (Grade 7) at the four schools were invited to participate in the study. They were informed that their participation was voluntary and confidential. Written consent forms were obtained before they began the questionnaire. Completing the questionnaire typically took 10–15 min. A total of 1,951 students participated in the study. After excluding responses that failed an attention check item and those with

missing values, 1,196 (mean age = 13.07 ± 0.58) students were included in the data analyses ([Table 1](#)).

The present study was approved by the institutional review board of the authors' university (HSEARS20230327004).

2.2 Measures

2.2.1 Meaning in life questionnaire

The participants' MIL was assessed using an adapted Chinese version of the Meaning in Life Questionnaire (MLQ; [Steger et al., 2006; Liu and Gan, 2010](#)). The Chinese MLQ consisted of nine items (Cronbach's alpha = 0.71) and two subscales: the presence of meaning (five items) and the search for meaning (four items). The participants responded to the items on a 7-point scale ranging from 1 ("absolutely untrue") to 7 ("absolutely true"). Higher scores indicated a greater presence of meaning and a stronger search for meaning. In the present study, the Cronbach's alpha value was 0.78.

2.2.2 Depression anxiety stress scale—youth

The participants' mental health was assessed using the Depression Anxiety Stress Scales - Youth (DASS-Y) version ([Szabo and Lovibond, 2022](#)), which was developed specifically to assess depression, anxiety, and stress among adolescents and children. We translated the scale into Chinese using a back-translation approach. The original Cronbach's alpha values were 0.89 (depression), 0.84 (anxiety), and 0.84 (stress). In the present study, they were 0.90 (depression), 0.87 (anxiety), and 0.91 (stress; [Table 2](#)).

In addition to MIL and mental health, sociodemographic information was also collected, including age, sex, native/immigrant status, and parents' education levels and marital status.

2.3 Statistical analyses

Data cleaning was conducted before the data analyses. To assess the students' attention while completing the questionnaire, one

TABLE 1 Sociodemographic background of the participants.

Age	Mean	SD					
(N = 1,196)	13.07	0.58					
Sex	Female	Male					
(N = 1,196)	535 (44.73%)	661 (55.27%)					
Intact family (N = 1,182)	Intact family	Non-intact family					
	1,059 (89.59%)	123 (10.41%)					
Local	Local	Immigrant					
(N = 1,179)	842 (71.42%)	337 (28.58%)					
Father's education level	No formal education	Primary school	Junior secondary school (Grade 7–9)	Senior secondary school (Grade 10–12)-	College (Without a bachelor's degree)	Bachelor's degree	Master's degree and above
(N = 1,042)	30 (2.88%)	114 (10.94%)	484 (46.45%)	227 (21.79%)	90 (8.64%)	89 (8.54%)	8 (0.77%)
Mother's education level	No formal education	Primary school (Grade 1–6)	Junior secondary school (Grade 7–9)	Senior secondary school (Grade 10–12)-	College (Without a bachelor's degree)	Bachelor's degree	Master's degree and above
(N = 1,031)	69 (6.69%)	153 (14.84%)	425 (41.22%)	215 (20.85%)	74 (7.18%)	91 (8.83%)	4 (0.39%)

TABLE 2 Descriptive statistics of MIL and mental health.

	Mean (SD)	Range		Cronbach's alpha
		Minimum	Maximum	
MIL				
PMIL	24.07(6.59)	5	35	0.80
SMIL	20.08(4.98)	4	28	0.76
Mental health				
Depression	2.65(3.96)	0	21	0.90
Anxiety	1.54(3.06)	0	21	0.87
Stress	5.32(5.49)	0	21	0.92

attention item was included in the questionnaire. After excluding careless responses from the participants who did not answer the attention check correctly ($N=613$) and those with missing values on the MLQ ($N=142$), a total of 1,196 responses were retained. First, a three-step latent profile analysis was conducted to classify the participants' MIL and to examine the associations between the different classes of MIL and sociodemographic factors. During the latent profile analysis, the following model fit indices were used: the Akaike information criterion (AIC), Bayesian information criterion (BIC), adjusted BIC (aBIC), entropy, and p -values for the Lo-Mendell-Rubin (LMR) test and bootstrapped likelihood ratio test (BLRT). Smaller values of the AIC, BIC, and aBIC indicate a better model fit. An entropy value closer to 1 indicates higher classification accuracy. p -values of less than 0.05 for the LMR test and BLRT indicate a satisfactory model fit (Asparouhov and Muthén, 2014). Furthermore, multivariate analysis of variance (MANOVA) was conducted to compare mental health (i.e., depression, anxiety, and stress) across the different MIL profiles. All data were analyzed using Mplus Version 8 and SPSS Version 23.0.

3 Results

3.1 Descriptive statistics

As self-report measures may produce common method bias (Zhou and Long, 2004), we first used Harman's one-factor test to assess for common method bias. For the MILQ and DASS-Y assessments, a single factor accounted for 37.72% and 48.55%, respectively, which is considered acceptable for further analysis. The participants scored higher on the PMIL than the SMIL, and their stress levels were higher than anxiety and depression (Table 2).

3.2 Latent classes of MIL

For the latent profile analysis of MIL, the present study initially started with two classes and then increased the number of classes by one each time. The results showed that the AIC, BIC, and aBIC were decreasing. The p -value for the LMRT was greater than 0.05 when there were four classes. The percentage of class 1 was less than 5% when there were five classes. Therefore, overall, a three-class solution was deemed the best, despite having a lower than the four-class and five-class solutions (Table 3).

Class 1 represented a medium level of PMIL and SMIL and was therefore labeled "medium MIL." Approximately half of the participants ($n=600$, 50.04%) were searching for their MIL at a medium level and found a medium level of the presence of MIL. Class 2 represented a lower level of PMIL and SMIL compared to the other two classes, with the smallest percentage (11.59%, $n=139$). The PMIL was lower than the SMIL, leading to its label as "low and searching MIL." Within this class, the participants scored higher on the subscale of the SMIL and lower on the subscale of the PMIL. The remaining participants ($n=460$, 38.37%) were categorized into Class 3 and scored higher on both PMIL and SMIL. Thus, Class 3 was labeled "high MIL." Taking the three classes together, the differences (Table 4; Figure 1) in the PMIL were larger than those in the SMIL. This suggested that the participants were searching for MIL at a similar level; however, some of them found high MIL (Class 3), half of them enjoyed medium MIL (Class 1), while a small percentage of them had low MIL (Class 2).

3.3 Sociodemographic factors

Regarding the sociodemographic factors associated with the MIL profiles, the results revealed that the participants whose mothers had higher education levels and those from intact families were 1.30 times and 3.21 times more likely, respectively, to be classified into Class 3 (high MIL) compared to Class 2 (low and searching MIL; Table 5).

3.4 Mental health across the different classes of MIL

Based on the class membership that resulted from the latent profile analysis, this study examined whether the participants in the different classes experienced different mental health statuses, including depression, anxiety, and stress. The results revealed that the participants in the three classes reported significantly different levels of depression, anxiety, and stress. The participants in Class 3 (high MIL) reported the lowest levels of depression, anxiety, and stress, while those in Class 1 (medium MIL) reported moderate levels and those in Class 2 (low and searching MIL) reported the highest levels. The most significant difference was in depression ($\chi^2(2)=69.75$, $p<0.001$; Table 6).

TABLE 3 Model indices for the latent profiles of meaning in life.

Class	AIC	BIC	aBIC	Entropy	LMRT <i>p</i> -value	BLRT <i>p</i> -value	Profile prevalence				
							1	2	3	4	5
2	40420.26	40473.82	40473.82	0.79	< 0.001	< 0.001	589 49.12%	610 50.88%			
3	39772.32	39965.71	39845.01	0.85	< 0.001	< 0.001	600 50.04%	139 11.59%	460 38.37%		
4	39232.99	39477.28	39324.81	0.87	0.096	< 0.001	120 10.00%	96 8.01%	608 50.71%	375 31.28%	
5	38860.13	39155.31	38971.08	0.87	< 0.01	< 0.001	52 4.34%	119 9.92%	371 30.92%	566 47.21%	91 7.59%
6	21481.19	21684.76	21557.70	0.82	0.021	< 0.001	60 5.00%	108 9.01%	35 2.92%	307 25.61%	389 32.44%

Note: The selected solution, i.e., 3 three-class solution, is shown in bold.

TABLE 4 Comparison of the PMIL and SMIL among the three classes.

	Class 1 (Medium MIL) (<i>n</i> = 600)	Class 2 (Low and Searching MIL) (<i>n</i> = 139)	Class 3 (High MIL) (<i>n</i> = 460)	Comparisons
	Mean (SD)	Mean (SD)	Mean (SD)	
PMIL	4.35 (0.63)	2.56 (0.74)	6.11 (0.60)	Class 2 < Class 1 < Class 3
SMIL	4.83 (0.99)	4.14 (1.53)	5.53 (1.23)	Class 2 < Class 1 < Class 3

The differences between Class 1 and Class 2, Class 2 and Class 3, and Class 1 and Class 3 were all significant at the 0.001 level.

4 Discussion

4.1 Latent classes in MIL

In the present study, the participants generally had a good sense of meaning in life. Three latent classes were identified, namely “high MIL,” “medium MIL,” and “low and searching MIL.” This finding is largely consistent with Ma et al.’s (2023) study, in which high school students (mean age = 16.33 ± 1.01) were classified into four classes: “high MIL,” “medium MIL,” “searching MIL,” and “low MIL.” Both Ma et al.’s (2023) study and the present study classified Chinese adolescents based on their levels of MIL. Moreover, adolescents with medium and high levels of MIL accounted for a large percentage in both studies, indicating that the majority of adolescents in China reported medium and high levels of MIL.

Both studies exhibited a pattern of “high SMIL and low PMIL” within a single class: the “searching MIL” class in Ma et al.’s (2023) study and the “low and searching MIL” class in the present study, with the gap between high SMIL and low PMIL being smaller. The two studies revealed a similar phenomenon: Chinese adolescents were searching for MIL, but not everyone had found it. Unlike their peers in the “low MIL” class in Ma et al.’s (2023) study, who scored the lowest in both PMIL and SMIL groups, these adolescents were actively seeking something that would make their lives meaningful and significant, as well as trying to figure out their life purposes; however, they failed to find them. They may need external support in the process of searching for their MIL. For example, secondary schools could provide a life education curriculum to help these adolescents understand themselves and their life events, as well as explore their purpose and the meaning of their lives.

However, the pattern “high SMIL and low PMIL” was not reported in He et al.’s (2024) study conducted on college medical students (mean age = 21.73 ± 1.13) in China, which identified three classes through an

LPA, and the PMIL was not lower than the SMIL. This may suggest that the phenomenon of adolescents searching for but failing to acquire MIL disappears when they enter early adulthood. Another possible reason is that He et al. (2024) conducted their study among medical students who might have encountered more opportunities to reflect on MIL during their studies (e.g., interacting with patients). This indicates that adolescents who are still in their searching phase may need more opportunities to be inspired by MIL.

4.2 Sociodemographic factors related to classification

The present study revealed that adolescents from intact families were more likely to be classified in the high MIL class compared to being classified in the low and searching MIL classes. This finding is consistent with the results of Shek et al.’s 2021 study, which reported that family intactness positively predicted MIL among adolescents. One possible explanation is that adolescents from intact families may have more resources and fewer challenges in their search for and acquisition of MIL. The attention and resources from both biological parents can help adolescents gain more life experiences, which is essential for searching for and acquiring MIL. This process requires life experience and the ability to interpret and make sense of what has happened in our lives (Steger, 2009). Parental support is related to MIL even among young adults through optimism and identity commitment (Kealy et al., 2022). On the contrary, adolescents from single-parent families and stepfamilies reported more suicidal thoughts (Garnefski and Diekstra, 1997), which may indicate a failure in searching for and acquiring their MIL.

The present study also found that the adolescents whose mothers had higher education levels were more likely to be classified in the

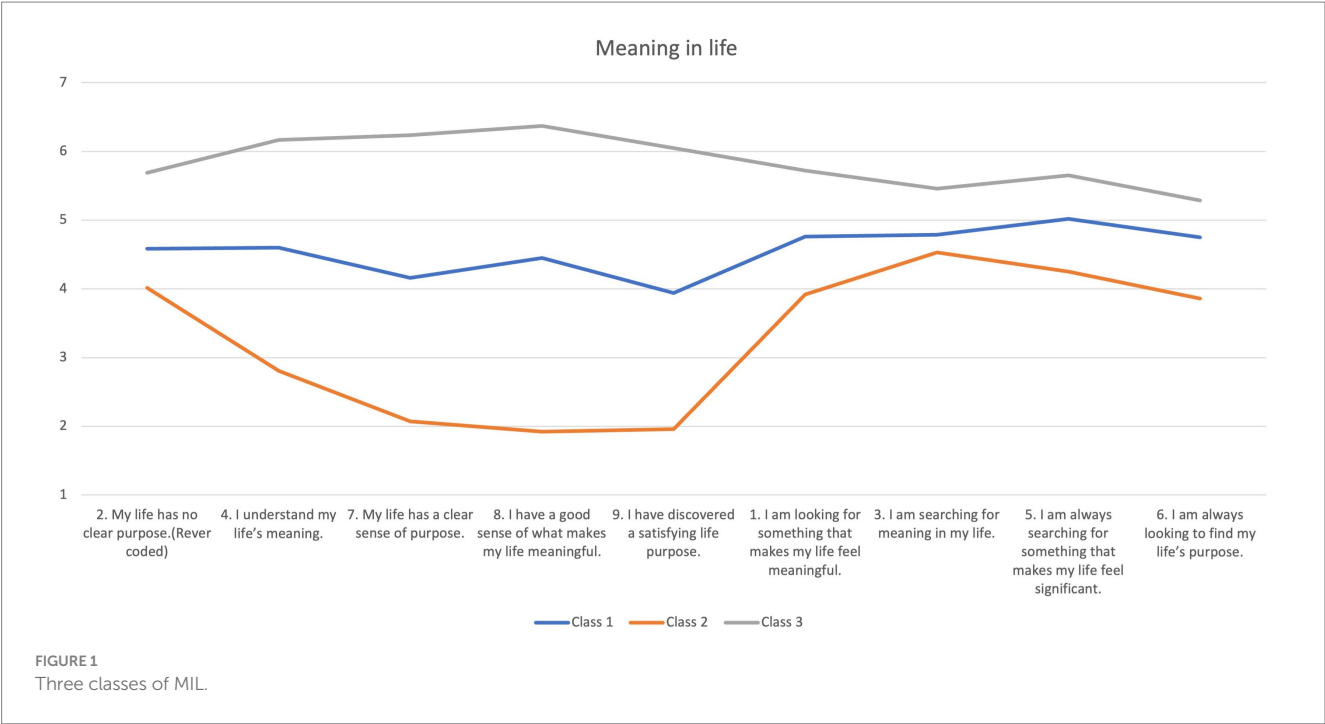


TABLE 5 Odds ratios of the sociodemographic factors on the MIL profiles.

	Class 1 (Medium MIL)				Class 3 (High MIL)			
	OR	SE	95% CI		OR	SE	95% CI	
			Lower	Upper			Lower	Upper
Age	0.85	0.20	0.53	1.34	0.89	0.21	0.56	1.40
Sex (1 = Female)	1.13	0.28	0.70	1.83	0.70	0.17	0.44	1.13
Father's education level	1.03	0.15	0.77	1.38	0.98	0.14	0.74	1.30
Mother's education level	1.14	0.15	0.88	1.46	1.30	0.17	1.01	1.67
Intact family (1 = Intact family)	1.36	0.52	0.64	2.88	3.21	1.39	1.37	7.52
Local (1 = Local)	0.71	0.20	0.41	1.23	1.05	0.29	0.61	1.82

Reference group: Class 2 (Low and Searching MIL).

high MIL class compared to being classified in the low and searching MIL class. One possible reason is that mothers with higher education levels may offer more opportunities for their children to explore the world and themselves, which are important for shaping one's MIL. As for why mothers' education levels, rather than fathers', are related to classification in the high versus low and searching MIL classes, it may be because mothers play a larger role in childcare and parenthood (Shek et al., 2019; Zou et al., 2019). Therefore, mothers' education levels play a more significant role than those of fathers.

The findings regarding the importance of both family intactness and mothers' education levels are consistent with the literature review, which identifies the family as the most important source of meaning in people's lives (Glaw et al., 2017).

4.3 MIL and mental health

The present study revealed that MIL was generally related to adolescents' depression, anxiety, and stress. The adolescents with high

MIL reported significantly less depression, anxiety, and stress. This finding is consistent with previous studies among adolescents in the US (Dulaney et al., 2018), Spain, and Russia (Shub et al., 2024), highlighting the cross-cultural importance of MIL as a protective factor for adolescents' mental health. Moreover, this finding builds on Krok (2018), which demonstrated that MIL is positively correlated with subjective wellbeing and psychological wellbeing, including factors such as autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance. While Krok (2018) revealed a positive relation between MIL and the positive indicators of wellbeing, the present study revealed a negative relation between MIL and negative mental health issues, such as depression, anxiety, and stress. Krok (2018) also suggested that the purpose embedded in the concept of MIL appears central to the formation of wellbeing in late adolescents, whose mean age is approximately 18 years in Poland. This study also found that the central role of MIL in influencing mental health is true for early adolescents (age = 13.07 ± 0.58) in China. Overall, these findings indicate the importance of leading a meaningful and purposeful life

TABLE 6 Mental health comparison among different profiles.

	Classes	Mean	SE	Between class differences (class k versus class k + 1)		Overall
				C1	C2	
Depression	C1 Medium MIL	2.73	0.17	–		69.75***
	C2 Low and Searching MIL	5.65	0.48	30.44***	–	
	C3 High MIL	1.64	0.18	18.68***	61.15***	
Anxiety	C1 Medium MIL	1.64	0.14	–		37.57***
	C2 Low and Searching MIL	3.11	0.37	12.88***	–	
	C3 High MIL	0.94	0.13	12.43***	30.69***	
Stress	C1 Medium MIL	5.30	0.23	–		60.83***
	C2 Low and Searching MIL	9.20	0.62	32.39***	–	
	C3 High MIL	4.12	0.25	10.64**	58.15***	

** $p < 0.01$ and *** $p < 0.001$.

in fostering good mental health and wellbeing holds true across different cultures and throughout both early and late adolescent years.

Another noteworthy observation is that the largest difference among the three categories of MIL was observed in depression rather than in stress or anxiety. This highlights the crucial role of MIL in addressing depression among adolescents. Finding out the purpose and meaning of their lives could protect adolescents from depression, a major health concern for them (Daly, 2022). Therefore, educators and social workers are encouraged to provide education, interventions, and support in the search for MIL to prevent depression among adolescents.

4.4 Contributions and limitations

Although the relationship between MIL and mental health has been examined before (for a literature review, see Glaw et al., 2017; Li et al., 2021), this study makes three unique contributions:

First, it employed a person-centered method instead of a variable-centered method. As mentioned earlier, searching for and acquiring MIL are individual experiences and endeavors. Therefore, a person-centered approach may be more appropriate for capturing the differences among individual adolescents. For instance, the latent profile analysis revealed a combination of relatively high SMIL and low PMIL in Class 2, which may not be easily identified using a variable-centered approach.

Second, the results revealed that the differences in mental health, such as depression, anxiety, and stress, were mainly caused by the PMIL rather than the SMIL among adolescents. This highlights that high SMIL does not necessarily guarantee high PMIL. Therefore, the intervention program should focus on helping adolescents find their MIL and identify a life purpose. For example, secondary schools can provide life education courses to enhance students' understanding of life events, help them understand themselves, and encourage them to explore the spirituality of life.

Finally, this study was conducted in the aftermath of the COVID-19 pandemic, and the results indicated that even after a 3-year-long global health crisis, the majority of Chinese adolescents possess a relatively medium to high MIL.

The study has several limitations that should be recognized. First, as it was a cross-sectional survey, the adolescents with better mental health might have had more mental resources to focus on deep questions regarding the meaning and purposes of their lives, making them more likely to find their meaning in life. Second, the convenience sampling might have limited the generalizability of the findings of this study. In the future, including adolescents from different regions in China in the survey may enhance its representativeness. More importantly, while we gathered snapshot data on the SMIL and PMIL, searching for and acquiring MIL are not endpoint statuses. Understanding the processes of SMIL and changing PMIL among adolescents may yield more interesting findings.

5 Conclusion

In summary, by applying a person-centered approach, we categorized the participants into three classes: high MIL, medium MIL, and low and searching MIL. We found that the adolescents whose mothers had higher education levels and those who came from intact families were more likely to be classified in the high MIL class rather than the low and searching MIL class. Moreover, we found that the adolescents with high MIL experienced the best mental health outcomes, those with medium MIL experienced moderate mental health, and those with low MIL and who were still searching for MIL exhibited the poorest mental health. Intervention programs and secondary school curricula may need to focus on supporting the search process for MIL among Chinese adolescents. Future research could delve into the process of searching for MIL and identify the challenges that adolescents encounter when developing their sense of MIL.

Data availability statement

All data can be made available upon request to the corresponding author.

Ethics statement

The studies involving humans were approved by Institutional Review Board, The Hong Kong Polytechnic University. The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation in this study was provided by the participants' legal guardians/next of kin. Written informed consent was obtained from the individual(s), and minor(s)' legal guardian/next of kin, for the publication of any potentially identifiable images or data included in this article.

Author contributions

XZ: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Writing – original draft. LY: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Writing – review & editing. CD: Data curation, Investigation, Methodology, Project administration, Writing – review & editing. YR: Data curation, Formal analysis, Investigation, Writing – review & editing. MD: Data curation, Investigation, Methodology, Project administration, Writing – review & editing.

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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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EDITED BY

Martijn Burger,
Open University of the
Netherlands, Netherlands

REVIEWED BY

Luisa Orru',
University of Padua, Italy
Vie Cheong Thong,
Universiti Malaysia Sabah, Malaysia

*CORRESPONDENCE

Heng Cao
✉ caoheng_25@163.com

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Relationships between dyadic coping, marital adjustment, and post-traumatic growth in patients with maintenance hemodialysis patients and their spouses

Qi Zhang and Heng Cao*

Shandong Provincial Hospital Affiliated to Shandong First Medical University, Jinan, Shandong, China

Aim: To measure the relationships between dyadic coping, marital adjustment, and post-traumatic growth in patients with maintenance hemodialysis and their spouses.

Background: Post-traumatic growth is common in patients facing maintenance hemodialysis. However, studies tend to focus on these patients as individuals rather than as part of a couple. Dyadic coping in a couple is important for their marital adjustment; however, little is known about how a couple's dyadic coping influences their marital adjustment and impacts their posttraumatic growth.

Design: Cross-sectional study.

Methods: A questionnaire survey was conducted among patients receiving maintenance hemodialysis and their spouses. Patients were recruited between December 2021 and October 2022 using convenience sampling from the blood purification centers of two first-class tertiary hospitals. A total of 230 couples (460 individuals) of patients receiving maintenance hemodialysis and their spouses were enrolled. A general condition questionnaire, the dyadic coping scale, and the Locke-Wallace marital adjustment scale were used for assessments and data entry and analysis were performed using EpiData 3.1, SPSS 25.0, and Mplus 8.4.

Results: The dyadic coping of patients receiving maintenance hemodialysis was positively correlated with both marital adjustment and posttraumatic growth, as was the dyadic coping of their spouses. The marital adjustment of both patients and their spouses was found to partially mediate the association between dyadic coping and posttraumatic growth.

Conclusion: Subject-mediated effects between the levels of dyadic coping, marital adjustment, and posttraumatic growth were established for both patients receiving maintenance hemodialysis and their spouses, and it was found that the marital adjustment in both showed varying degrees of mediation in the relationship between their dyadic coping and posttraumatic growth.

Impact: The findings of the study suggest that attention should be given to promoting dyadic coping behaviors in patients receiving maintenance hemodialysis and their spouses. It is recommended that nurses offer both education and support to couples to promote dyadic coping.

KEYWORDS

maintenance hemodialysis, dyadic coping, marital adjustment, post-traumatic growth, subject-object interdependence model

1 Introduction

Maintenance hemodialysis (MHD) is the main form of replacement therapy for patients with end-stage renal disease (ESRD) resulting from chronic renal failure (Qiu et al., 2021), with 89.5% of patients with ESRD in China receiving MHD treatment. According to the latest census data released in the China Kidney Disease Network Data Report, ~402.18 patients per million receive MHD in China (Li and Liang, 2019; Wang et al., 2019). Although MHD treatment can prolong the survival of patients with ESRD, it is often associated with various issues, owing to the multimorbid nature of CKD, the requirement for multidisciplinary care, the high frequency of polypharmacy and the high rates of hospitalization and death, all of which affect the quality of life of patients (Bello et al., 2024; Chesnaye et al., 2024; Rehmann-Sutter, 2019). Furthermore, the treatment affects not only the physical and mental health of the patient but also their spouses who shoulder the main responsibility of care. Studies have found that the person most involved in patient care is the spouse (Hussien et al., 2021) and the burden of long-term care adversely affects their psychological balance (Rodakowski et al., 2012). Thus, MHD imposes stress on both the patient and their spouse and has a profound impact on the physical and mental health and marital satisfaction of couples.

Studies have shown that couples who view illness as a “couple experience” exhibit better personal and binary adaptability and greater relationship satisfaction than couples who view illness as a personal stressor (Stulz et al., 2022). In these situations, Bodenmann considered that couples depend on each other while coping with stress, helping each other during the process, and thus maintaining marital stability and promoting the mental health of both parties (Bodenmann, 2005; Ding and Mei, 2018). The concept of the systematic transaction model (STM) is dyadic coping, which refers to the shared reactions and strategies of couples to binary stress events (Bodenmann, 2005). These include positive dyadic coping behaviors, such as mutual support, joint coping, and communication when coping with disease-related stress, as well as negative dyadic coping styles, such as avoiding blame (An, 2020). The STM indicates that couples can reduce stress and strengthen marital adjustment through dyadic coping, thus maintaining and strengthening the marital bond. To date, research on dyadic coping both at home and abroad has focused on cancer (Badr et al., 2010; Shi, 2021), diabetes (Bai, 2021), stroke (Yang, 2021), and other fields, while research on chronic kidney disease is limited.

The Actor-Partner Interdependence Mode (APIM) proposed by Kenny and Ledermann (2010) represents a new method for data analysis, as it not only analyzes the relationship between the dependent variable in the research (such as the patient) and an independent variable, but can also analyze the relationship of the dependent variable with an independent variable associated with another part (such as the spouse) in the paired relationship, and can thus represent the overall relationship between the patient and spouse more scientifically and comprehensively (Sun et al., 2022).

Thus, the present study is based on the perspectives of both patients undergoing hemodialysis and their spouses, evaluating them as a whole. By analyzing the impact of the dyadic coping strategies of patients receiving maintenance hemodialysis and their spouses on marital adjustment, the findings provide a scientific reference for the identification of key targets and formulating

intervention the formulation of effective interventional measures in clinical practice.

2 Background

2.1 The relationship between dyadic coping and marital adjustment

The quality and degree of supportive dyadic coping between couples has an impact on affects both the degree strength of the marital intimacy bond and each other's mental health (Sun et al., 2022). Longitudinal studies on patients with breast cancer and their partners found that the higher the degree of breast cancer patients and partners dyadic coping, the better the marital adjustment (Rottmann et al., 2015). It has thus been suggested that there is a correlation between dyadic coping and marital adjustment. However, there are few studies on MHD patients and their spouses in China, and this topic thus requires further exploration to provide a quantitative basis for developing interventions to improve marital quality among MHD patients and their spouses.

2.2 The relationship of dyadic coping with post-traumatic growth

Active dyadic coping has been found to improve post-traumatic growth (PTG) levels in patients (Fujimoto and Okamura, 2021) and may thus be an effective strategy for enhancing PTG. In a previous study on the association between marriage quality and PTG in patients with cancer, we found that marriage quality was associated with greater positivity in dyadic relationships (Canavarro et al., 2015), while a study of 133 patients with breast cancer patients found that excessive intimacy between couples had a negative impact on PTG (Bodenmann and Randall, 2012). The mechanism by which marital adjustment affects PTG in MHD patients and spouses is unclear.

3 The study

3.1 Aim

The aim of this study was to evaluate the associations between dyadic coping in the spouses of patients undergoing hemodialysis, marital adjustment, and PTG.

3.2 Design

A cross-sectional study was conducted.

3.3 Participants

The study included patients with ESRD who were undergoing maintenance hemodialysis treatment and their spouses. The patients were recruited from the blood purification centers of

two tertiary hospitals from December 2021 to October 2022, and were selected using convenience sampling. A cross-sectional survey method was used to conduct a questionnaire survey of the patients and their spouses. Patient inclusion criteria: (a) regular dialysis more than 1 month; (b) married and patient's primary caregiver is spouse; (c) stable condition, with no impairment of consciousness; (d) voluntary participation and the provision of written informed consent for study participation. Patient exclusion criteria: (a) being unable to understand the content of the questionnaire; (b) suffering from other serious physical diseases. Spouse inclusion criteria: (a) spouse of MHD patient included in the study; (b) literate and able to communicate normally; (c) voluntary participation and the provision of signed informed consent. Spouse exclusion criteria: (a) being unable to understand the content of the questionnaire; (b) suffering from serious physical conditions. Following [Hoelter's \(1983\)](#) guidelines, a sample size of at least 200 is recommended for path analysis to produce statistically reliable results. To meet this criterion 230 pairs of patients and spouses were initially recruited for the study, thus meeting the sample size requirements.

3.5 Procedure

Before the study, the investigator informed the supervisors of the sampled hospitals about the purpose and process of the study, and also obtained their approval. The collaborators selected by the researcher informed the nurses in the department about the study and instructed them to recruit participants.

3.6 Instruments

3.6.1 General information

The general information questionnaire included information on gender, age, educational level, marriage age, monthly income, and other demographic information on MHD patients, as well as disease-related information such as the duration of dialysis treatment, primary disease type, and number of complications.

3.6.2 Dyadic coping inventory

The dyadic coping inventory (DCI) scale was developed by [Bodenmann \(2008\)](#) to evaluate the quality of communication and joint coping between both parties in a close relationship when facing pressure. [Xu et al. \(2016\)](#) examined the Chinese version of the DCI's factorial structure, measurement invariance (MI), and construct validity of test scores based on data from 474 Chinese couples. The scale contains 37 items and six dimensions, among which four dimensions, namely, stress communication, supportive coping, authorized coping, and negative coping are included for both individual perceived self-coping and individual perceived spousal coping. The joint coping dimension only covers the joint coping of both spouses as perceived by the patients, and two items in the dimension of coping quality evaluation were not included in the total score. Negative coping support was scored using a 5-point Likert scale, ranging from 1 (rarely) to 5 (very frequently). The total score was 35–175, with 111 as the critical value, 111–145

as the normal level, and scores above 145 as higher than the normal level. The higher the score, the greater the number of supportive coping behaviors and the better the dyadic coping.

3.6.3 Locke-Wallace Marriage Adjustment Scale

The Locke-Wallace Marital Adjustment Test (LWMAT) was used to measure the quality and satisfaction of the relationships between MHD patients and their spouses. [Wang and Wang \(1999\)](#) translated this scale into Chinese version, and be used to Chinese couples. The scale has 15 items and four dimensions, including communication, sexual life inclusiveness, emotion, and differences in values. The total score is 0–158 points with higher scores indicating greater quality and satisfaction, and scores below 100 points representing marital disorder.

3.6.4 Post-traumatic growth inventory

The Chinese version of the post-traumatic growth inventory (PTGI) was revised by [Wang \(2011\)](#) to measure the post-traumatic growth of MHD patients and their spouses. The scale has 20 items and five dimensions, and is scored on a 6-point Likert scale (0 = none, 5 = very much) with a total score of 0–100, with higher scores indicating higher levels of post-traumatic growth.

3.7 Data analysis

Data were analyzed using SPSS version 26.0 (IBM Corp, Armonk, NY, USA) and Mplus 8.4 software, with a significance level of $\alpha = 0.05$. Normally distributed data are presented as mean $\pm$ standard deviation, while non-normally distributed data are shown as median and interquartile interval. Count data are presented as frequencies and percentages. Pearson correlation analysis was used for normally distributed data and Spearman rank correlation analysis for non-normally distributed data. To explore the subject-object effects of dyadic coping and marital adjustment on post-traumatic growth, a subject-object interaction-mediated model was constructed by Mplus. Mediating effects were evaluated by bootstrapping with a sample size of 5,000.

4 Results

4.1 Demographic characteristics

A total of 230 couples, including patients and their spouses, were enrolled in the study. Of these, 135 patients were male (58.7%) and 95 (41.3%) were female. Patient ages ranged from 28 to 82 years old, with an average age of 59.62 ± 10.59 years ([Table 1](#)).

4.2 Comparison of dyadic coping, marital adjustment, and post-traumatic growth scores in hemodialysis patients

Paired-sample *t*-tests were used to analyze differences in dyadic coping, marital adjustment, and post-traumatic growth scores in

TABLE 1 General demographic data of maintenance hemodialysis and spouses and disease data of patients.

Variable	Patients (<i>n</i> = 230)		Spouses (<i>n</i> = 230)	
	<i>N</i> (%)		<i>N</i> (%)	
Gender				
Male	145	63.04	85	36.96
Female	85	36.96	145	63.04
Age				
≤45	25	10.90	24	10.43
46–64	120	52.20	124	53.91
≥65	85	37.00	82	35.65
Marriageable age				
≤10	7	3.00	7	3.00
11–20	20	8.70	20	8.70
21–30	47	20.43	47	20.43
31–40	83	36.09	83	36.09
>40	73	37.74	73	37.74
Education level				
Junior high school and below	106	46.09	110	47.82
High school or technical secondary school	64	27.83	69	30.00
College degree or bachelor degree or above	60	26.08	51	22.17
Type of employment				
Employed	45	19.57	51	22.17
Unemployed	185	80.43	179	77.83
Medical insurance				
Medical insurance for urban workers	135	58.70		
Medical insurance for urban and rural residents	70	30.40		
Own expense or otherwise	25	10.90		
Per capita monthly household income (RMB)				
<1,000	48	20.87		
1,000–3,000	98	42.61		
3,000–5,000	58	25.22		
More than 5,000	26	11.30		
Age of dialysis (month)				
≤12	37	16.09		
13–60	111	48.26		
>60	56	24.35		
>120	26	11.30		
Primary disease				
Chronic glomerular nephritis	43	18.70		
Diabetic nephropathy	88	38.26		

(Continued)

TABLE 1 (Continued)

Variable	Patients (<i>n</i> = 230)		Spouses (<i>n</i> = 230)	
	<i>N</i> (%)		<i>N</i> (%)	
Hypertension kidney disease	50	21.74		
Comorbidity				
None	11	4.78		
1	80	34.78		
2	88	38.26		
More than 3	51	22.17		

MHD patients and their spouses. This showed that the mean total dyadic coping score of the patients was 116.87 ± 10.69 points, while that of the spouses was 116.04 ± 94.0 points. In terms of the perceived self-support coping, perceived self-authorization coping, perceived self-negative coping, and perceived spouse pressure communication dimensions, the patients scored significantly higher than their spouses (all $P < 0.05$). However, there were no significant differences in the total scores of dyadic coping and the dimensions of shared coping between patients and spouses and marital adjustment scores did not differ significantly between the hemodialysis patients and their spouses. The total scores for post-traumatic growth, personal strength, and new possible dimensions were lower in the patients relative to those of their spouses, with a significant difference in the post-traumatic growth scores ($P < 0.05$) (Table 2).

4.3 Correlations between dyadic coping, marital adjustment, and post-traumatic growth in hemodialysis patients

The Pearson correlation analysis showed that dyadic coping was positively correlated with both marital adjustment and post-traumatic growth ($P < 0.01$). The spouse dyadic coping scores were positively correlated with marital adjustment and post-traumatic growth ($P < 0.01$) (Table 3).

4.4 The mediating role of subject-object interdependence in dyadic coping, marital adjustment, and post-traumatic growth of maintenance hemodialysis patients and their spouses

Bootstrap tests were performed on the mediating effect, and the results showed self-marital adjustment played a partial mediating role in the relationship between dyadic coping strategies of hemodialysis patients and their spouses and their post-traumatic growth ($\beta = 0.031$, 95% CI = 0.008–0.059 and $\beta = 0.063$, 95% CI = 0.011–0.122). This indirect effect between subjects was significant, demonstrating the subject-mediated effect of marital adjustment

TABLE 2 Dyadic coping and marital adjustment scores in hemodialysis patients and their spouses.

	Item	Patient ($\bar{x} \pm s$)	Spouse ($\bar{x} \pm s$)	<i>t</i>	<i>P</i>
Total dyadic coping score	35	116.87 $\pm$ 10.69	116.04 $\pm$ 9.40	1.332	0.184
Self-perception of dyadic communication	4	13.08 $\pm$ 2.25	11.00 $\pm$ 2.26	10.502	<0.001
Self-supportive dyadic coping	5	15.97 $\pm$ 2.49	17.14 $\pm$ 2.04	−6.631	<0.001
Self-authorized coping, and	2	5.52 $\pm$ 1.37	7.40 $\pm$ 1.31	−14.146	<0.001
Self-negative dyadic coping	4	15.46 $\pm$ 1.99	16.17 $\pm$ 1.88	−4.485	<0.001
Perceived spouse dyadic communication	4	11.64 $\pm$ 2.17	12.93 $\pm$ 1.82	−7.534	<0.001
Perceived spouse supportive dyadic coping	5	16.94 $\pm$ 2.16	15.36 $\pm$ 2.53	8.768	<0.001
Perceived spouse delegated dyadic coping	2	7.24 $\pm$ 1.49	5.48 $\pm$ 1.44	12.044	<0.001
Perceived spouse negative dyadic coping	4	15.98 $\pm$ 2.13	15.50 $\pm$ 2.12	2.827	0.005
Common dyadic coping	5	15.03 $\pm$ 2.27	15.04 $\pm$ 2.31	−0.105	0.916
Marital adjustment	15	105.35 $\pm$ 14.839	106.52 $\pm$ 15.10	−1.288	0.199
Post-traumatic growth	20	53.62 $\pm$ 11.36	55.59 $\pm$ 9.07	−2.580	0.010

of the patients and their spouses in their own dyadic coping and post-traumatic growth relationship. At the same time, the marital adjustment of the other party played a partial mediating role ($\beta = 0.061$, 95% CI = 0.032–0.097 and $\beta = -0.048$, 95% CI = 0.088–0.013), demonstrating the object-mediated effect of the marital adjustment of the other party in their own dyadic coping and post-traumatic growth relationship. The mediating role of marital adjustment between patients and spouses in the relationship between the dyadic coping strategies of spouses and the post-traumatic growth of patients ($\beta = -0.010$, 95% CI = −0.026 to −0.002 and $\beta = 0.020$, 95% CI = 0.155–0.255) indicated that the marital adjustment of patients and their spouses played a partial mediating role in the relationship between the patient's dyadic coping and spouse's post-traumatic growth ($\beta = 0.147$, 95% CI = 0.103–0.198 and $\beta = 0.019$, 95% CI = 0.004–0.044), establishing the object-mediation effect of patient and spouse marital adjustment in the relationship between the patient's dyadic coping and the spouse's post-traumatic growth. Details are provided in Table 4 and Figure 1.

5 Discussion

5.1 Current status of dyadic coping levels in maintenance hemodialysis patients and their spouses

In this study, the mean dyadic coping score of hemodialysis patients was found to be 116.87 $\pm$ 10.69 points, and that of their spouses was 116.04 $\pm$ 9.40 points. According to the dyadic coping scoring standard, total scores between 111 and 145 are considered to be within the reference range. Therefore, the dyadic coping scores of both the patients and their spouses were within the normal range, and there was still room for improvement. The results of this study are similar to those of Cai et al. (2021) in patients with breast cancer but higher than those reported in a study by Ye et al. (2022) on 320 pairs of middle-aged and elderly patients with gynecological cancer and their spouses. The present

study found no significant difference in the total dyadic coping score between patients and spouses, consistent with the findings of Cai et al. (2021). Perhaps because stress concerning disease spreads from the patient to the spouse in close relationships, stress perception is relatively consistent between both parties, with both being profoundly affected by the disease experience.

The negative dyadic coping scale in this study used a reverse-scoring method, that is, the higher the score of the negative dimension, the less the possibility of negative coping in life and the more positive the dyadic coping. In this study, both spouses were found to exhibit negative coping, with each perceiving the other's negative coping. However, the self-negative coping scores of the patients were lower than those of their spouses, while their perceived negative coping scores of the spouses were higher than those of their spouses. These differences were statistically significant, indicating that patients had higher levels of negative coping in daily life. The possible reason is that ESRD is an irreversible chronic progressive disease, which requires long-term dependence on dialysis to maintain life. Together with increasing the patient's physical discomfort, their economic status and interpersonal relationship are also seriously affected (Yang and Gao, 2022), making it easier for them to adopt negative coping styles.

5.2 Maintenance hemodialysis patients and spouses need to improve their marital adjustment levels

Marital adjustment refers to the mutual adjustment of couples within a specific time period that can enhance the individual's perception of spouse support and relationship satisfaction. The results of this study showed that the total marital adjustment scores of maintenance hemodialysis patients and their spouses were 105.35 $\pm$ 14.84 and 106.52 $\pm$ 15.10 points, respectively, which is similar to the results of a survey by Jieyu et al. (2022) on marital adjustment in couples undergoing first-time IVF but lower than the scores reported by Han and Xu (2021) on marital

TABLE 3 Correlations between dyadic coping, marital adjustment, and post-traumatic growth in hemodialysis patients.

Variable	Patient dyadic coping	Spouse dyadic coping	Patient marital adjustment
Patient dyadic coping	–	–	–
Spouse dyadic coping	0.568**	–	–
Patient marital adjustment	0.633**	0.468**	–
Spouse marital adjustment	0.436**	0.584**	0.576**

** $P < 0.05$.

adjustment in infertile couples. It is possible that the reasons may be related to discomfort and distress caused by dialysis. Most patients tend to focus on their own pain, often ignoring the feelings of their spouses. The spouses represent the main caregivers for patients receiving long-term hemodialysis treatment, shouldering the responsibilities of taking care of the patient's daily living activities, accompanying them for dialysis treatment, supervising medication, and controlling their diet and water drinking. They can thus experience long-term physical and mental exhaustion, affecting emotional communication between husband and wife, leading to complex changes in their relationship, and potentially increasing the likelihood of conflict (Wawrziczny et al., 2021), which is not conducive to marital adjustment. In addition, female patients are often affected by reduced fertility or kidney disease, while male patients can be affected by reduced sexual function, potentially leading to feelings of loneliness, shame, or embarrassment. This can adversely affect the relationship, as when spouses see that their partner is experiencing physical pain and weakness, it is difficult to feel sexual attraction (Schembri Lia and Abela, 2020), thus reducing marital intimacy. Therefore, even if couples involved in hemodialysis have stable marital relationships, the quality of the relationship is likely to be reduced.

5.3 Low levels of post-traumatic growth in maintenance hemodialysis patients and their spouses

The results of this study showed that the total post-traumatic scores of hemodialysis patients and their spouses were 53.62 ± 11.36 and 55.59 ± 9.07 , respectively, lower than those reported by Wang and Zhang (2021). Most maintenance hemodialysis patients and their spouses felt uncertain about the disease development and future life, and it was difficult to distinguish positive from painful emotions, indicating that the level of post-traumatic growth required improvement.

In this study, the results of the different dimensions of post-traumatic growth showed that the scores of both patients and their spouses in the personal strength dimension were higher, with the scores of the spouses in this dimension significantly higher than those of the patients ($P < 0.01$). The reasons were analyzed. After

experiencing dialysis events, the families of patients make necessary changes in their lives, discovering their vulnerabilities and finding new internal strengths (Levkovich et al., 2023). Spouses often take over care tasks, help patients manage their disease, deal with the minutiae of daily life, and are open to accepting new things and ideas in the process. Spouses thus tend to experience greater growth in the face of adversity. In addition, the spouse is usually the main confidant of the patient, and thus becomes stronger with better-developed personal strength while guiding the patient (Bertschi et al., 2021). The dimension of life perception scored second, with the dimension of new possibility showing the lowest score. This may be due to the multiple comorbidities and obvious symptom burden (such as fatigue, insomnia, and itching) of the patient, which leads to the patient's family easily becoming immersed in the long-term painful experience associated with disease, potentially leading to a negative outlook and difficulties in discovering new possibilities in life. Medical professionals should thus encourage both patients and their spouses to actively explore new possibilities in life (He et al., 2024), cultivating and exploring new interests that will help divert attention from illness, making life more fulfilling, promoting a more positive outlook, and helping the recovery of their families.

5.4 Correlation between dyadic coping, marital adjustment, and post-traumatic growth in maintenance hemodialysis patients and their spouses

The dyadic coping style of hemodialysis patients and their spouses was positively correlated with their levels of marital adjustment and post-traumatic growth. This is consistent with previous studies (Li, 2021). Couples go through a phase of relationship readjustment as they try to balance stress through dyadic coping. Both partners experience pain associated with the disease and thus require the resources to cope with the consequences together, emphasizing the patient and partner roles, "you" and "me," but also functioning as a whole. Intimate relationships can act as buffers against stress (Li et al., 2022; Zhou et al., 2024), and help couples focus on unity, strength, and resilience (Meuleman et al., 2024). Dyadic coping has two main functions, namely, stress-related functions and relationship-related functions. Stress-related functions are associated with stress reduction, which may primarily affect one partner, may spread to the other, or affect both partners simultaneously. Dyadic coping can mitigate the negative effects of stress and maintain and restore the overall health of both partners. A second, more important function of dyadic coping is to enhance trust and intimacy between couples and constructively resolve conflicts. Positive dyadic coping enhances a couple's ability to adapt to the disease, and when couples understand, unite, and support each other, they become dependable resources for each other, assisting in the active achievement of common goals and the creation of new emotional experiences. Helping each other during stressful times enhances the quality of their relationship. Previous studies have shown that sharing helps foster relationships (Zhaoyang et al., 2018), while reduced sharing introduces compromise in

TABLE 4 Bootstrap test and effect value of the subject-object interdependence mediating model between dyadic coping and post-traumatic growth.

Effect	B	SE	95% CI		P
Patient dyadic coping → patient post-traumatic growth					
Total effect	0.519	0.047	0.443	0.599	<0.001
Direct effect	0.428	0.046	0.352	0.506	<0.001
Total indirect effect	0.091	0.023	0.056	0.131	<0.001
Actor-actor simple IE (patient dyadic coping → patient marital adjustment → patient post-traumatic growth)	0.031	0.016	0.008	0.059	0.023
Partner-partner simple IE (patient dyadic coping → spouse marital adjustment → patient post-traumatic growth)	0.061	0.019	0.032	0.097	0.001
Spouse dyadic coping → spouse post-traumatic growth					
Total effect	0.360	0.058	0.263	0.454	<0.001
Direct effect	0.345	0.065	0.236	0.450	<0.001
Total indirect effect	0.015	0.040	−0.053	0.080	0.679
Actor-actor simple IE (spouse dyadic coping → spouse marital adjustment → spouse post-traumatic growth)	0.063	0.033	0.011	0.122	0.020
Partner-partner simple IE (spouse dyadic coping → patient marital adjustment → spouse post-traumatic growth)	−0.048	0.023	−0.088	−0.013	0.034
Patient dyadic coping → spouse post-traumatic growth					
Total effect	−0.118	0.053	−0.208	−0.034	0.028
Direct effect	−0.284	0.053	−0.373	−0.198	<0.001
Total indirect effect	0.166	0.031	0.119	0.220	<0.001
Partner-partner simple IE (patient dyadic coping → patient marital adjustment → spouse post-traumatic growth)	0.147	0.030	0.103	0.198	<0.001
Partner-partner simple IE (patient dyadic coping → spouse marital adjustment → spouse post-traumatic growth)	0.019	0.012	0.004	0.044	0.049
Spouse dyadic coping → patient traumatic growth					
Total effect	0.157	0.045	0.084	0.231	<0.001
Direct effect	−0.033	0.047	−0.110	0.045	0.480
Total indirect effect	0.190	0.030	0.142	0.247	<0.001
Spouse dyadic coping → spouse marital adjustment → patient traumatic growth	0.200	0.030	0.155	0.255	<0.001
Spouse dyadic coping → patient marital adjustment → patient traumatic growth	−0.010	0.007	−0.026	−0.002	0.105

the relationship where couples do not discuss and resolve their concerns, avoiding discussion of the concerns which weakens the unity of the relationship (Brandao et al., 2017), leading to loneliness and persistent worry in coping with illness, and reduced intimacy. The dyadic coping of hemodialysis patients and their spouses was found to be significantly positively correlated with their post-traumatic growth. This could be due to one partner strengthening the sense of intimacy through supportive understanding, with both partners openly communicating their thoughts and feelings about the disease, thus reducing their sensitivity to stressful events and promoting a positive attitude toward hemodialysis.

5.5 Matrimonial adjustment mediates the interaction between dyadic coping and post-traumatic growth in maintenance hemodialysis patients and their spouses

The results of this study suggest that marital adjustment has a subject-object mediating effect between dyadic coping and post-traumatic growth in maintenance hemodialysis patients and their

spouses. Specifically, marital adjustment partially mediates the relationship between dyadic coping and post-traumatic growth in hemodialysis patients and their spouses. This is consistent with the findings of Suo et al. (2021). The coping styles of dialysis patients and their spouses positively affect their marital adjustment, and marital adjustment also positively affects their post-traumatic growth. That is to say, the stronger the ability of both patients and spouses to cope with disease together, the better their marital adjustment, which positively affects the post-traumatic growth of both patients and spouses. Analysis of the reasons suggests that a greater frequency of positive coping behaviors, such as joint coping and stress communication, and a lower frequency of negative coping behaviors are more likely to benefit communication and understanding between the husband and wife in the daily management of the disease. Open communication allows both parties to understand each other's common expectations, leading to better adaptation to the disease, sharing and encouraging one another, and thus promoting the positive psychological experience of both spouses after coping with stressful events. The results are consistent with those of Sun et al. (2022) in cancer couples. The system interaction model proposed by Bodenmann and Randall (2012) was also verified. Both parties rely on each other when

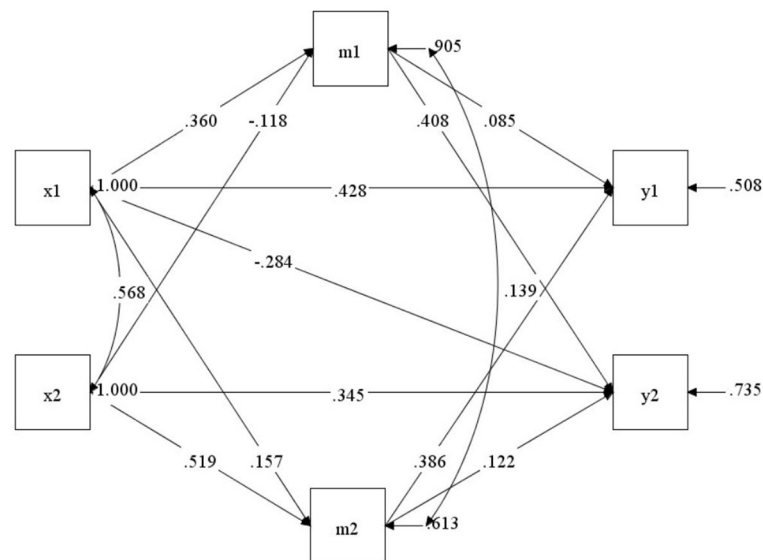


FIGURE 1

The mediating model of subject-object interdependence in marital adjustment between dyadic coping and post-traumatic growth. x1, m1, and y1, respectively, represent the patient's dyadic coping, marital adjustment, and post-traumatic growth; x2, m2, and y2 represent the spouse's dyadic coping, marital adjustment, and post-traumatic growth, respectively.

coping with stress through their perception and evaluation of stress, working together to support each other and cope with stress together, thus strengthening marital adjustment while reducing personal stress, and promoting mental health. The couple, as an interdependent system, contributes to personal wellbeing, improving the effectiveness of adjustment, creating a comfortable atmosphere of equal communication, positive expression of needs, mutual affirmation, and effective coping strategies. At the same time, good marital adjustment helps to reduce the distress of the patient. The life crisis faced by the patient is a catalyst for growth, triggering major changes in behavior, values, and priorities (Henson et al., 2021). The patient's family reacts to the threat posed by the disease as a catalyst for reshaping life. The patient and the spouse begin to critically examine themselves and the whole world when dealing with threatening events. This self-consciousness on the part of the affected individual allows successful coping with traumatic events, during which the perceptions of others and the meaning of the event can be reassessed and positively reshaped. In other words, deliberation enables the integration of traumatic events and the discovery of new meaning. Post-traumatic growth does not originate from the trauma itself but from constant struggle and effort. The more partners identify with their relationship, the more they think and talk about it from an "us" perspective, the more satisfied and positive they are likely to be with their relationship.

The dual coping strategies of hemodialysis patients and their spouses were found to have inconsistent effects on each other's post-traumatic growth. An object effect was observed between the patient's dual coping strategy and the spouse's post-traumatic growth, while the object effect between the spouse's dual coping strategy and the patient's post-traumatic growth was not established. The reason for this may be due to the

active participation of the patient in coping with stress from both spouses, which reduces the physical and mental pressure on the spouse and assists with their psychological adjustment. However, while the spouse may have a high level of one-way dyadic coping, the patient is still immersed in distress. When the patient is not attuned to their spouse, only one party actively takes on the pressure and responds positively. This type of coping rarely leads to a couple's mutual growth, although it can promote personal growth (Badr et al., 2010). Previous studies have shown that if one spouse communicates actively but the other remains unaware, the couple often performs worse (Stulz et al., 2022), and the pain may increase. Effective nursing measures should be instituted to guide the expression of feelings and allow active coping with the pressure, assisting in overcoming difficulties. Therefore, future investigations should evaluate the dyadic coping strategies of maintenance hemodialysis patients and their spouses, guide patients and their spouses to adopt positive and effective joint coping strategies, promote communication between both parties, improve marital satisfaction, and promote individual growth.

There was an object-mediating effect between marital adjustment by one party and the post-traumatic growth of the other, that is, the marital adjustment of the spouse of the hemodialysis patient plays a partial mediating role between their joint response and their post-traumatic growth, while the marital adjustment level of the patient plays a partial mediating role between the spouse's contribution to the joint response and their post-traumatic growth. This result suggests that the dyadic coping of one party not only affects their own level of marital adjustment but also impacts the marital adjustment of their spouse, which in turn affects their own and their spouse's levels of post-traumatic growth. This once again confirms that

hemodialysis events are a common source of stress for both spouses that require response as a couple rather than two individuals. Previous studies have shown that marital adjustment can not only predict one's own post-traumatic growth but also predict a spouse's post-traumatic growth (Zhaoyang et al., 2018). Both patients with chronic disease and their spouses can jointly adopt positive dyadic coping strategies to promote intimate marital relationships. For example, constructive communication between the two parties, through discussing pressure, emotional communication, and providing practical support, allows the members of the couple to convey positive ideas and hopes to each other, helping to strengthen individual marital adjustment, alleviate psychological pressure, reduce the emotional burden on the patient and their spouse, and promote individual psychological transformation toward a positive direction, thus assisting individuals in adapting to hemodialysis events. This suggests that medical staff should not only focus on hemodialysis patients in clinical work but should also evaluate both patient and spouse from a binary perspective, and develop binary interventional measures for both partners. For example, providing psychological education on the benefits of dyadic coping benefits not only the overall marital relationships but also the sexual relationship. Interventional strategies should focus on promoting common coping strategies, such as identifying problems, helping each other in ways that reduce stress, fostering intimacy, and encouraging couples to recognize and reduce the use of negative coping strategies, such as offering unwilling or unintentional support and not taking their partner's stress seriously (Weiss et al., 2019), thereby promoting marital adjustment and enhancing post-traumatic growth.

6 Limitations

The findings of this study have limitations. Firstly, the sample source is not extensive enough, and future research should incorporate data from multiple centers and larger samples. Secondly, due to the limitations of cross-sectional studies, this research can only reveal correlations between variables and cannot determine causality. Thirdly, the results of this study rely on patient self-reports, which often depend on the recall and reporting of investigators, potentially leading to recall bias.

7 Conclusion

Both maintenance hemodialysis patients and their spouses were found to have relatively low levels of dyadic coping, marital adjustment, and post-traumatic growth, thus requiring further improvement. The dyadic coping of maintenance hemodialysis patients was positively correlated with marital adjustment and post-traumatic growth, and dyadic coping in the spouses was also correlated with marital adjustment and post-traumatic growth. Subject-object mediation effects between dyadic coping, marital adjustment, and post-traumatic growth of both maintenance hemodialysis patients and their spouses were established. There were different degrees in

the mediating effect of marital adjustment between patients and their spouses. The dyadic coping level of couples could affect their level of marital adjustment, subsequently affecting their post-traumatic growth. Couple-centered interventions aimed at cultivating positive dyadic coping and mitigating negative dyadic coping might be beneficial. Therefore, medical personnel should develop targeted interventional programs for hemodialysis patients and their spouses to improve the dyadic coping skills, marital adjustment, and post-traumatic growth of couples (Feng et al., 2024; Han and Gao, 2024).

Data availability statement

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

Ethics statement

The studies involving humans were approved by Shandong First Medical University, China. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

QZ: Writing – original draft, Writing – review & editing. HC: Writing – review & editing, Conceptualization, Methodology, Data curation.

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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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EDITED BY

Martijn Burger,
Open University of the Netherlands,
Netherlands

REVIEWED BY

Pauline Yong Pau Lin,
Universiti Malaysia Sabah, Malaysia
Ashraf Alam,
Indian Institute of Technology Kharagpur,
India

*CORRESPONDENCE

Difeng Lin
✉ 202328030265@mail.bnu.edu.cn
Zeyun Liu
✉ zeyun_liu@bnu.edu.cn

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How does educational inequality affect residents' subjective well-being?—Evidence from China

Difeng Lin* and Zeyun Liu*

School of Economics and Management, Beijing Normal University, Beijing, China

In the context of promoting educational equity and improving welfare, exploring ways to further enhance residents' subjective well-being from the perspective of educational equity holds significant practical importance. This study uses the educational Gini coefficient to measure the educational inequality index across different provinces and cities, and matches it with data from the China Family Panel Studies (CFPS) to investigate the relationship between educational inequality and residents' subjective well-being. The research findings reveal a significant negative correlation between educational inequality and residents' well-being, with observed heterogeneity. Specifically, educational inequality has a greater negative impact on groups with lower levels of well-being, rural areas, and the central and western regions of China. Mechanism analysis confirms the income distribution effect and economic growth effect of educational inequality. Therefore, increasing attention to the issue of educational equity and understanding the well-being effects of educational inequality are of great significance for the Chinese government in improving residents' welfare in the new era.

KEYWORDS

residents' well-being, educational inequality, income disparity, economic growth, econometric analysis

1 Introduction

Subjective well-being refers to the sense of pleasure individuals experience when subjectively evaluating their quality of life and the value of their existence. It not only influences individuals' physical and mental health but also serves as a crucial indicator for measuring a nation's level of welfare. As nations focus on economic growth, equal attention must be given to improving the well-being and quality of life for their citizens (Nelson, 1959; Emmons, 2003). However, despite the continuous deepening of economic development in China and the steady growth of GDP, the overall national happiness has not increased but rather declined. According to the "World Happiness Report" released by the United Nations, although China's happiness ranking has seen some improvement in recent years, the 2022 report indicates that China ranks only 72nd out of 146 countries and regions worldwide in terms of happiness. The level of national happiness is even lower than that of the 1990s.

In fact, the academic community has extensively and deeply explored the phenomenon of happiness not increasing alongside income growth. American economist Richard Easterlin termed this phenomenon the "Easterlin Paradox" (Clark et al., 2008; Tachibanaki, 2016; Slag et al., 2019), and scholars have sought to understand the underlying logic behind this phenomenon from various perspectives. Income inequality stands out as the most significant research perspective. However, the academic community has not yet reached a consensus regarding the relationship between income inequality and happiness. Research indicates that

income inequality can harm residents' happiness through a mechanism of "relative deprivation" (Shin, 2018; Tao et al., 2022; Osborne et al., 2019). However, some studies have also found that income inequality contributes to people developing optimistic expectations for the future, thereby increasing happiness (Graham et al., 2004; Boehm et al., 2015). Hence, some scholars propose that at different stages, income inequality may have varying effects on happiness, suggesting a curvilinear relationship between the two, known as an inverted U-shape (Yu and Wang, 2017). Therefore, solely examining income inequality may not fully explain the rationality behind the "happiness paradox." The main reason for this uncertainty lies in the fact that income inequality is an outcome variable. Hence, subsequent scholars have gradually shifted their focus towards analyzing the causes of this outcome (Ahmad, 2017; Checchi and García-Peñalosa, 2008). It is worth noting that in China, education serves as a crucial means of accumulating human capital, playing a decisive role in determining individuals' level of education and income. Thus, the distribution of residents' education levels directly affects the income distribution of the entire society. Furthermore, educational equity is closely related to a nation's welfare and output levels. Severe educational inequality can hinder social mobility, lead to social stratification, and even exacerbate inequalities across other dimensions of socio-economic conditions. Moreover, educational equity is closely linked to national welfare and productivity. Severe educational inequality can limit social mobility, deepen social stratification, and exacerbate disparities in other socio-economic dimensions. Thus, exploring how to further enhance national happiness by promoting education equity during periods of economic transformation holds significant theoretical and practical significance.

Given this background, this paper utilizes the Gini coefficient to measure the educational inequality among various provinces and cities. It then matches this data with micro-level survey data from the CFPS to empirically test the relationship between educational inequality and residents' happiness. By constructing a mediation effects model, it further explores the mediating mechanisms through which educational inequality affects residents' happiness. Thus, this study provides a new perspective and approach for research in the field of happiness economics and sheds light on unraveling the "Easterlin Paradox" in China.

The innovations of this paper are mainly reflected in the following aspects. First, compared to most existing studies that focus on the impact of income inequality on subjective well-being, this paper approaches the topic from the perspective of educational inequality, expanding the understanding of well-being. As a core indicator of social opportunity distribution, the impact of educational inequality on individual well-being has not been fully explored, thus offering a new perspective in this field. Second, this paper utilizes provincial-level educational inequality indicators, constructing an education Gini coefficient to measure the distribution of educational resources across regions in greater detail. By combining this with micro-level CFPS data, the paper provides a more precise empirical analysis framework, which stands in contrast to existing studies that primarily focus on macroeconomic data or income disparities. Finally, the paper explores the underlying mechanisms through which educational inequality affects well-being using a mediation effects model, specifically highlighting the role of intermediary variables such as income and economic development. This reveals how educational inequality indirectly affects residents' well-being through multiple channels, helping to deepen the understanding of the complex relationship between educational equity and social welfare.

2 Theoretical analysis and research hypotheses

2.1 The overall relationship between educational inequality and well-being

The relative deprivation theory suggests that an individual's sense of well-being is influenced by comparisons with others around them. If individuals perceive their situation as better than that of others, they are more likely to experience happiness (Nadler et al., 2020; Moore and Aweiss, 2003; Hoch and Loewenstein, 1991; Collins, 1996). Conversely, if they feel that their situation is worse than others', they may experience a sense of "deprivation" and feel unhappy.

Bourdieu's theory of social capital and cultural reproduction further deepens our understanding of educational inequality. According to Bourdieu, education is not only a site for the transmission of knowledge and skills but also an important mechanism for the reproduction of social and cultural capital (Nomaguchi and Milkie, 2020; Diener and Seligman, 2004; Mahendru et al., 2020). The education system, by maintaining and reproducing inequalities in the distribution of resources between social classes, further solidifies inequalities within the social structure. In this framework, educational inequality is not merely a difference in resource distribution but has a profound impact on the accumulation and transmission of social and cultural capital. This inequality leads to unequal opportunities, especially for individuals at the lower end of the social ladder, who find it more difficult to access high-quality educational resources, thereby limiting their social mobility and weakening their sense of well-being.

Thus, under the combined influence of relative deprivation theory and Bourdieu's theory, educational inequality may have a negative impact on well-being. Relative deprivation theory explains the deprivation individuals experience through social comparison, while Bourdieu's theory reveals how educational inequality deepens the differences in well-being through the accumulation and reproduction of social capital. These multiple mechanisms indicate that educational inequality not only affects individuals' short-term well-being but also poses a threat to the long-term welfare of society as a whole.

Based on this theoretical foundation, the following research hypothesis is proposed:

Hypothesis 1: Educational inequality has a significant negative impact on residents' well-being.

2.2 Mechanisms through which educational inequality affects well-being

According to the three-stage theory of social comparison, the indirect impact of educational inequality on well-being is reflected when individuals attribute the reasons for their inferiority in positional goods to educational inequality. Based on this, this paper analyzes the pathways through which educational inequality influences well-being from the perspectives of income distribution effects and economic growth effects.

Firstly, Income Distribution Effects: According to the human capital model of income disparity, in a market economy, individuals' income levels primarily depend on the accumulation of human capital. Therefore, educational inequality affects income disparity through the pathway of "differences in human capital accumulation—differences

in labor productivity—differences in occupational salaries.” Firstly, from the perspective of educational opportunities, the opportunity to access equitable educational resources is the primary prerequisite for accumulating human capital (Šlaus and Jacobs, 2011; Sima et al., 2020). However, in China, there exists a serious imbalance in the distribution of educational resources between urban and rural areas as well as among different regions. The higher social strata often utilize their resource advantages to access more educational resources and opportunities for advancement, especially in terms of access to higher education. Unequal educational opportunities can affect income distribution by influencing labor productivity and continuous training capabilities (Mincer, 1958). Secondly, from the perspective of the educational process, family background not only affects the availability of educational opportunities for children but also influences the quality of education they receive. On the one hand, high-income families tend to place more emphasis on education than low-income families and have sufficient financial resources to invest in the education sector to ensure that their children can access quality education. Morgan et al. was the first to categorize school education quality into key and non-key, academic and vocational. They found that higher family socioeconomic status significantly increased the probability of students entering key schools and academic education tracks, effectively confirming this (Zhang, 2017). On the other hand, schools with better education quality are more conducive to stimulating students’ learning motivation, promoting the improvement of their learning abilities, and consequently enhancing their academic performance (Sekreter, 2019; Zhang and Ma, 2023). Therefore, even in situations where educational resources are abundant and everyone has the opportunity to receive education, it is difficult to ensure that everyone receives education of equal quality. Educational inequalities in the process also contribute to widening income disparities. Lastly, if we ignore the positive role of individual effort in narrowing educational disparities, unequal educational outcomes resulting from unequal educational opportunities and processes will exacerbate income disparities through the pathway of “differences in labor productivity—differences in occupational salaries.” This, in turn, will further exacerbate the unequal distribution of educational opportunities and educational quality, thus forming a vicious cycle of “educational inequality—income inequality—widening educational inequality.” Given that income inequality is a key factor influencing residents’ well-being, and the majority of literature supports the view that income inequality is negatively correlated with residents’ well-being, this paper proposes the second research hypothesis as follows:

Hypothesis 2: Educational inequality widens income disparities, thereby reducing residents’ well-being.

Secondly, Economic Growth Effects: Since the emergence of the new growth theory, countries have started to pay attention to the role of human capital in economic growth. Empirical evidence also indicates that the accumulation of human capital is indeed a significant factor contributing to the differences in economic growth rates among countries. Therefore, education, as the primary means of human capital formation, is closely linked to economic growth. Early literature mostly argued that educational inequality would decrease the stock of human capital and inhibit economic growth (Aghion et al., 1999; Popkova et al., 2015). However, empirical evidence shows that the relationship between educational inequality and economic growth is not simply positive or

negative. At different stages of development, the effect of educational inequality on economic growth varies. When the degree of educational inequality is high, it generally corresponds to a stage of low education levels and economic backwardness. In such circumstances, allowing some individuals to enjoy high-quality education can fully leverage the externality of higher education. This can stimulate overall productivity levels through the advancement of productive forces, thereby promoting economic growth. When the degree of educational inequality is at a moderate level, it is mainly caused by unequal distribution in basic education and higher education. At this stage, economic growth is mainly driven by industries such as manufacturing, which is the second sector. However, because the returns on higher education are lower than those on basic education, simply increasing investment in higher education to exacerbate educational inequality not only leads to a waste of educational resources but also risks causing structural unemployment. This situation occurs when the development of human capital fails to meet the talent demand of the production sectors in this stage of economic development, ultimately hindering economic growth (Storper and Scott, 2008). However, when the degree of educational inequality decreases to a lower level, educational inequality becomes beneficial for economic growth. This is because as education expands and deepens, the average level of education *per capita* generally increases. Economic development primarily relies on knowledge and technological innovation. At this stage, appropriately increasing the degree of educational inequality and increasing the proportion of the population with higher education can enhance the level of technological innovation in society, improve total factor productivity, and thereby promote economic growth (Wang et al., 2021). Shahbaz et al. confirmed the existence of a nonlinear relationship between educational inequality and economic growth when studying the situation of educational inequality in China from 1990 to 2010 (Shahbaz, 2010). They suggested that the government should adjust education policies according to different stages of development. Furthermore, since the reform and opening-up, with the continuous improvement of the education enrollment rate, China’s degree of educational inequality has been decreasing year by year, especially in developed regions in the east (Kanbur and Zhang, 2005). Based on this, it can be inferred that in the non-linear relationship between educational inequality and economic growth, educational inequality in most regions of China may have passed the stage of promoting economic growth and may have a suppressive effect on economic growth. Therefore, the third research hypothesis proposed in this article is as follows:

Hypothesis 3: Educational inequality suppresses economic growth, thereby negatively affecting the well-being of residents.

3 Research design

3.1 Baseline regression model

In this study, the dependent variable, well-being, is an ordered variable. To ensure the accuracy of the regression results, we employ an ordered probit model for regression analysis:

$$Happiness_{ijt} = \alpha G_{jt}^{edu} + \beta X_{ijt} + Y_{jt} + \mu_j + \mu_t + \varepsilon_{ijt} \quad (1)$$

In Equation 1, $Happiness_{ijt}$ represents the subjective well-being of individual i in province j at time t , G_{jt}^{edu} represents the level of educational inequality in province j at time t , X_{ijt} represents individual characteristic variables, Y_{jt} represents province characteristic variables, μ_j and μ_t represent province and time fixed effects respectively, and ε_{ijt} represents the error term.

3.2 Transmission effects model

To effectively identify the pathways through which educational inequality influences well-being, this study follows the approach of Russ and Bansal and constructs a transmission effects model as shown in Equations 1, 3 below (Russ et al., 2017):

Step 1: Test the effect of educational inequality on the mediating variables (income inequality, economic growth):

$$M_{jt} = \beta_0 + \beta_1 Edu_{jt} + \beta_2 X_{ijt} + \beta_3 Y_{jt} + \varepsilon_{ijt} \quad (2)$$

Step 2: Test the effect of mediating variables on well-being:

$$Happiness_{ijt} = \beta_0 + \beta_1 M_{jt} + \beta_2 X_{ijt} + \beta_3 Y_{jt} + \varepsilon_{ijt} \quad (3)$$

3.3 Variables and data sources

Dependent Variable: The dependent variable in this study is residents' subjective well-being. To better reflect the "subjectivity" of residents' happiness in China, the CFPS questionnaire is selected as the data source. Based on the question "How happy do you feel about your life?" in the questionnaire, we can obtain respondents' self-rated scores of well-being, which are integer values ranging from 0 to 10. A higher score indicates a higher level of well-being.

Explanatory Variable: The core explanatory variable in this study is educational inequality. Following the approach proposed by Thomas et al. and widely used in academia, the education Gini coefficient for each province is calculated based on the average years of education. A higher education Gini coefficient indicates greater educational inequality. This method is currently the most widely used in academic research and, compared to other measurement methods, the education Gini coefficient calculated using the average years of education better reflects the level of educational equality in a particular region (Senadza, 2012). In Equation 4, μ represents the average years of education, y_i and y_j represents different levels of education, p_i and p_j represents the corresponding population proportion for each level of education. n is the total number of groups. Specifically, education levels are categorized into five groups: no schooling, primary school or junior high school, senior high school or technical school, junior college, and above. These groups correspond to educational years of 0, 6, 9, 12, and 16 years respectively, based on China's educational system. Additionally, to minimize estimation bias caused by endogeneity issues, this study matches the lagged one-period education Gini coefficient with the CFPS database.

$$G^{edu} = \frac{1}{\mu} \sum_{i=2}^{i-1} \sum_{j=1}^{i-1} p_i |y_i - y_j| p_j \quad (4)$$

Control variables: drawing on the current research in the field of happiness economics (Ferrer-i-Carbonell and Ramos, 2021; Cuñado and De Gracia, 2012), this study selects control variables from both micro and macro dimensions. At the micro level, control variables mainly consist of individual characteristics of residents, including gender, age, household registration status, relative income, educational level, employment status, marital status, health, religious beliefs, and social trust. At the macro level, control variables include provincial-level economic indicators, such as GDP growth rate and the proportion of the tertiary industry. Data for these variables are sourced from the "China Statistical Yearbook." Considering that middle-aged individuals may experience reduced well-being due to greater work and family pressures compared to younger and older individuals, the model includes the square term of age (Age^2) to control for the nonlinear effect of age on well-being. Additionally, relative income is used as a control variable in the model because several studies have shown that factors determining the level of well-being among residents are not absolute income but relative income (Wang et al., 2019).

The micro-level survey data used in this study are derived from the China Family Panel Studies (CFPS) conducted by the China Social Survey Center of Peking University. This dataset is updated every two years and currently covers 31 provinces, municipalities, and autonomous regions nationwide from 2010 to 2018. However, considering that the categorization of well-being levels in 2010 differs from other years, and there is substantial missing data for well-being in 2012 and 2016, this study opts to merge the data from the 2014 and 2018 waves of the Adult Dataset into panel data. After completing data cleaning tasks such as removing samples with missing variables, refusal to answer, or answering "do not know," a total of 38,456 observations are obtained. The definitions and descriptive statistics of the main variables used in the model are presented in Table 1. From Table 1, it can be observed that the mean value of well-being among Chinese residents is 7.489, indicating a generally high level of well-being. The mean value of education inequality is 0.199, with a maximum value of 0.414. This suggests that the issue of education inequality in China has been alleviated to some extent (see Table 2).

4 The empirical results analysis

4.1 Baseline regression

In the baseline regression section, this paper will present the estimated coefficients and marginal effects of the ordered probit model. According to the results in the first column of the table, at the 1% significance level, the coefficient of education inequality is significantly negative. The results in the second column show that even after adding a series of control variables and controlling for time and regional fixed effects, the coefficient of education inequality remains significantly negative at the 1% significance level. Additionally, the absolute value of the regression coefficient decreases, indicating a significant negative relationship between education inequality and happiness. This indicates a significant negative impact of education inequality on happiness, particularly in substantially reducing the probability of residents feeling "very happy," thus confirming the validity of hypothesis 1. The expansion of education inequality undermines social fairness, increases the difficulty for disadvantaged groups to upward mobility through education, and reduces happiness.

TABLE 1 Descriptive statistics of variables.

Variable	Variable definitions	Mean	Std. dev.	Min	Max
Panel A. Dependent variable					
<i>Happiness</i>	“How happy are you?” Values range from 1 to 10, where 1 indicates “Not happy” and 10 indicates “Extremely happy.”	7.489	2.184	0	10
Panel B. core Explanatory Variable					
<i>Gini^{edu}</i>	Education Gini Coefficient	0.199	0.257	0.161	0.414
Panel C. Individual characteristics variables					
Gender	Dummy Variable, Male = 1, Other = 0	0.503	0.499	0	1
Age	Resident's Age	49.470	14.594	16	96
Hukou	Dummy Variable, Urban Household Registration = 1, Other = 0	0.272	0.445	0	1
R income	How would you rate your personal income locally? Values range from 1 to 5, where 1 = Very low and 5 = Very high	2.741	1.051	1	5
Edu	Dummy Variables, 1 = Illiterate, 2 = Primary School, 3 = Junior High School, 4 = High School, 5 = Junior College, 6 = Bachelor's Degree, 7 = Master's Degree, 8 = Doctorate	2.571	1.330	1	7
Employ	Dummy Variable, Employed = 1, Other = 0	0.781	0.414	0	1
Marry	Dummy Variable, Married = 1, Other = 0	0.874	0.332	0	1
Health	How would you rate your health condition? Values between 1–5, where 1 = Very healthy, 5 = Unhealthy	3.059	1.227	1	5
Religion	Dummy variable, belief = 1, otherwise = 0	0.157	0.364	0	1
Trust	Degree of trust in strangers: A value between 1 and 10, where 1 = very distrustful and 10 = very trusting	2.030	2.145	0	10
Panel D. Provincial economic variables					
Growth	The GDP growth rate of each province and municipality in the same year (%)	7.411	1.384	3.600	10.900
Proportion	The proportion of the tertiary industry in each province and municipality in the same year (%)	47.656	8.227	35.400	81.000

When disadvantaged groups constitute the majority, the average happiness of society will decrease.

In addition, we added a quadratic term about educational inequality in the article to explore whether it has an inverted U-shaped relationship with happiness. The results were not significant, indicating that there is no non-linear relationship between educational inequality and happiness.

The regression results of the control variables show that in China, the happiness of males is significantly lower than that of females. Age shows a U-shaped relationship with happiness, indicating that the happiness of middle-aged individuals is significantly lower than that of younger and older individuals. The coefficient of household registration is significantly positive, indicating that having an urban Hukou significantly increases the probability of residents feeling happy. The coefficient of relative income is significantly positive, indicating that relative income helps individuals achieve a sense of accomplishment and satisfaction in comparison with others, thereby enhancing happiness. The coefficient of education level is significantly positive, suggesting that an increase in education level contributes to increasing the probability of residents feeling happy. The coefficient of employment status is significantly negative, which may be because employed individuals experience higher work pressure, leading to a decrease in happiness. The marginal effect of marital status on happiness is significantly positive,

indicating that being married increases the probability of residents feeling happy compared to other marital statuses. The coefficient of health is significantly negative, suggesting a positive relationship between physical health and happiness. The coefficient of religious belief is significantly positive, indicating that individuals with religious beliefs tend to have higher levels of happiness. This is because religious beliefs can provide spiritual solace and support during hardships and setbacks. The estimated coefficient of social trust is significantly negative, but the marginal effect on happiness is not significant. The coefficients of GDP growth rate and the proportion of the tertiary industry are both significantly negative, suggesting that economic growth does not necessarily lead to an increase in residents' happiness, thus falling into the “Easterlin paradox.” The impact of these control variables on residents' happiness aligns with existing research findings.

4.2 Heterogeneity analysis

To further investigate whether the effect of educational inequality on happiness varies across different groups, this section uses three dummy variables—happiness level, urban–rural status, and region—as grouping criteria, and then employs the baseline regression model for testing.

4.2.1 Classifying residents by their level of happiness

This study analyzes the impact of educational inequality on well-being through quantile regression, revealing the heterogeneity of this effect across different groups. Compared to conventional OLS regression, quantile regression can capture the differences in well-being responses to educational inequality across different quantile groups, as shown in Table 3.

First, the low well-being group (the 25th percentile) exhibits a significant negative response to educational inequality. This group is likely to face higher economic pressures and limited access to educational opportunities. Educational inequality exacerbates the gap

in resource access, leading to further limitations in their social status and opportunities, thus reducing their well-being. This group appears to be more sensitive to educational inequality, likely because the disparity in educational opportunities is more direct and pressing for them, which significantly suppresses their well-being. As a result, the intensification of educational inequality tends to further degrade the quality of life for the low well-being group, making them more sensitive to their perceptions and reactions to inequality.

Next, the middle well-being group (the 50th percentile) shows a relatively smaller response to educational inequality. While educational inequality still exerts some negative impact on them, this group typically enjoys a more stable socio-economic status, with relatively balanced educational opportunities and social resources. Therefore, their well-being may not be as significantly affected as that of the low well-being group. In this case, the impact of educational inequality on the middle well-being group is relatively mild, suggesting that this group is less sensitive to the allocation of educational resources or can compensate for the inequality through other means.

Finally, the high well-being group (the 75th percentile) shows the least response to educational inequality, with coefficients approaching zero. This can be understood from several perspectives: high well-being individuals typically enjoy higher socio-economic status, better access to educational resources, and stronger social support systems. They are likely to have a greater ability to adapt and cope with educational inequality. Given that their resources and opportunities are relatively abundant, the impact of educational inequality on their well-being is small. In other words, the influence of educational inequality on the high well-being group is limited, mainly because they do not rely as much on public education resources, and the determinants of their well-being are more influenced by other social and economic factors.

TABLE 2 Education inequality and residents' happiness.

	Estimation coefficients	
	Happiness	Happiness
$Gini^{edu}$	−4.097*** (0.194)	−2.171*** (0.098)
$Gini^{edu\wedge2}$	−0.101 (0.254)	−0.081 (0.073)
Gender		−0.102*** (0.009)
Age		−0.001*** (0.002)
Age ²		0.000*** (0.000)
Hukou		0.103*** (0.013)
R income		0.182*** (0.005)
Edu		0.014*** (0.002)
Employ		−0.058*** (0.009)
Marry		−0.172*** (0.006)
Health		0.023 (0.011)
Religion		0.002 (0.003)
Trust		−0.053*** (0.005)
Growth		−0.006*** (0.001)
Proportion		−2.621*** (0.278)
Province fixed effects		Yes
Year fixed effects		Yes
N		38,456

Standard errors in parentheses. *, **, and *** denote significance at the 10, 5, and 1% levels, respectively. Coefficients in the first column of the table represent the regression coefficients of the ordered probit model.

4.2.2 Classification by urban and rural areas

Considering the significant inequality between urban and rural areas in China, it is possible that urban residents and rural residents perceive educational inequality differently. Therefore, this study classifies the total sample according to urban and rural areas, comparing the differences in the impact of educational inequality on the subjective well-being of urban and rural residents. Table 4 reports the results of grouped regression. Comparing the results between the (1st) column and the (3rd) column, as well as the (2nd) column and the (4th) column, it is found that in different samples, educational inequality is significantly negatively associated with subjective well-being at the 1% significance level. However, the absolute value of the regression

TABLE 3 Heterogeneity analysis: classified by happiness level.

	25	50	75
	(1)	(2)	(3)
	Happiness	Happiness	Happiness
$Gini^{edu}$	−2.894***	−0.091***	−0.001
	−0.007	−0.019	−0.024
Control variables	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
N	13,973	12,483	12,000

TABLE 4 Heterogeneity analysis: classified by urban and rural areas.

	Urban	Rural
	(2)	(4)
	<i>Happiness</i>	<i>Happiness</i>
$Gini^{edu}$	−0.190*** (0.103)	−2.316*** (0.003)
Control variables	Yes	Yes
Province fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
N	18,253	20,203

TABLE 5 Heterogeneity analysis: classified by regional categories.

	Eastern	Central-western
	(1)	(3)
	<i>Happiness</i>	<i>Happiness</i>
$Gini^{edu}$	−0.063*** (0.016)	−2.355*** (0.009)
Control variables	Yes	Yes
Province fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
N	16,462	21,994

coefficient in the rural sample is larger, indicating that rural residents are the primary bearers of the consequences of educational inequality. The reason for this may be that, compared to urban areas, rural areas in China have a relatively lower level of economic development and generally lower levels of education. Therefore, educational inequality not only reduces happiness by widening the urban–rural gap but also decreases happiness by hindering economic development in rural areas.

4.2.3 Classification by region

Similarly, considering the significant disparities between different regions in China, this study divides the total sample into Eastern and Central-Western regions by region to examine whether the subjective well-being of residents in different regions is affected differently by educational inequality. Table 5 reports the regression results for different groups. The results indicate that educational inequality has little impact on the subjective well-being of residents in the eastern region, but has a significant negative impact on the subjective welfare of residents in the central and western regions. This may be because the Eastern region belongs to economically developed areas, where the government invests heavily in education and the public's attitude towards education investment is more positive.

5 Mechanism analysis

The preceding sections have validated the significant negative impact of educational inequality on subjective well-being and its heterogeneity. In this section, starting from the perspectives of income distribution and economic growth, we further explore how educational inequality affects residents' subjective well-being.

To examine whether educational inequality affects residents' subjective well-being through income distribution, this study first

calculates the level of income inequality in each province and municipality. Specifically, this study adopts the formula for calculating the Gini coefficient, and refers to the income grouping standards in the 'China Statistical Yearbook.' After calculating the Gini coefficient for urban and rural residents in each province and municipality separately, the overall Gini coefficient is then calculated using the modified urban–rural weighted method (Bi et al., 2016; Stevenson and Wolfers, 2013). Since income inequality is a continuous variable, when examining the impact of educational inequality on income inequality, OLS regression is used. The results in the (1st) column of Table 6 show that the regression coefficient of educational inequality is significantly positive, indicating that an increase in the degree of educational inequality leads to an expansion of income disparities. The results in the (2nd) column show that the coefficient of income inequality is significantly negative, indicating that an increase in the level of income inequality significantly reduces residents' subjective well-being. Therefore, it can be inferred that educational inequality reduces subjective well-being by widening income inequality, thus verifying the income distribution effect and confirming Hypothesis 2.

Similarly, in order to examine whether educational inequality affects residents' subjective well-being through economic growth, in addition to the income distribution effect, this study also selected the natural logarithm of *per capita* GDP as a proxy variable for economic growth. According to the results in columns (3) and (4) of Table 6, at a significance level of 1%, an increase in educational inequality is not conducive to economic growth, thereby affecting residents' subjective well-being. Confirmed hypothesis 3. This discovery is consistent with the conclusions of several scholars, including Yang et al. (2020).

6 Robustness analysis

To ensure the robustness of the empirical results, this study further conducts tests using alternative models and alternative dependent variables. The results are presented in Table 7.

6.1 Replacement models

In happiness studies, although most scholars advocate treating the happiness data obtained from survey questionnaires as ordinal variables and using ordered probit or ordered logit models for regression. However, Becchetti have pointed out after their research that even if happiness is treated as a continuous variable, it would not substantially affect the empirical results as long as the regression equation's correctness is ensured (Becchetti et al., 2011). Therefore, in this study, the regression results using the OLS model and the ordered logit model are used as part of the robustness test. As shown in columns (1) and (2) of Table 7, even when the regression model is changed, the coefficient of educational inequality remains significantly negative, indicating the robustness of the baseline regression results.

6.2 Replacement of dependent variables

To further ensure the robustness of the empirical results, this study also employs the method of replacing variables. Specifically, a new dummy variable *Happiness* is generated. If the value of the

TABLE 6 Mechanism test results.

	(1)	(2)	(3)	(4)
	<i>Gini</i> ^{income}	<i>Happiness</i>	<i>Lnpgdp</i>	<i>Happiness</i>
<i>Gini</i> ^{edu}	0.574*** (0.027)	−0.206*** (0.021)	−1.106*** (0.025)	−0.861*** (0.005)
<i>Gini</i> ^{income}		−0.142*** (0.018)		
<i>Lnpgdp</i>				0.071*** (0.003)
Control variables	Yes	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
N	38,456	38,456	38,456	38,456

TABLE 7 Robustness test results.

	(1)	(2)	(3)
	<i>Happiness</i> (OLS)	<i>Happiness</i> (logit)	<i>Happiness</i>
<i>Gini</i> ^{edu}	−5.463*** (0.601)	−0.760*** (0.084)	−0.599*** (0.109)
Control variables	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
N	38,456	38,456	38,456

variable *Happiness* is greater than 5, then *Happiness* is set to 1; otherwise, it is set to 0. This converts happiness from an ordinal variable to a binary variable, and a binary probit model is constructed for regression. From column (3) of Table 7, it can be observed that the coefficient of educational inequality is significant at the 1% level, indicating a robust negative relationship between educational inequality and happiness.

7 Discussion on endogeneity

Due to the potential issue of omitted variable bias, endogeneity may arise in the model of this study. For example, unobservable variables such as the educational and cultural foundations of different regions, as well as the emphasis placed on education, may simultaneously influence individual well-being and the level of educational inequality, leading to endogeneity problems. To address this issue, this study employs an instrumental variable approach (see Table 8).

Specifically, we use the average proportion of education-related texts in the government work reports of each province from 2014 to 2018 (denoted as *EDU*^{GOV}) to measure the provincial government's level of emphasis on education. The reason for choosing this variable is that government work reports not only reflect the achievements of past government work but also highlight the priorities for future work. Therefore, the proportion of education-related content can be seen as an important indicator of the government's commitment and focus on education. When discussing the validity of this variable, we need to focus on its relevance and exogeneity.

First, there is a significant correlation between *EDU*^{GOV} and educational inequality, as government policy orientation and investment directly impact the allocation of educational resources and the fairness of educational opportunities. Second, this variable is exogenous because it comes from government reports, reflecting the government's stance and priorities on education rather than being a direct result of individual well-being or educational inequality. This characteristic allows *EDU*^{GOV} to effectively serve as an instrumental variable to help resolve the endogeneity problem in the model, thus enhancing the reliability of the results.

7.1 Replacement of the core explanatory variable

To test the robustness of the research findings, we further replace the core explanatory variable from educational inequality (education Gini coefficient) to the Human Opportunity Index (HOI) for education. This modification aims to more comprehensively reflect the impact of educational opportunities on well-being and to overcome the simplification issues that may arise from the education Gini coefficient.

First, we calculate the Human Opportunity Index for education based on higher education enrollment rates across provinces. HOI better captures the multidimensional nature of education, particularly in terms of educational quality and resource distribution. Therefore, we expect that the introduction of the Human Opportunity Index will provide more accurate results and reveal the true impact of educational opportunities on well-being. The results, as shown in

TABLE 8 Discussion on endogeneity.

	(1)	(2)
	<i>EDU^{GOV}</i>	<i>Happiness</i>
<i>Gini^{edu}</i>	−0.677*** (0.127)	
<i>EDU^{GOV}</i>		−1.112*** (0.128)
<i>Lnp^{gdp}</i>		
Control variables	Yes	Yes
Province fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
<i>N</i>	38,456	38,456

TABLE 9 To replace core explanatory variables.

	(1)
	<i>Happiness</i>
<i>HOI^{edu}</i>	−1.063*** (0.016)
Control variables	Yes
Province fixed effects	Yes
Year fixed effects	Yes
<i>N</i>	38,456

Table 9, indicate a negative impact of educational inequality on well-being.

8 Conclusion

This study uses data from the China Family Panel Studies (CFPS) to examine the impact of educational inequality on subjective well-being. The baseline results indicate that educational inequality significantly reduces the probability of individuals feeling happy, and the robustness checks support this conclusion. Heterogeneity analysis shows that the impact of educational inequality is more pronounced for individuals with lower well-being. Additionally, the effect of educational inequality on subjective well-being varies across urban and rural areas, as well as regions. In economically underdeveloped rural areas and central and western regions, educational inequality significantly lowers residents’ well-being, whereas the effect is minimal in urban and eastern regions. Further analysis reveals that educational inequality has significant effects on income distribution and economic growth. Educational inequality affects subjective well-being by exacerbating income inequality and suppressing the level of economic development.

Firstly, optimizing the distribution of educational resources and promoting the establishment of a fair education system is crucial for improving residents’ well-being. Educational inequality not only has a significant negative impact on individual subjective well-being but also hinders the achievement of social equity and sustainable development goals. Therefore, the government should further increase financial investment in education, particularly by creating more opportunities for continuing education, improving the quality of the teaching workforce, and accelerating the construction of a high-quality education system. In this process, policy transparency and

accountability mechanisms are essential to ensure that the institutional rules for educational equity are effectively implemented.

Secondly, when formulating education policies, the differences in regional economic development stages should be fully considered. The empirical analysis in this study shows that educational inequality has a significantly heterogeneous impact on different regions and groups at various stages of economic development, particularly in economically underdeveloped rural areas and the central and western regions, where educational inequality significantly reduces residents’ happiness. Therefore, in addition to expanding education coverage, policies should focus on the structural allocation of educational resources, particularly by increasing investment in rural and remote areas to narrow the educational gap between regions. This approach will help improve the overall well-being of society and address the challenges posed by the “Easterlin paradox”.

Although this study has made some progress in exploring the relationship between educational inequality and subjective well-being, there are still some limitations that future research can address. First, this study only uses the educational Gini coefficient as a measure of overall educational inequality. Future research can further decompose educational inequality using the “endowment-effort” binary framework to examine its impact on subjective well-being from multiple dimensions. Such a multidimensional analysis can provide deeper insights into which aspects of educational inequality have the most significant effect on well-being.

Secondly, this study primarily investigates the intrinsic mechanisms of how educational inequality affects subjective well-being from the perspectives of income distribution and economic growth. Future research can consider other potential mechanisms, such as social capital, mental health, and social security, to further reveal how educational inequality influences residents’ well-being through various socio-economic pathways. This would offer a more comprehensive perspective on the multi-layered impact of educational inequality.

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 authors.

Author contributions

DL: Writing – original draft. ZL: Writing – review & editing.

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EDITED BY

Martijn Burger,
Open University of the Netherlands,
Netherlands

REVIEWED BY

Xiaozi Gao,
The Education University of Hong Kong,
Hong Kong SAR, China
Anna Alexandrova-Karamanova,
Bulgarian Academy of Sciences, Bulgaria

*CORRESPONDENCE

Daniel T. L. Shek
✉ daniel.shek@polyu.edu.hk

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Association between positive youth development and family functioning in the Chinese context: a four-wave longitudinal survey in mainland China

Xiang Li, Yi-Ting Tang and Daniel T. L. Shek*

Department of Applied Social Sciences, The Hong Kong Polytechnic University, Kowloon, Hong Kong SAR, China

Introduction: There is a notable scarcity of research examining the developmental trajectories of positive youth development (PYD) attributes among Chinese preadolescents and adolescents and the predictive effect of family functioning on these trajectories over time.

Methods: Using four waves of data, this longitudinal study investigated preadolescents and adolescents in China in January 2020 (T1), June 2020 (T2), June 2021 (T3), and June 2022 (T4). The study utilized the 90-item “Chinese Positive Youth Development Scale” and the 33-item “Chinese Family Assessment Instrument” to assess PYD and family functioning, respectively. The final matched sample comprised 2,652 Chinese students from grades 4 to 8, with an average age of 10.9 years ($SD = 1.32$; range 9–15) at the first wave of the survey, and with 51.1% male ($n = 1,354$).

Results: The Latent Growth Curve Modeling (LGCM) revealed that the PYD developmental trajectories of preadolescents and adolescents followed a quadratic U-shaped curve, characterized by an initial decline from T1 to T3, followed by a rebound from T3 to T4. Although the time-invariant covariate LGCM indicated no significant gender difference in the initial level of PYD, girls exhibited a slower decline rate and a faster growth rate in PYD over time than did boys. The parallel LGCM demonstrated that initial levels of family functioning significantly and positively predicted both the initial level and the rate of change in PYD over time.

Discussion: This study highlights the critical importance of considering the direct and sustained impact of family functioning within Chinese contexts on positive developmental outcomes among Chinese preadolescents and adolescents. This study also suggests that when designing and formulating specific programs or interventions, it is essential to consider gender differences in the development of competencies to ensure the optimal development of young individuals of different genders.

KEYWORDS

preadolescents, adolescents, positive youth development, family functioning, latent growth curve modeling

1 Introduction

A core principle underlying the “Positive Youth Development (PYD)” approach is that every child possesses natural talents, strengths and interests (Damon, 2004). The theoretical models of PYD posit that when young individuals interact adaptively with their multi-level environments, positive developmental trajectories of improvement are more likely to occur

(Lerner et al., 2003; Lerner, 2004). In particular, PYD emphasizes nurturing the competencies of young individuals, along with providing them with comprehensive support systems to enable them to unleash their full potential, achieve positive and healthy development, and successfully transition into adulthood.

As the basic and most crucial developmental context for children and adolescents, the family directly and profoundly influences their developmental outcomes. The family provides essential assets and a support system necessary for children's positive development and can initiate PYD trajectories. In this context, the family environment such as family interactions not only directly impact children's developmental outcomes but may also have long-lasting effects on their future well-being. In Chinese communities, the highly child-centered nature of Chinese families may be a double-edged sword, offering a supportive and protective environment while also potentially leading to excessive parental control. Therefore, it is crucial to explicitly examine how family functioning influences developmental outcomes among Chinese young individuals over time.

1.1 Positive youth development—an alternative vision of youth development

A new perspective on viewing young individuals has emerged since the early 1990s, which considers every child and adolescent as a social resource with untapped potential for positive growth (Lerner et al., 2005). This developmental view takes the concepts of plasticity and resilience in human development as its foundation and focuses on the strengths of young individuals (Lerner et al., 2015), and highlights the malleability, diversity, and self-determination inherent in young individuals' developmental processes (Steinberg and Lerner, 2004). According to Hamilton's (1999) discussion, the term "Positive Youth Development (PYD)" can be interpreted from at least three aspects. Firstly, it is a developmental process. Secondly, PYD represents an ideology and serves as a guiding principle for designing and implementing youth programs. Thirdly, PYD exemplifies those youth programs that emphasize nurturing the abilities of young individuals and promoting their positive and harmonious development.

There are different approaches in the field of PYD, with the Five Cs Model (Lerner, 2004; Lerner et al., 2005) and the 15 PYD constructs (Catalano et al., 2004) being the most widely utilized and improved upon. The Five Cs Model conceptualizes PYD through five key components: "competence," "confidence," "character," "connection," and "caring" (Lerner et al., 2005). These five Cs are considered essential developmental attributes that young individuals need to become contributing members of society. Catalano et al. (2004), based on their review of the effective programs in the United States, identified 15 developmental constructs as indicators of PYD, such as cognitive, emotional, behavioral, social and moral competence. Scholars operationalize and define PYD from various perspectives, however, there is a consensus on two common emphases across different PYD models. Plasticity, the capacity to adapt to different environments, is regarded as an inherent potential in human development and is commonly emphasized within various conceptual frameworks of PYD. Taking into account the entire lifespan, change is always present, and the direction of change toward improvement (a positive change) or deterioration (a negative change) can become a characteristic of an individual's developmental trajectory. The complexity and diversity of

the "relational developmental system" provide possibilities for identifying pathways of positive change for individuals, thereby promoting or sustaining positive development (Lerner et al., 2015). Hence, the second common emphasis in various PYD models is the relationship between individuals and their contexts. Within this "relational developmental system," adaptive developmental regulations occur when individuals and their developmental contexts are mutually beneficial (Brandtstädter, 2007), leading to positive and healthy development. Therefore, the relative plasticity of young individuals is seen as an instantiation of the bidirectional exchanges between them and their developmental contexts (Lerner et al., 2005). When there is consistency and mutual benefit between the ecological assets that promote positive development and individual strengths, which is realized through the adaptive individual-contextual developmental regulations, the important qualities for positive development, such as the 5 Cs (Lerner et al., 2005) and 15 PYD attributes (Catalano et al., 2004), can continue to develop in the individual's developmental trajectory, thereby leading to the realization of idealized adulthood.

1.2 Developmental trajectory of PYD during preadolescence and adolescence

There is currently no universally accepted international definition for the youth age group. The World Health Organization (WHO, 2021) defines "adolescents" as individuals aged between 10 and 19 years old, and "youth" as those in the 15–24 years age group. The term "young people" typically encompasses both of these groups. Additionally, some scholars define the preadolescent age range as 9–12 years old (Buhrmester, 1990; Verburgh et al., 2014) or 10–12 years old (McMakin and Alfano, 2015), typically from Grade 4 to Grade 6, thereby distinguishing this subset of young individuals more precisely from children and adolescents.

Existing empirical research on the developmental trajectories of PYD in young people has primarily focused on the longitudinal investigation, such as the "4-H Study of Positive Youth Development" conducted in the United States since 2002. The study was designed to track the second decade of the youth's lives to capture their developmental trajectories and examine the individual and ecological factors that promote health and positive growth (Lerner et al., 2005). Multiple findings were observed in this longitudinal study. Based on data from the first three waves, Phelps et al. (2007) found an overall nonlinear decline in PYD developmental trajectories from Grades 5 to 7, with a larger decrease from fifth to sixth grade. Furthermore, it was observed that girls are more likely to be on "positive" developmental trajectories compared to boys. Zimmerman et al. (2008) used data from four waves to identify five PYD developmental trajectories exhibited by adolescents from Grades 5 through 8. Three trajectories remained relatively stable over time, labeled as "high" (27.6%), "medium-high" (39.6%), and "low" (7.8%). The remaining two trajectories showed a slow increase ("increasing," 21.3%) or decrease ("decreasing," 3.7%) over time. Similar gender differences were again identified in this study.

With a longer follow-up period, four PYD trajectories were identified among Grades 5–10 students using data from six waves, with the majority of adolescents clustering in the two highest trajectories (Lewin-Bizan et al., 2010). These two trajectories exhibited growth from the initial point to a stable high level after sixth grade (i.e., "increasing-to-stable-high," 28.3%) and a stable moderate level

(i.e., “increasing-to-stable-moderate,” 39%). The other two trajectories included one that grew from the initial point to sixth grade and then began to decline continuously (i.e., “increasing-decreasing,” 26.5%) and another that showed a gradual decline over time (i.e., “decreasing,” 6.2%). Consistent with previous findings (Phelps et al., 2007; Zimmerman et al., 2008), girls are more likely to be in the optimal developmental trajectory, namely, in the “increasing-to-stable-high” group. Using a sample from Grade 7 to Grade 9 students, Schmid et al. (2011) reported four PYD developmental trajectories, with three representing moderate (27%), high (42%), and highest (24%) groups that remained stable over time. A smaller proportion of participants (7%) clustered in the fourth trajectory, which had a lower starting point compared to the other groups and showed a continuous slow decline throughout the study. The superior performance of girls in PYD was still observed, with more girls clustering in the optimal PYD trajectory (i.e., the highest group).

Beyond the 4-H Study, other longitudinal studies have investigated the trajectories of PYD among adolescents in Western cultural contexts. Using four waves of data, Kaniusonytė and Truskauskaitė-Kunevičienė (2021) identified three PYD trajectories among Lithuanian adolescents from Grade 9 to Grade 12, specifically, “high” (30%) and “medium” (48%) remained stable, while “low” (22%) showed a slight decline from Grade 9 to Grade 10, followed by a slow and slight increase. However, no significant gender differences were observed in this study. In another study focusing on Latinx adolescents (Coulter, 2022), using three waves of data, researchers examined adolescents from Grade 8 to Grade 10 and observed that their PYD trajectories experienced a slight decline from Grade 8 to Grade 9, followed by a more pronounced decrease from Grade 9 to Grade 10. Other longitudinal studies can be seen in the handbook by Dimitrova and Wiium (2021) and their review (Wiium and Dimitrova, 2019).

In the Chinese context, drawing upon the theoretical framework of 15 constructs of PYD summarized by Catalano et al. (2004) and using the “Chinese Positive Youth Development Scale (CPYDS),” Shek and Lin (2017) examined the developmental trajectories of PYD attributes among adolescents in Grades 7 through 12 in Hong Kong. The study revealed that the overall developmental trajectory of PYD followed a quadratic pattern rather than a linear one, with a decline observed from Grade 7 but a later increase after Grade 10. Similar developmental trajectories were also found in three higher-order factors: “general positive youth development,” “cognitive-behavioral competence,” and “positive attributes,” based on the four higher-order components identified by Shek and Ma (2010), with the fourth factor being “positive identity.” These findings replicated the results of their previous work (Shek and Ma, 2012), which utilized 8-wave data from Grades 7 to 11 in Hong Kong and observed a U-shaped curve in composite PYD attributes (e.g., moral, behavioral competence and resilience), initially declining, then increasing, and gradually declining again. Moreover, Shek and Zhu (2020) investigated the developmental trajectories of thriving among Hong Kong adolescents. Utilizing 8-wave data from Grades 7 to 11, the overall thriving developmental trajectory also exhibited a U-shaped curve. Specifically, thriving declined from Grade 7 to 9 and then began to rise again from Grade 10 onwards.

In recent years, researchers began some related studies in mainland China. Measured by the CPYDS, Chi et al. (2020) reported a similar change pattern of positive identity among early adolescents from China, showing a decline from Grade 7 to Grade

8 followed by a rebound in Grade 9. However, they observed in the study that the other three components of PYD constructs were relatively stable from the starting point and then slightly increased in Grade 9. Utilizing a similar measurement tool, Chai et al. (2023) explored the trajectory of PYD among high school students during the first semester in China. They identified four trajectory types of dynamic changes in PYD, which were “high start-fast decreasing” (5.0%), “high start-low decreasing” (61.1%), “low start-low increasing” (8.3%), and “mid-persistent” (25.6%) groups. These findings highlighted the dynamics and diversity of adolescent PYD development trajectories, that is, multi-finality of the same initial level and convergence of different initial levels at the endpoint.

Although some preliminary empirical evidence has been obtained using samples of Chinese adolescents, compared to Western contexts, research on the developmental trajectories of PYD among adolescents in Chinese contexts remains limited, highlighting a significant gap in the literature. When using “longitudinal” and “adolescent” as keywords to search in PsycINFO database in November 2024, there were 4,289 articles obtained. By adding “Chinese,” the number dropped to 84. When searching with PsycINFO database utilizing “PYD,” “longitudinal” and “adolescent,” we found 7 articles, and after adding “Chinese,” we did not find any record of publication.

1.3 Family functioning as the foundation of positive youth development

PYD is concerned with the dynamic relationship between individuals and their developmental contexts. Within the “relational developmental system,” the family serves as the earliest and most significant microsystem of every child, exerting enduring influences on their development (Xia, 2022). Parents are considered as the primary proximal factors directly impacting children’s developmental outcomes and well-being (Yu and Shek, 2021; Shek et al., 2022b). It is widely acknowledged that healthy family functioning forms the foundation for the positive development of the youth (Smith et al., 1997; Stormshak and Dishion, 2002) which is determined by a variety of interrelated factors (Coulacoglou and Saklofske, 2017). In different models of family functioning, it is commonly regarded as a concept with different dimensions (Beavers and Hampson, 2000; Miller et al., 2000; Olson, 2000), such as problem-solving, communication, and emotional involvement in the family.

Using cross-sectional adolescent samples, healthy family functioning has been demonstrated to be a promotive factor for adolescents’ positive development. For instance, a strong positive association between positive family relationships (e.g., satisfactory relationships with parents, and frequent participation in family activities) and PYD among adolescents was observed in Grasmeyer et al. (2024). Notably, these positive associations were stronger among girls compared to boys. It was reported that healthy family functioning reduced adolescents’ internalizing problems by facilitating PYD (Wang et al., 2021). Leung et al. (2016) observed that in single-mother families, single mothers’ perceptions of family functioning level were positively associated with their adolescent children’s developmental positive outcomes. Moreover, Mackova et al. (2019) examined more complex pathways that connected family crisis (a risk factor for healthy family functioning) with PYD in adolescents: crisis in the

family leading to perceived poor parental supervision which reduced participation in family activities, eventually leading to declined PYD.

1.4 Family functioning and positive youth developmental outcomes in Chinese families

Chinese society is often regarded as familial, as Chinese individuals prioritize the interests of the family over their own personal interests (Yan, 2018). However, the structure of the family has undergone transformation, transitioning from the traditional three-generation household to the nuclear family in contemporary China. This nuclear family structure was further reduced to couples with only one child after the implementation of the “One-Child Policy” by the Chinese government in 1979. Although this policy officially ceased on January 1, 2016, the nuclear family remains prevalent in modern Chinese society. Consequently, “child-centeredness” in traditional Chinese families has become more pronounced in the present-day Chinese family context (Xu et al., 2007), with children receiving the utmost attention within the Chinese family system. Despite these changes, Confucianism continues to hold a central position as a cultural value influencing family relationships and family education in contemporary China. This traditional philosophical ideology highlights the importance of group harmony over individual fulfillment (Wong, 2002). In light of the traditional values that emphasize harmony and mutual obligations, Chinese families tend to have a low tolerance for open family conflicts and a high emphasis on family cohesion (Chow, 1999). Harmony is considered a prominent facet of family strength in Chinese families, and the provision of family support contributes to enhanced family functioning in China (Xie et al., 1996, 2004).

Research supported the impact of healthy family functioning on developmental problem behaviors in Chinese adolescents. For example, Shek et al. (2022b) found that healthy family functioning is not only a negative predictor of juvenile delinquency but also a positive predictor of PYD attributes among young people from mainland China. Using positive developmental outcomes, Shek et al. (2014) observed significant positive correlations between various aspects of healthy family functioning and PYD in multiple domains across each wave. Dou et al. (2023) also demonstrated that healthy family functioning predicted an increase in resilience in children from mainland China over time.

On the other hand, the highly child-centered nature of modern Chinese families is often coupled with high parental control, including both behavioral and psychological control. Research on Chinese adolescents in Hong Kong indicated that adolescents’ life satisfaction was associated with parental behavioral control, while their sense of hopelessness was related to parental psychological control (Leung and Shek, 2020). Additionally, the self-esteem of Chinese adolescents was positively predicted by parental autonomy-granting behavior (Bush et al., 2002). Nevertheless, it was observed that as children enter preadolescence, American parents are more likely than Chinese parents to reduce their control, such as making fewer decisions about their children’s personal issues. Consequently, children from American families exhibited better emotional functioning (emotional competence) during early adolescence and late adolescence (Qin et al., 2009).

1.5 Research gap in the current literature

Upon a closer examination of the existing literature, two significant study limitations are present. First, despite the multiple studies on the developmental trajectories of PYD during adolescence, there is a notable lack of investigation during preadolescence (which is commonly regarded as a period between 9 to 12 years; Buhrmester, 1990; Verburgh et al., 2014), especially in a Chinese context. Preadolescence is considered a unique period during which preadolescents undergo concurrent physical, cognitive, and social-emotional changes, manage changes in school and social relationships, and address increased conflicts in interpersonal relationships, which warrants specific attention (Mascia et al., 2023). Recently, some limited preliminary findings were provided by Chen et al. (2024). They used the three-wave data from Chinese young individuals to estimate the trajectory for PYD attributes during late childhood and adolescence. The developmental trajectory for PYD attributes among the participants was observed as nonlinear, with a first drop and a later increase across the 3 years investigated. However, the participants involved in Chen et al.’s study (2024) had a wide age range, from 7 to 21 years old, which not only implies significant individual differences but also notable disparities in psychosocial competence, thereby affecting the generalizability of the results.

Secondly, there is limited knowledge regarding the longitudinal dynamic relationship between family functioning and PYD among preadolescents and adolescents in the Chinese cultural context (Shek et al., 2022b). With growing urbanization and Westernization, families in China are facing increasing challenges, such as growing divorce and family violence. Besides, with the influence of traditional Chinese cultural influences, Chinese family members may have different views of family functioning, such as the expression of negative views. Hence, it is theoretically and practically important to understand the linkage between family functioning and child developmental outcomes in Chinese societies.

1.6 The present study

Based on 15 PYD constructs model by Catalano et al. (2004), the present study investigated PYD trajectories among Chinese preadolescents and adolescents. In response to the research gaps discussed above, this study aimed to answer the following questions.

Research Question 1: What is the development trajectory for PYD attributes in Chinese preadolescents and adolescents? Based on the available findings in samples of Chinese adolescents from Hong Kong (Shek and Ma, 2012; Shek and Lin, 2017), it was predicted that there would be a decline in PYD development with a later rebound during preadolescence and adolescence (Hypothesis 1).

Research Question 2: Is gender related to the initial level and changes in PYD trajectory in Chinese preadolescents and adolescents? Previous studies have shown that girls are more likely to have a more optimal PYD development trajectory compared to their male counterparts (Phelps et al., 2007; Lewin-Bizan et al., 2010). Hence, we expected that compared with boys, girls would be more likely to have a higher level of PYD at baseline (Hypothesis 2a) and have a faster growth rate in PYD (Hypothesis 2b).

Research Question 3: How do the initial levels and the subsequent development of PYD and family functioning co-vary across time

among Chinese preadolescents and adolescents? With reference to the promoting effect of healthy family functioning on positive outcomes among adolescents, we proposed that as levels of family functioning increase, PYD would also increase (Hypothesis 3).

2 Materials and methods

2.1 Participants and procedure

The current longitudinal study conducted four waves of surveys on Chinese preadolescents and adolescents. The initial data collection took place in 2019/20 academic year, from December 2019 to January 2020 (T1), before the outbreak of the pandemic. Using a cluster sampling method, five schools (one elementary school, one junior secondary school, and three admitting elementary and junior secondary students) were selected to participate in this study from among 623 elementary schools, 317 junior secondary schools, and 156 schools that admitted both elementary and junior secondary students located in Chengdu, Sichuan Province, China. A total of 143 classrooms in the five schools involved participated in the study. To specifically assess the impact of the pandemic on Chinese students, a second survey was conducted after classes resumed in the same academic year, specifically from June 2020 to July 2020 (T2). Subsequent surveys were conducted at one-year intervals, with T3 in June 2021 (in 2020/21 academic year) and T4 in June 2022 (in 2021/22 academic year), to more comprehensively track and capture the developmental trajectories and changes in students over time.

This study focused on preadolescents and adolescents (i.e., Grade 4 and above). A total of 6,854 students who were in Grade 4 and above completed the questionnaire at T1. Among them, 748 students participated only in the first survey. One thousand three hundred and fifty-six students participated in any two surveys, with 1,331 completing the survey at T1 and T2, 14 completing at T1 and T3, and 11 completing at T1 and T4. In addition, 2,071 students participated in any three surveys. Among them, 1,759 completed the survey at T1, T2 and T3, and 312 completed the survey at T1, T2, and T4. A total of 2,679 students participated in all four surveys. Hence, the analytical sample for this study was drawn from these 2,679 data points. Inclusion criteria include (1) students who participated in all four waves of the survey; (2) the overall missing rate of less than 50%; (3) less than 10% missing data for the variables of interest. The sample size included in the final analysis was 2,652. The study sample comprised students from Grades 4 through 8 at T1. Specifically, there were 853 students who were in Grade 4, 232 in Grade 5, 742 in Grade 6, 816 in Grade 7, and 9 in Grade 8. According to T1 data, the average age was 10.94 years ($SD = 1.32$; range 9–15), and 51.1% were male ($n = 1,354$). According to Buhrmester (1990), 89.8 and 10.2% could be regarded as preadolescents (9–12 years old) and adolescents (over 12 years old), respectively, in the first wave of survey.

Students completed the questionnaire in the classroom during each of the four survey rounds. A trained and experienced researcher was present during each data collection session, providing detailed explanations of the research purposes to the students. Scholars and educators hold the view that elementary school students in the upper grades, namely, those in Grade 4 and above, possess adequate cognitive and intellectual abilities to comprehend social-psychological factors and engage in

self-reporting (He and Xiang, 2022). Nevertheless, the elementary school participants were instructed to ask the researchers any questions they had about the questionnaires before and during its completion, and to respond according to their true feelings and understanding. Both parents and students provided their informed consent before participating in the study. This research obtained ethical approval from the Institutional Review Board (IRB) at Sichuan University.

2.2 Measures

2.2.1 Positive youth development

The 90-item “Chinese Positive Youth Development Scale” (CPYDS; Shek et al., 2006) was used to assess PYD attributes. The CPYDS consists of 15 subscales that assess 15 attributes of PYD (Catalano et al., 2004). Each of the first 83 items was rated on a 6-point Likert scale (1 = “strongly disagree,” 6 = “strongly agree”), while the last seven items concerning positive behavioral recognition were rated using a 7-point Likert scale (1 = strongly negative description, 7 = strongly positive description). The total score evaluates the overall characteristics of PYD, with higher scores indicating greater PYD attributes. The CPYDS has demonstrated good test–retest reliability and validity in Chinese adolescent samples (Shek and Ma, 2010). In the current investigation, the CPYDS showed excellent internal consistency (see Table 1).

2.2.2 Family functioning

The 33-item “Chinese Family Assessment Instrument” (C-FAI; Shek, 2002) was used to assess family functioning. The C-FAI assesses family functioning across five dimensions: “communication,” “mutuality,” “harmony and conflict,” “parental concern,” and “parental control,” using a Likert scale ranging from 1 (“most similar”) to 5 (“most dissimilar”). Regarding scoring, all positive statements are encoded in a reverse manner, where a higher score on an item was positively correlated with healthier family functioning, with a higher total score indicating better overall family functioning (Shek, 2002). Past research has reported strong validity and reliability (Shek et al., 2023). The C-FAI demonstrated good reliability in this study as well (see Table 1).

2.3 Data analytic plan

To capture the trajectory of PYD over time and investigate the concurrent development of PYD and family functioning across four waves, we employed Latent Growth Curve Modeling (LGCM), an analytical approach for tracking changes in variables longitudinally (Kline, 2016). LGCM enables the delineation of a variable's trajectory (either growth or decline) and the differentiation among individuals in terms of their developmental patterns. Through LGCMs, we calculated the means and variances of the latent intercepts and slopes to determine any significant individual differences in the initial levels of PYD or in the rate and direction of its development. The quadratic slope represents the rate of change in the linear slope over time (Bollen and Curran, 2006). A larger linear slope value indicates a faster rate of change, while a larger quadratic slope value signifies an accelerating rate of change (i.e., a steeper change).

TABLE 1 The mean value, standard deviation, correlation matrix between study variables, and reliability of scales across 4 time points.

	α	Inter-item correlation	Mean	SD	1	2	3	4	5	6	7	8	9
1. Gender ^a					–								
2. Age			10.94	1.32	0.004	–							
3. PYD (T1)	0.974	0.350	5.16	0.72	0.034	–0.035	–						
4. PYD (T2)	0.980	0.408	5.14	0.78	–0.028	–0.094***	0.551***	–					
5. PYD (T3)	0.984	0.460	5.05	0.83	–0.049*	–0.160***	0.400***	0.478***	–				
6. PYD (T4)	0.981	0.428	5.20	0.72	–0.008	–0.027	0.147***	0.124***	0.182***	–			
7. FFT (T1)	0.935	0.324	4.16	0.72	0.035	–0.015	0.493***	0.347***	0.294***	0.093***	–		
8. FFT (T2)	0.941	0.365	4.17	0.73	0.003	–0.087***	0.371***	0.474***	0.363***	0.072***	0.482***	–	
9. FFT (T3)	0.948	0.388	4.18	0.73	–0.025	–0.109***	0.311***	0.368***	0.483***	0.140***	0.410***	0.455***	–
10. FFT (T4)	0.948	0.390	4.27	0.66	–0.004	–0.040*	0.115***	0.100***	0.142***	0.472***	0.102***	0.120***	0.174***

^a1 = male, 2 = female; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.
T1 = Time 1; T2 = Time 2; T3 = Time 3; T4 = Time 4; SD, Standard Deviation; PYD, Positive Youth Development; FFT, Family Functioning.

The maximum likelihood estimation with robust standard errors (MLR) was used for all models in this study. Unconditional linear and quadratic LGCMs were first performed to evaluate the overall growth pattern of PYD without any covariates. Next, we included gender as a time-invariant covariate in a conditional LGCM to determine any significant gender differences in the initial level of PYD and the rate of change in the PYD development. Finally, a parallel processing LGCM was performed to assess the parallel growth of PYD and family functioning after controlling gender. Model fit was assessed using Chi-square tests, Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR). A good fit is indicated by CFI and TLI values above 0.95 (acceptable if above 0.90), RMSEA values below 0.06 (acceptable up to 0.08), and SRMR values below 0.08. For model comparison, lower Bayesian Information Criterion (BIC) values are preferred, with the smallest BIC indicating the best fit. A BIC difference (Δ BIC) between two models <2 suggests weak evidence in favor of the model with the lower BIC, Δ BIC 2–6 shows positive evidence, Δ BIC 7–10 shows strong evidence, and Δ BIC > 10 shows very strong evidence (Raftery, 1995). The LGCMs were performed using Mplus Version 8.3. Descriptive and correlation analysis of study variables as well as reliability of scales were performed using SPSS 28.0.

3 Results

3.1 Descriptive statistics

Table 1 provides descriptive statistics and correlation analyses. There was a significant positive correlation between PYD and family functioning level at all waves (r s range 0.072–0.493; p s < 0.001). A significant negative correlation was found between age and PYD at T2 ($r = -0.094$, $p < 0.001$) and T3 ($r = -0.160$, $p < 0.001$). A significant negative correlation was found between age and family functioning level at T2 ($r = -0.087$, $p < 0.001$), T3 ($r = -0.109$, $p < 0.001$), and T4 ($r = -0.040$, $p < 0.05$), respectively. Gender was significantly correlated with PYD at T3 ($r = -0.049$, $p < 0.05$).

3.2 Developmental trajectory of PYD

Compared with the linear unconditional LGCM of PYD which reported a relatively poor model fit (see model fit indicators in Table 2) with a BIC value of 22303.496, the nonlinear (quadratic) unconditional LGCM demonstrated a better fit with a smaller BIC of 22116.651 (Δ BIC = 186.85), suggesting a very strong evidence in favor of the model with the lower BIC. Hence, the quadratic unconditional LGCM was used. The parameter estimates are reported in Table 3. Overall, PYD showed a U-shaped developmental trajectory. Figure 1 depicts the average trajectory of PYD over time. Specifically, the means of the intercept of PYD was 5.168, significantly greater than 0 ($p < 0.001$), indicating that students had already developed PYD substantially at the baseline measurement. The means of the linear slope was -0.097 ($p < 0.001$), indicating the instantaneous decreasing trajectory. The means of the quadratic slope was 0.035 ($p < 0.001$), reflecting a U-shape trajectory that decreased firstly and then increased, thus supporting Hypothesis 1.

Moreover, the variance of the intercept ($\sigma^2 = 0.282$, $p < 0.001$), the variance of the slope ($\sigma^2 = 0.141$, $p = 0.006$), and the variance of the quadratic function ($\sigma^2 = 0.027$, $p < 0.001$) were all significantly greater than 0. It suggests significant individual differences in the initial PYD level and the rate of change in PYD. Finally, no significant correlation was found between the intercept and slope ($r = 0.078$, $p = 0.064$). However, the intercept was significantly negatively correlated with the quadratic function ($r = -0.049$, $p < 0.001$). Similarly, the slope was significantly negatively correlated with the quadratic function ($r = -0.059$, $p < 0.001$). The findings indicated that individuals with higher initial PYD levels tend to have decelerated growth over time, as well as individuals with higher linear rates of change tend to have decelerated growth over time (see Figure 2).

3.3 Gender difference in PYD trajectory

Conditional nonlinear LGCM, as displayed in Figure 3, adjusted for the time-invariant covariate of gender and demonstrated a good model fit as shown in Table 2 (Model 2). As reported in Table 4, the

TABLE 2 Model fit indices of latent growth curve models.

Model	Chi-square	df	CFI	TLI	RMSEA	SRMR	BIC
Model 1 ^a							
Linear	250.834	5	0.865	0.838	0.138	0.141	22303.496
Nonlinear	32.550	1	0.983	0.896	0.080	0.020	22116.651
Model 2 ^b	32.724	2	0.983	0.916	0.077	0.018	22122.238
Model 3 ^c	213.358	12	0.964	0.891	0.080	0.047	41089.325

^aUnconditional latent growth curve model (LGCM).
^bConditional nonlinear LGCM with gender as a time-invariant covariate.
^cParallel processing LGCM with gender as covariate.
CFI, Comparative Fit Index; TLI, Tucker-Lewis Index; RMSEA, Root Mean Square Error of Approximation; SRMR, Standardized Root Mean Square Residual; BIC, Bayesian Information Criterion.

TABLE 3 Results of unconditional non-linear LGCM.

	Estimate	SE	p
S WITH I	0.078	0.073	0.064
Q WITH I	−0.049	0.011	<0.001
Q WITH S	−0.059	0.014	<0.001
Means			
I	5.168	0.014	<0.001
S	−0.097	0.018	<0.001
Q	0.035	0.006	<0.001
Variances			
I	0.282	0.037	<0.001
S	0.141	0.051	0.006
Q	0.027	0.004	<0.001

I, Intercept; S, Slope; Q, Quadratic. Bold values indicate statistical significance.

model results indicate no significant gender difference in the initial PYD levels ($\beta_{\text{intercept}} = 0.048, p = 0.085$). However, the linear slope ($\beta_{\text{slope}} = -0.140, p < 0.001$) and the quadratic slope ($\beta_{\text{quadratic}} = 0.040, p = 0.001$) were significantly influenced by gender. The findings suggested that compared to boys, girls decreased at a slower rate and changed more steeply over time (i.e., accelerated faster). These findings partially supported Hypothesis 2a and Hypothesis 2b.

3.4 Joint development of PYD and family functioning

A parallel processing LGCM with gender as a covariate was further tested (see Figure 4), which provided a relatively acceptable model fit (refer to Table 2, Model 3). As presented in Table 5, after accounting for gender, the intercept of family functioning positively predicted the intercept of PYD ($\beta = 0.423, p < 0.001$), suggesting that better initial family functioning is associated with higher initial PYD levels. Secondly, the intercept of family functioning positively predicted the slope of PYD ($\beta = 0.805, p < 0.001$), indicating that better initial family functioning leads to a faster positive change in PYD. Thirdly, the slope of family functioning positively predicted the intercept of PYD ($\beta = 0.783, p < 0.001$), implying that a faster positive change in family functioning corresponds to higher initial PYD levels. Then, the slope of family functioning negatively affected the slope of

PYD ($\beta = -0.200, p < 0.001$), indicating that a faster negative change in family functioning results in a slower rate of change in PYD. Finally, the intercept of family functioning significantly negatively affected the quadratic of PYD ($\beta = -0.322, p < 0.001$), indicating that worse initial family functioning increases the likelihood of accelerated negative change in PYD. Taken together, Hypothesis 3 was substantiated.

4 Discussion

In this study, we examined the trajectory of PYD in preadolescence and adolescence in China and investigated gender differences in the initial levels as well as changes in the developmental trajectory of PYD over time among the participants. Additionally, the study explored the longitudinal parallel change patterns over time between PYD trajectory and family functioning among these Chinese preadolescents and adolescents. Three models were conducted within the LGCM framework to test our three hypotheses. Firstly, utilizing 4-wave data, an unconditional LGCM was employed to assess the univariate growth curve of PYD, revealing a nonlinear U-shaped trajectory with an initial decline followed by an increase. Secondly, a conditional LGCM, adjusting for the time-invariant covariate of gender, was conducted to examine gender differences in initial PYD and the rate of change in the trajectory of PYD over time. The results indicated no significant gender difference in PYD at the baseline. However, girls showed a steeper positive growth in PYD and a slower decline rate in PYD over time as compared with boys. Thirdly, a parallel processing LGCM with gender as a covariate was utilized to evaluate the association between the developmental trajectory of PYD and family functioning over time. Our findings suggested that the initial level of family functioning positively predicted the initial level of PYD and its rate of positive change over time. These findings will be further discussed in detail in the subsequent sections.

Confirming Hypothesis 1 and aligning with prior research conducted on Chinese adolescent populations in Hong Kong (e.g., Shek and Lin, 2017), the overall developmental trajectory of PYD in Chinese preadolescents and adolescents did not exhibit a relatively stable upward or downward trend but rather displayed a fluctuating quadratic U-shaped curve, marked by a decline from T2 to T3 followed by a significant rise. This developmental trajectory suggests that these young individuals may have encountered turbulence in their developmental journey. The study spanned from January 2020 to June 2022, during which students experienced the outbreak of the COVID-19 pandemic, periods of home isolation, interruptions in

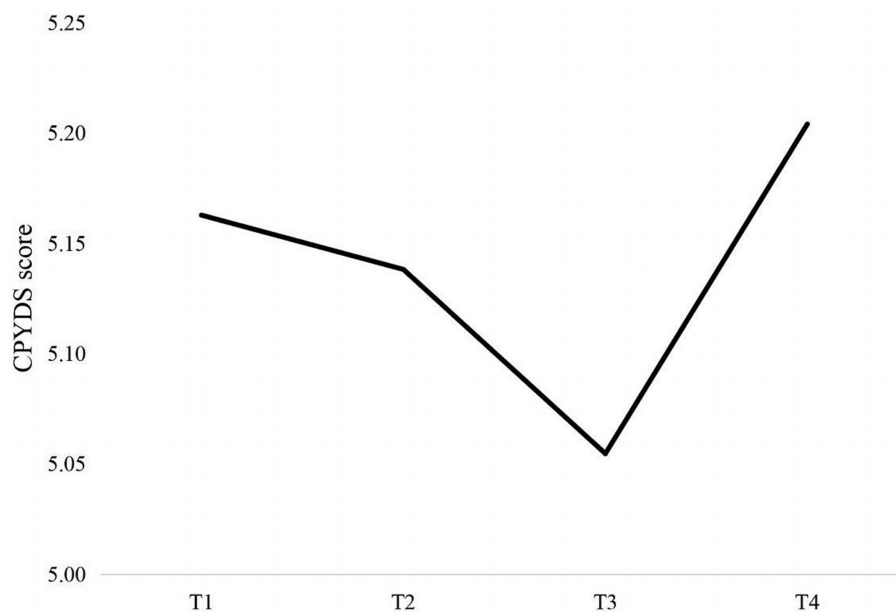


FIGURE 1

Developmental trajectory of Positive Youth Development (PYD) across 4 waves. T1 = Time 1; T2 = Time 2; T3 = Time 3; T4 = Time 4.

school activities, and subsequent resumptions. The multifaceted challenges and adaptive demands stemming from this series of significant life events likely contributed to the sustained decline in PYD observed from the initial phase (January 2020) to T3 (June 2021), with a particularly pronounced drop between T2 (June 2020) and T3 (June 2021). Earlier research has documented the enduring impact of the pandemic on young individuals (Shek et al., 2022a), even post-lockdown and resumption of activities (Shek et al., 2021). As noted recently by Shek (2024a), the possibility of “post-pandemic stress disorder” as a consequence of the stressors following the pandemic outbreak is easily overlooked. Such trauma and harm may manifest in various forms, with a decline in the construction and quality of PYD being one manifestation (Wang et al., 2023). The return to school and resumption of regular activities may have introduced additional stressors for children (Rashid et al., 2022; Shek, 2024a), thereby adding extra pressure for these young individuals in this developmental phase with limited coping strategies and socio-psychological resources. As daily life and learning gradually resumed over an extended period, students may have eventually overcome these difficulties and challenges through adaptation and resilience, consistent with the assumption of relative plasticity in human development (Lerner, 1996; Belsky and Pluess, 2013).

Besides the contribution of COVID-19 which is transient in nature, the PYD trajectory may also be an intrinsic developmental change in young people. Across samples of Chinese young individuals from different Chinese communities, such as Hong Kong (Shek and Lin, 2017) and mainland China (Chi et al., 2020), similar nonlinear U-shaped trajectories of PYD suggest that young individuals experience comparable turbulent changes during their development. In contrast, adolescents in Western cultural contexts tend to exhibit relatively stable PYD trajectories (e.g., Lewin-Bizan et al., 2010; Schmid et al., 2011). This difference may be related to the relatively high developmental pressures faced by Chinese children and

adolescents. Chinese communities generally place a strong emphasis on academic achievement (Li, 2017), leading to strong expectations for better academic performance at a younger age (Fang et al., 2018). Schools in Chinese communities are also perceived to have stricter discipline and a higher competitive environment (Ang, 2017; Zhou and Kim, 2006). These developmental pressures and challenges may contribute to the initial decline or fluctuation in the PYD trajectories of Chinese young individuals.

Additionally, the results of the quadratic unconditional LGCM also indicated the individual differences in the development of PYD in preadolescents and adolescents. Basically, students exhibited notable variations in their initial levels of PYD and rates of change. Students with higher initial levels and steeper linear growth rates tended to demonstrate a decelerated growth trend in PYD over time. These observations may reflect the possibility of resource constraints that preadolescents and adolescents experience in their PYD development over time. For instance, sustained high levels of functioning may lead to subsequent growth deceleration and resource depletion, as documented in the research literature on human flourishing and well-being (Fredrickson and Losada, 2013). Similarly, developmental theories such as the lifespan perspective (Baltes, 1987) suggest that human growth trajectories typically follow nonlinear patterns, positing that a period of decelerated change often follows a phase of accelerated growth. Consistent with this, prior research has indicated that, overall, PYD development may undergo declines over adolescence (Conway et al., 2015), with different attributes of PYD such as competence, confidence, and connection slowing down or declining over time (Geldhof et al., 2014).

Our findings partially supported our Hypothesis 2, indicating that girls outperformed boys in the development of PYD in adolescent years. Girls demonstrated a slower rate of decrease in PYD and exhibited a steeper positive growth rate of PYD over time, as compared to boys. However, contrary to our prediction, no significant gender

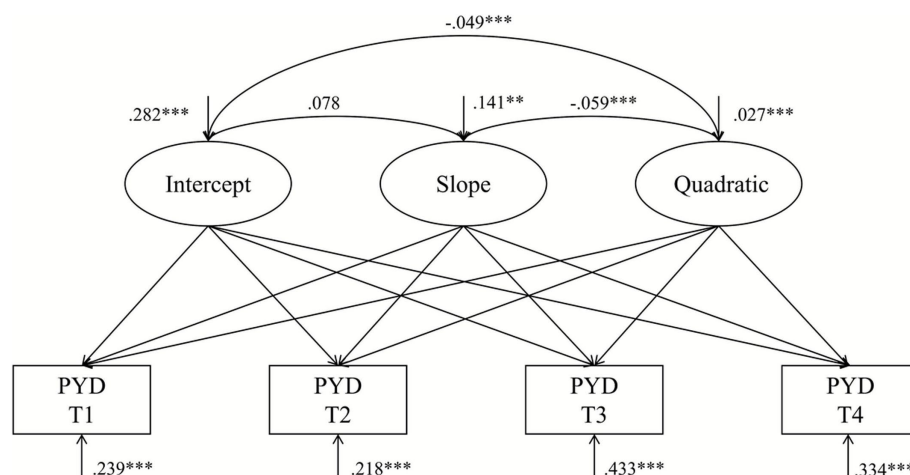


FIGURE 2
Nonlinear unconditional LGCM of Positive Youth Development (PYD). T1 = Time 1; T2 = Time 2; T3 = Time 3; T4 = Time 4; ** $p < 0.01$; *** $p < 0.001$.

difference was found in the initial PYD levels. Previous research suggests that boys and girls may have different developmental advantages in various PYD attributes. For instance, [Shek and Wu \(2014\)](#) observed that girls tend to score higher than boys in terms of pro-social attributes, while boys excel in positive identity and cognitive-behavioral competencies. Female primary school students tend to develop communication skills, empathy, and autonomy experiences earlier than their male counterparts ([Sun and Stewart, 2007](#)). On the other hand, male primary school students are more likely to exhibit stronger positive competence beliefs and greater confidence in subjects such as mathematics and physical activities compared to girls ([Eccles et al., 1993](#)). In this study, we used the overall PYD score to represent the students' general PYD characteristics without exploring individual PYD attributes separately. Therefore, it is possible that boys and girls may differ in the initial levels of specific PYD attributes. Another possibility is the "One-Child Policy" in China, which suggests that boys and girls may receive similar family input, hence resulting in similar PYD attributes.

Nonetheless, our findings indicate that girls exhibit a more positive PYD developmental trajectory during preadolescence and adolescence, characterized by a slower decline and a more pronounced positive growth trend. During childhood and adolescence, girls may exhibit greater adaptability and developmental capacity across different dimensions of abilities compared to males ([Juraska, 1986](#)). Conversely, boys often exhibit greater vulnerability in their developmental journey compared to girls. They may struggle more to effectively cope with significant stressors during childhood, rendering them more susceptible to developmental challenges, while females appear to demonstrate more resilience in adverse and extreme circumstances. Previous work by [Shek and Zhu \(2020\)](#) provided indirect supporting evidence. Following a longitudinal investigation involving eight waves of data collection on Hong Kong adolescents, they found that interventions aimed at promoting PYD had a more pronounced effect on girls, with the upward trend in PYD manifesting earlier in females compared to their male counterparts. In contrast, boys appeared to require more time to respond to these PYD-promoting interventions and exhibit growth in PYD.

For Hypothesis 3, aligned with our prediction, this study substantiated the reciprocal influence between family functioning and the developmental trajectory of PYD over time, thereby exhibiting a parallel common trend of change longitudinally. After adjustment for gender, it was observed that the initial family functioning positively predicted both the initial level and subsequent rate of change in PYD. Specifically, better initial family functioning was associated with a higher initial PYD level and a faster growth rate in PYD. In other words, entering preadolescence, children in functional, harmonious, and supportive family environments not only commence with higher levels of development at the outset, but they are also more likely to demonstrate faster growth during subsequent development. These observations echo the findings from prior research within the Chinese cultural context where healthy family functioning has been linked to enhanced well-being in children, contributing to positive outcomes such as increased resilience and life satisfaction among young individuals ([Dou et al., 2023](#)). According to ecological systems theory, the family environment serves as the most direct and influential external context that shapes children's overall growth and well-being during childhood and early adolescence ([Bronfenbrenner, 2000](#)). Our findings suggest that the family environment, including its static features (harmonious atmosphere) and dynamic features (mutuality and stable family structure), has direct and subsequent developmental implications for PYD during preadolescence and adolescence.

The present findings regarding a parallel change pattern between family functioning and PYD trajectory are noteworthy in a Chinese context. On one hand, the traditional Confucian ideology and the predominant familism within Chinese communities emphasize the importance of family harmony. This value system may to some extent promote changes in parental behaviors and interactions aimed at avoiding family conflicts, thereby fostering a more harmonious family environment for Chinese children. Concurrently, however, the strong emphasis on respect for elders and filial piety within Confucian culture may contribute to authoritarian parenting practices and excessively strict parenting styles among Chinese parents. Based on the observations of [Qin et al. \(2009\)](#), Chinese parents are less likely than parents from Western cultural backgrounds to reduce their control as their children enter preadolescence. In such a family environment with

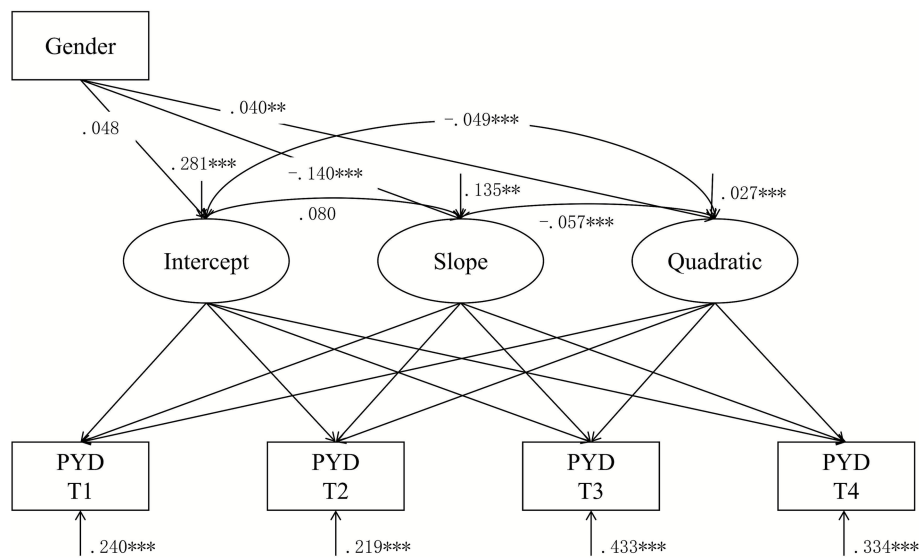


FIGURE 3
Time-invariant covariate LGCM of Positive Youth Development (PYD). Estimates indicate girls. Gender (0 = male, 1 = female); T1 = Time 1; T2 = Time 2; T3 = Time 3; T4 = Time 4; ** $p < 0.01$; *** $p < 0.001$.

TABLE 4 Results of conditional non-linear LGCM with gender as a time-invariant covariate.

	Estimate	SE	p
Gender ^a →I	0.048	0.028	0.085
Gender ^a →S	−0.140	0.036	<0.001
Gender ^a →Q	0.040	0.012	0.001
S WITH I	0.080	0.043	0.065
Q WITH I	−0.049	0.011	<0.001
Q WITH S	−0.057	0.013	<0.001

^aGender (0 = male, 1 = female); I, Intercept; S, Slope; Q, Quadratic. Bold values indicate statistical significance.

higher levels of parental control, children are less likely to openly express themselves (Dou et al., 2020). Our research findings support the scholars' viewpoint that children in Chinese families may benefit from reduced parental control and increased autonomy when it is more normative in contemporary families (Qin et al., 2009). Furthermore, child-centered Chinese families commonly prioritize the future success of their children as a central educational goal. As observed in the research by Leung and Shek (2013), expectations regarding children's future prospects were dominant factors in Chinese parenting styles and family functioning. This lack of supportive family environments, characterized by high levels of parental control and overly stringent parenting styles, led to higher levels of compliance among children from Chinese families, thereby compromising their autonomy acquisition (Huang and Lamb, 2014). This may further impede their development in various areas such as creativity and critical thinking. Autonomy has been identified as a core driving force and key trait for children's creativity and nonconformity (Kirsch et al., 2015; Wang and Dong, 2019) and is considered one of the fundamental psychological needs of humans according to Self-Determination Theory (SDT; Ryan and Deci, 2000). SDT emphasizes that the fulfillment of children's

autonomy needs is a foundational element for their future positive development and well-being. It asserts that parental autonomy support, specifically addressing the needs for autonomy, plays a pivotal role in promoting children's intrinsic motivation, adaptability, sense of volition, and broad positive developmental outcomes, including enhanced academic performance, social competence, self-regulation, and psychological well-being (Joussemet et al., 2008; Soenens and Vansteenkiste, 2010).

4.1 Theoretical and practical implications

Theoretically, this study supports the thesis that a supportive family environment is a protective factor contributing to positive and beneficial trajectories in PYD during preadolescence and adolescence. At the macro-environmental level, through four longitudinal surveys conducted on Chinese preadolescents and adolescents before, during, and after the pandemic, the study identifies fluctuating PYD developmental trajectories exhibited by students within this turbulent context. Simultaneously, at the micro-environmental level, the research elucidates the dynamic relationship between family functioning and PYD development over time. The contrasting changes in levels of family functioning and PYD trajectory among young individuals underscore the direct impact of supportive family environment on the positive developmental outcomes in young individuals. Overall, these findings collectively indicate that a supportive environment system, encompassing both macro and micro levels, can directly influence the direction and outcomes of young individuals' subsequent developmental trajectories during preadolescence and adolescence, thereby supporting the notion in PYD models that the occurrence of adaptive individual-environmental developmental patterns serves as a crucial catalyst for positive underage development. Theoretically, there are several insights. First, the study challenges the common belief that adolescents will become

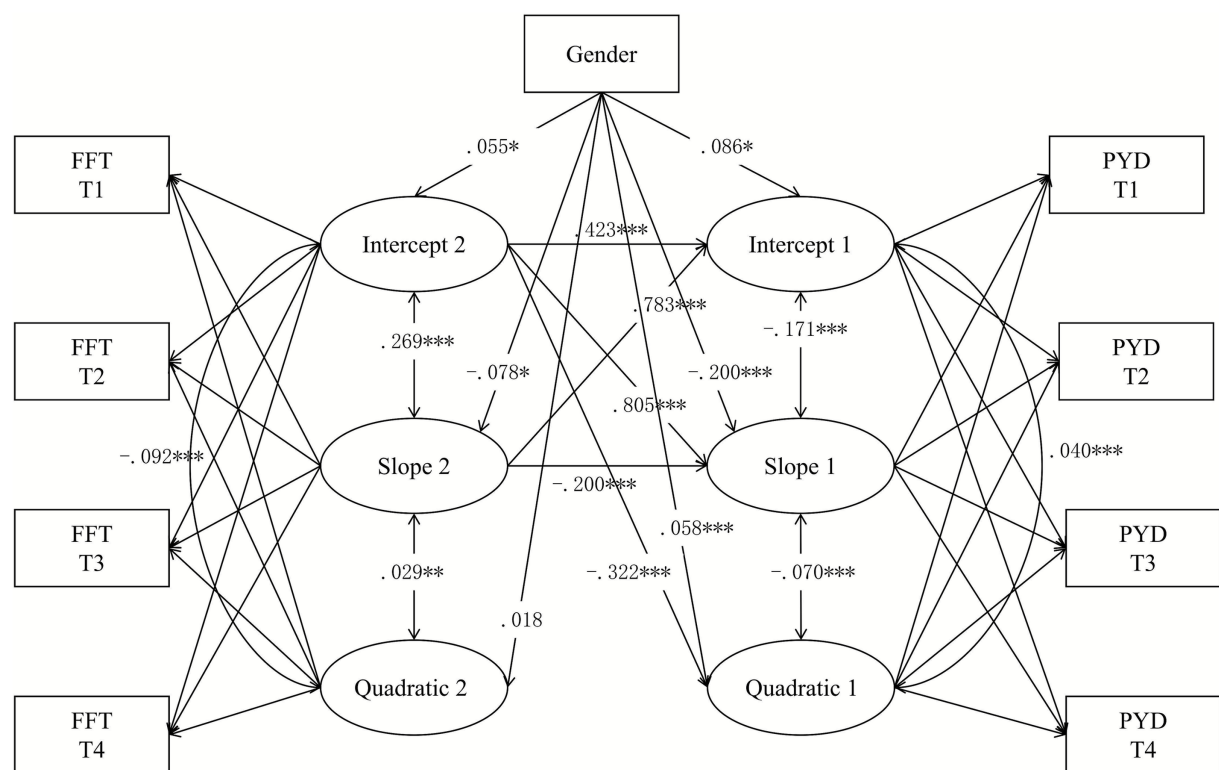


FIGURE 4
Parallel processing LGCM of Positive Youth Development (PYD) and Family Dysfunctioning (FFT). T1 = Time 1; T2 = Time 2; T3 = Time 3; T4 = Time 4;
*p < 0.05; **p < 0.01; ***p < 0.001.

TABLE 5 Results of parallel processing LGCM with gender as covariate.

	Estimate	SE	p
I2→I1	0.423	0.058	<0.001
S2→I1	0.783	0.038	<0.001
I2→S1	0.805	0.065	<0.001
S2→S1	−0.200	0.016	<0.001
I2→Q1	−0.322	0.020	<0.001
Gender ^a →I1	0.086	0.034	0.012
Gender ^a →S1	−0.200	0.046	<0.001
Gender ^a →Q1	0.058	0.014	<0.001
Gender ^a →I2	0.055	0.027	0.040
Gender ^a →S2	−0.078	0.034	0.021
Gender ^a →Q2	0.018	0.011	0.108
I2 WITH S2	0.269	0.014	<0.001
I2 WITH Q2	−0.092	0.004	<0.001
S2 WITH Q2	0.029	0.009	0.001
S1 WITH I1	−0.171	0.039	<0.001
Q1 WITH I1	0.040	0.010	<0.001
Q1 WITH S1	−0.070	0.013	<0.001
Q2 WITH I1	0.003	0.002	0.048
Q2 WITH S1	−0.008	0.002	<0.001
Q2 WITH Q1	0.005	0.001	<0.001

^aGender (0 = male, 1 = female); 1, Positive Youth Development; 2, Family Functioning; I, Intercept; S, Slope; Q, Quadratic. Bold values indicate statistical significance.

fine when they grow, assuming that adolescents will become more mature and stable when they study in high school. Second, the drop in PYD attributes with an increase in age suggests that the higher primary school and early junior years are “high-risk” years. As preadolescence is commonly ignored in the scientific literature (Bulimwengu and Cartmel, 2022), the present study suggests the need to construct more refined theoretical models on late childhood and early adolescence.

Practically speaking, the results of this study highlight the plasticity and resilience of preadolescents and adolescents. The upward trajectory in PYD development over time suggests the potential for growth even in the face of initial maladjustment. Conversely, the decline in PYD development experienced by these young individuals underscores the necessity for additional efforts and timely interventions in nurturing competencies when external environments might pose challenges. Thus, in this regard, the study also emphasizes the benefits of family-based interventions in promoting positive development within the Chinese cultural context. Presently in China, family-centered social service systems such as family counseling remain underdeveloped and not widely accessible. In such circumstances, establishing a network of connections between schools, teachers, and student families is crucial. Moreover, targeted interventions tailored to the unique circumstances of different family structures may characterize this network originating from child-family units. In addition to family services, school-based positive youth development programs that focus on enhancing family bonds can also contribute to strengthening PYD attributes in young individuals (Shek, 2024b; Shek and Dou, 2024).

Furthermore, specific programs or interventions can be designed and developed to ensure synchronized development for children of varying genders. Tailored interventions designed for boys may better address boys' developmental needs in PYD-related competencies. Additionally, students who initially exhibit higher levels of competence should not be overlooked as being in a "safe zone" of positive development. Ongoing targeted interventions could potentially bridge any developmental slowdown these young people might encounter later on. As [Shek et al. \(2023\)](#) argued, nurturance of individual, family and community resilience is important to help young people adapt to adversities such as the COVID-19 pandemic.

4.2 Limitations

Several limitations exist within this study. Firstly, the participants in this research were primarily concentrated in Chengdu City, thus the developmental environments of these students may differ from those of peers in other regions of China, such as rural areas or relatively underdeveloped cities. Consequently, the findings of this study may not be generalizable to a broader young group across different regions in China. Future efforts should aim to capture PYD developmental trajectories in diverse groups of Chinese preadolescents to better comprehend the impact and characteristics of environmental diversity on their PYD constructs and competence development. Moreover, our longitudinal surveys relied on self-reports from students, potentially introducing bias into the results. To more comprehensively capture children's PYD developmental trajectories and the longitudinal dynamic relationship with family functioning, involving parents and teachers in the assessments would be beneficial. Additionally, utilizing multiple investigative strategies, such as combining self-reports with classroom observations and home visits, could offer a multi-faceted understanding of the dynamic relationship between PYD and family functioning.

5 Conclusion

By conducting four waves of surveys on preadolescents and adolescents from China, this study examined the longitudinal developmental trajectories of PYD from preadolescence to adolescence, tested gender differences in these trajectories and the rate of PYD changes, and explored the concurrent changes and relationships between PYD development trajectories and family functioning among these young individuals over time. Utilizing an unconditional LGCM, the PYD developmental trajectories of the participants exhibited a quadratic U-shaped curve characteristic with an initial decline followed by a rebound. According to the time-invariant covariate LGCM, gender differences were observed in change rates of PYD, with girls showing a slower decline rate as well as a faster growth rate in PYD over time. No gender difference was observed in the initial level of PYD. Based on the parallel LGCM, PYD changed in parallel with family functioning. The initial levels of family functioning were positively correlated with the initial level and growth rates of PYD. This study highlights the significance of paying attention to the impact of family functioning in fostering positive development

processes among preadolescents and adolescents in the Chinese context.

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 humans were reviewed and approved by the Institutional Review Board (IRB) at Sichuan University. The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation in this study was provided by the participants' legal guardians/next of kin.

Author contributions

XL: Writing – review & editing, Formal analysis. Y-TT: Writing – original draft, Formal analysis. DS: Writing – review & editing, Supervision, Methodology, Investigation, Funding acquisition, Conceptualization.

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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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Martijn Burger,
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REVIEWED BY

Yiting Tang,
Hong Kong Polytechnic University, Hong
Kong SAR, China
Hazhira Qudsy,
Islamic University of Indonesia, Indonesia

*CORRESPONDENCE

Lei Hum Wee
✉ lei.hum.wee@taylorsof.edu.my

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Psychological well-being and its associated factors among university students in Sichuan, China

Juan Wan^{1,2}, Lei Hum Wee^{2,3,4*}, Ching Sin Siau² and
Yin How Wong^{3,4}

¹School of Software Engineering, Chengdu University of Information Technology, Chengdu, China,

²Centre for Community Health Studies, Faculty of Health Sciences, Universiti Kebangsaan Malaysia, Kuala Lumpur, Malaysia, ³School of Medicine, Faculty of Health and Medical Sciences, Taylor's University, Subang Jaya, Selangor Darul Ehsan, Malaysia, ⁴Digital Health and Medical Advancement Impact Lab, Taylor's University, Subang Jaya, Selangor Darul Ehsan, Malaysia

Introduction: Psychological well-being refers to a mental state that allows an individual to achieve their full potential, be productive and innovative in their work, and manage everyday stressors. This study aims to assess university students' psychological well-being by examining its associations with demographic factors such as gender, only child status, family background, grade level, financial aid status, and household income.

Methods: This cross-sectional, online study utilized the EPOCH Measure of Adolescent Well-being to examine five positive well-being indicators: Engagement, Perseverance, Optimism, Connectedness and Happiness among Chinese university students aged 18–25 years ($N = 4,911$).

Results: The results showed that females, only children, first-year students, and urban students exhibited higher levels of psychological well-being. Additionally, students who received the highest level of financial assistance were significantly associated with lower levels of psychological well-being.

Conclusion: Identifying the influence of these socioeconomic factors on psychological well-being allows for targeted interventions to improve the mental health and social well-being of at-risk groups.

KEYWORDS

psychological well-being, positive psychology, university students, EPOCH, China

1 Introduction

Mental health, including emotional, psychological, and social well-being, is vital at every life stage (World Health Organization, 2022; Dattani et al., 2023; Mental Health, 2024). Well-being, as defined by Huppert (2009) and echoed by Diener et al. (2009), Ryan and Deci (2001), and Tov (2018), is the experience of health, happiness, and prosperity. It includes good mental health, high life satisfaction, a sense of purpose, and stress management (Davis, 2019), encompassing both hedonia (subjective well-being) and eudaimonia (psychological well-being). This aligns with Healthy People 2030's definition of overall life satisfaction, reflecting both health and non-health factors (Office of Disease Prevention and Health Promotion, 2020).

Psychological well-being (PWB) is a multifaceted concept that encompasses aspects of positive functioning, self-realization, and the ability to face life's challenges (Ryff, 1989). Various models have been proposed to explain this, such as Ryff (1989), Antonovsky (1979), Deci and

Ryan (2008), and Seligman's (2011) PERMA model of well-being in positive psychology. Seligman's (2011) PERMA model in positive psychology suggests that psychological well-being is enhanced through fostering Positive emotions, Engagement, Relationships, Meaning, and Accomplishment. Kern et al. (2016) developed the EPOCH model, a framework for optimal adolescent functioning that aligns with Seligman's PERMA model. It identifies five traits that support adult flourishing: Engagement, Perseverance, Optimism, Connectedness, and Happiness.

Emerging adulthood is crucial for students to gain autonomy from parents (Sussman and Arnett, 2014) and explore opportunities on campus, laying the foundation for full social integration post-graduation (Porru et al., 2022). The five factors of the EPOCH model are believed to support well-being in adulthood, aligning with the PERMA model's key elements (Kern et al., 2016).

Studies across various countries, including the US, Australia, China, Iran, and Indonesia, support the cross-cultural invariance and equivalence of the EPOCH measure, though further validation and extension to diverse adolescent groups are needed (Kern et al., 2016; Kern et al., 2019; Setyandari, 2019; Taheri et al., 2021; Zeng and Kern, 2019). University students, as a distinct age group and social role in transition from adolescence to adulthood, face a myriad of unique challenges. Research conducted in Thailand has delved into the application of the EPOCH measure among college students (Rhein and Nanni, 2022).

University students have the potential to make significant societal contributions, and public awareness of their mental health issues is rising (Chen, 2024). However, anxiety, stress, depression, and challenging living circumstances remain significant barriers to students' well-being. The reports of mental health issue among students have been increasing globally (Orygen, 2023; Youth Insight, 2023). According to the report from the Healthy Minds Network (HMS) for 2022–2023, 36% of surveyed students indicated receiving counseling or therapy. In China, the prevalence of anxiety, depression, sleep problems, and suicide attempts among college students has significantly increased over the past decade (Chen et al., 2022).

Studies suggest a global decline in student well-being at universities (Riva et al., 2020). Cross-cultural research examining happiness among college students from 24 countries reported that students from Southeast Asia (including China) had lower levels of happiness when compared to students from South America, sub-Saharan Africa, and the Caribbean (Peltzer et al., 2017). Additionally, research indicates that mental health tends to worsen after students enter college, with college students generally reporting worse mental health than non-students (Worsley et al., 2022). However, research focusing specifically on Chinese students' well-being remains insufficient (Dobosz and Hetmańczyk, 2023).

There have been many one-child births in China since the enactment of the policy in 1980. As the birth rate declines, there will be a substantial number of families with only one child (National Bureau of Statistics of the People's Republic of China, 2023a). Non-only children face challenges in terms of having less access to material educational resources and parenting styles that are conducive to their skill development, compared to only children (Li et al., 2024). Previous studies have increasingly suggested that the well-being of rural children was affected by the impact of parental absence (Zhao and Yu, 2016), family economic status (Wen and Lin, 2012), and neighborhood environment (Zhao et al., 2017).

Financial stress is the cause of mental health deterioration, which results in poor academic performance, academic dishonesty, in addition

to mental disorders such as anxiety, depression and Burnout Syndrome (Pokhrel et al., 2020). China's student financial assistance system, funded by the government and supplemented by schools and society, supports needy students and rewards high achievers. Aid is provided in tiers to address varying needs through a well-structured mechanism (State Council of the People's Republic of China, 2022). In this study, financial assistance is categorized into four classes: the first targeting specific vulnerable groups, the second for poorer families not in the first category, the third covering general poor families, and none for families receiving no assistance (State Council of the People's Republic of China, 2018).

Addressing these challenges requires culturally tailored approaches to support students' well-being, recognizing variations in psychological well-being across cultures. Studies suggest that while Western cultures often define well-being through positive affectivity, hedonic balance, and individualistic traits like autonomy and self-esteem (Joshlanloo, 2014), Eastern cultures, including China, emphasize moral values, contentment, harmony, and spiritual fulfillment (Suh and Choi, 2018; Wirtz et al., 2009). This cultural distinction underscores the necessity of designing psychological well-being interventions that are both evidence-based and culturally appropriate. Demographic and socio-economic characteristics are important determinants of youth development and can be located in the exosystem (Gomez-Baya et al., 2023). The literature on the effects of socio-demographics on psychological well-being in university students has indicated differences by gender and cultural background, place of residence and neighborhood and family status (Zeng and Kern, 2019; Miles et al., 2020). China's population size and geography present tremendous challenges and opportunities to improve the mental well-being of whole populations (Ni et al., 2020).

Kern et al. (2016) suggested five positive psychological characteristics in EPOCH model that support positive youth development. Moreover, most existing research was conducted with adolescent samples worldwide (Zeng and Kern, 2019; Taheri et al., 2021; Maurer et al., 2021; Setyandari, 2019; Rhein and Nanni, 2022), meaning that more research is needed with emerging adults in China. Addressing these issues in the Chinese context will ensure that all students have the resources and support they need to thrive both academically and personally. Thus, comprehending their level of psychological well-being and its associated factors is pivotal for fostering their mental health and holistic development.

In this study, we aimed to investigate the level of psychological well-being and its associations with demographic factors among Chinese undergraduate students, specifically gender, grade, poverty level, and locality. Within China's unique socio-cultural and economic context, factors such as rural–urban divides, financial strain, and the legacy of the one-child policy are particularly relevant to understanding students' well-being. Additionally, the disparities in educational resources and financial aid across regions further highlight the need to explore these demographic influences. This study seeks to provide culturally relevant insights to inform targeted interventions that promote the well-being of Chinese university students.

2 Materials and methods

2.1 Study design

Considering the time constraints and limited resources, we adopted a convenience sampling method to efficiently gather

data from undergraduate students at our university between January and May 2024. The survey was conducted on the WJX online platform, leveraging students' high digital engagement and aligning with current trends in online data collection (Lefever et al., 2007; Couper, 2017). Recruitment was facilitated through multiple official channels, including public elective courses, the university's WeChat account ("Boya Xinyu"), counselor studio QQ groups, class meetings, and campus events. After providing informed consent online, participants completed the questionnaire anonymously on the platform. This approach ensured both the integrity of the data and the privacy of the participants, as no personally identifiable information was collected.

The sample size was large ($N = 4,911$) and represented diverse demographic and socioeconomic backgrounds, aligning closely with national data on gender distribution in higher education (National Bureau of Statistics of the People's Republic of China, 2023b). The rural–urban distribution also reflected broader trends, highlighting increased access to higher education for rural students despite national urban residency rates (National Bureau of Statistics of the People's Republic of China, 2021). This large sample enhances the reliability and generalizability of the findings, capturing the demographic diversity of Chinese university students.

2.2 Instruments

The demographic information of the participants, including the year of study, gender, only child status, locality, financial aid status and domestic average income, was recorded.

The EPOCH Measure of Adolescent Well-being, available in both English (Kern et al., 2016) and Chinese (Zeng and Kern, 2019) was used in this study. It has previously demonstrated good internal consistency across all its subscales, with Cronbach's α values ranging from 0.78 to 0.89. All participants responded to the 20-item EPOCH, which contains subscales of Engagement (e.g., 'I get completely absorbed in what I am doing'), Perseverance (e.g., 'I finish whatever I begin'), Optimism (e.g., 'I think good things are going to happen to me'), Connectedness (e.g., 'When I have a problem, I have someone who will be there for me') and Happiness (e.g., 'I love life'). Each item is rated on a 5-point Likert scale ranging from 1 'Almost never' to 5 'Almost always', reflecting how frequently the participants experience for each aspect of well-being. These dimensions collectively provide a comprehensive assessment of positive psychological functioning and well-being in adolescents.

2.3 Participants

Data were collected from university students at Chengdu University of Information Technology, with 4,911 out of a total of 25,000 students (19.6%). The inclusion criteria for participants in this study are Chinese nationality, university students aged between 18 and 25 years, and full-time enrollment at the university during the study. Participants were excluded if they were part-time students, international students, or not enrolled as students, as they either had a relatively small presence at the university or were unable to commit to the entire duration of the survey.

Ethical considerations were addressed by ensuring anonymity, avoiding identifiable data, and obtaining electronic informed consent with clear communication of participants' rights. All students completed the questionnaire anonymously, ensuring data integrity and respect for privacy.

2.4 Data analysis

Descriptive statistics were used to compute means, standard deviations, frequencies, and percentages. Independent sample t-tests and analysis of variance were employed to assess the statistical significance of differences between groups, and multiple linear regression analysis was used to explore the complex interactions between variables. IBM SPSS for Mac (version 26.0) was used to analyze the data.

3 Results

3.1 Description of the EPOCH scale

Compared with previous studies, the Cronbach's alpha value obtained in this study is relatively high (Cronbach's $\alpha = 0.952$). Specifically, in previous studies, the Indonesian version (Simanjuntak et al., 2023) had a Cronbach's alpha value of 0.889, and the Swedish version (Maurer et al., 2021) had a Cronbach's alpha value of 0.91. The subscales had acceptable reliability: Engagement ($\alpha = 0.873$), Perseverance ($\alpha = 0.822$), Optimism ($\alpha = 0.838$), Connectedness ($\alpha = 0.846$), and the strongest one was Happiness ($\alpha = 0.917$).

In the research sample, males accounted for more than half, reaching 55.40% ($n = 2,721$). The proportion of only children was less than half, at 37.70% ($n = 1,849$). Over 60% of the students came from rural areas, accounting for 60.30% ($n = 2,963$) of the total. Nearly half of the students were first-year students, accounting for 48.80% ($n = 2,398$), while students in the third year or higher accounted for less than one-fifth, at 20.90% ($n = 1,024$). Only 8.20% ($n = 404$) of students received first-class assistance, while more than 60%, specifically 66.80% ($n = 3,281$), did not receive any financial assistance at all. Nearly half of the students were from lower-income families, representing 47.60% ($n = 2,338$) (see Figure 1).

The study found significant differences between males and females, with males (3.32 ± 0.76) scoring significantly lower than females (3.47 ± 0.70) on the EPOCH total score. Only children (3.45 ± 0.76) had significantly higher EPOCH total score compared to non-only children (3.35 ± 0.73), and this trend was consistent across all five dimensions. Additionally, urban students (3.47 ± 0.74) scored significantly higher than rural students (3.33 ± 0.73) on the overall EPOCH dimension.

First-year students had the highest EPOCH total score (3.50 ± 0.73) compared to other academic years. Students receiving higher levels of financial assistance exhibited poorer performance on various psychological indicators, although not all differences were statistically significant. Those receiving financial assistance had significantly lower scores in Happiness (3.29 ± 0.95) and overall EPOCH total score (3.29 ± 0.70) compared to students without

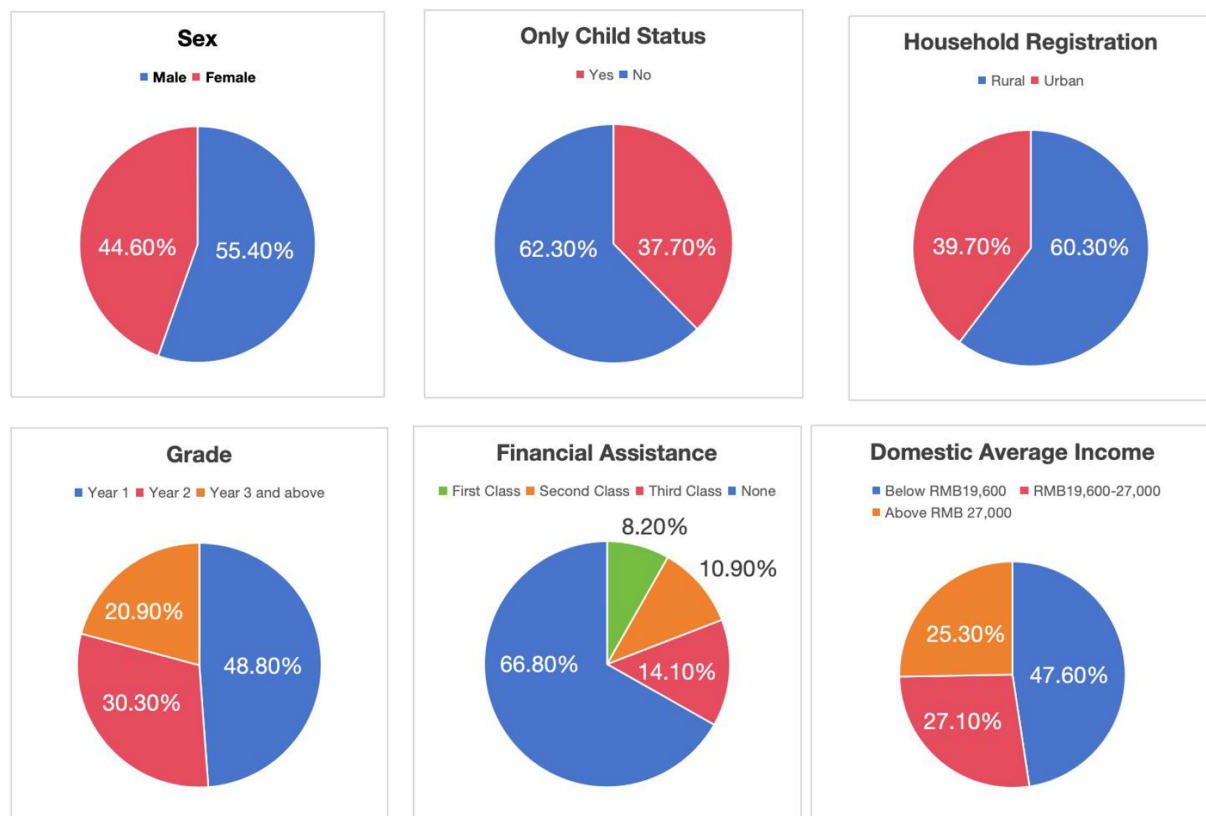


FIGURE 1
Demographic characteristics of the participants (N = 4,911).

financial assistance. Students from lower-income families had significantly lower scores in overall EPOCH total score (3.29 ± 0.76) compared to other groups (see Table 1).

3.2 Multiple linear regression analysis using the EPOCH scale across different groups

Family economic status was measured using the financial assistance category, as it reflects institutional assessments of students' financial circumstances based on standardized criteria. This approach avoided multicollinearity with domestic average income, ensuring model clarity and stability in the regression analysis.

The results of the multiple regression analysis identified several significant predictors of psychological well-being. Domestic average income was not entered into the model due to multicollinearity with financial assistance. Only child status was positively associated with higher scores in the Connectedness dimension ($B = 0.10$, 95% CI [0.05, 0.15], $p < 0.001$). Additionally, being a first-year student was positively correlated with higher levels of psychological well-being ($B = 0.10$, 95% CI [0.11, 0.21], $p < 0.001$). Conversely, males were found to have lower levels of psychological well-being ($B = -0.14$, 95% CI [-0.18, -0.10], $p < 0.001$). Similarly, students from rural areas ($B = -0.09$, 95% CI [-0.13, -0.04], $p < 0.001$) and students receiving first-class financial assistance ($B = -0.08$, 95% CI [-0.16, -0.01], $p < 0.01$) also demonstrated lower levels of psychological well-being (see Table 2).

4 Discussion

In this study, we explored the psychological well-being of Chinese university students by analyzing the correlation between the EPOCH Measure of Adolescent Well-being and their demographic characteristics. We found that being female, an only child, an urban student, and in the first grade predicted higher overall well-being among university students.

The results indicate that male students had significantly lower total EPOCH scores, which corresponds to previous research findings that girls in China reported higher psychological well-being than boys (Chen et al., 2009; Liu and Zhao, 2016; Wong et al., 2009; Geng and He, 2022). Both Western and Eastern scholars have noted that Confucianism, a prevalent cultural heritage in East Asia, regards men as the mainstay of social order and family, while women are primarily viewed as caregivers and mothers (Hamilton, 1990; Qing, 2020).

This aspect of traditional Chinese culture influences societal values, shaping parental expectations that male students should be future providers and achieve career success, thereby creating significant pressure and restricting their emotional expression despite experiencing emotions as intensely as women (Heesacker et al., 1999; Kiselica, 2005; Wester et al., 2002). This could affect their ability to express emotions and establish supportive relationships, which may further impact their scores in terms of psychological well-being.

TABLE 1 Score of different domains in EPOCH scale according to demographic groups.

Variable	Total	Engagement	Perseverance	Optimism	Connectedness	Happiness	EPOCH (total)
	Frequency (n), Percentage (%)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Sex							
Male	2721 (55.40)	3.30 (0.84)	3.24 (0.82)	3.26 (0.90)	3.45 (0.86)	3.34 (0.92)	3.32 (0.76)
Female	2190 (44.60)	3.32 (0.79)	3.24 (0.80)	3.40 (0.87)	3.84 (0.82)	3.55 (0.86)	3.47 (0.70)
P-value	-	0.657	0.941	< 0.001	< 0.001	< 0.001	< 0.001
Only child status							
Yes	1849 (37.70)	3.36 (0.85)	3.29 (0.83)	3.40 (0.91)	3.71 (0.87)	3.49 (0.91)	3.45 (0.76)
No	3062 (62.30)	3.28 (0.80)	3.21 (0.79)	3.28 (0.88)	3.57 (0.86)	3.39 (0.89)	3.35 (0.73)
P-value	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Household registration							
Rural	2963 (60.30)	3.27 (0.81)	3.20 (0.79)	3.26 (0.88)	3.55 (0.86)	3.38 (0.88)	3.33 (0.73)
Urban	1948 (39.70)	3.37 (0.83)	3.29 (0.83)	3.42 (0.90)	3.74 (0.86)	3.51 (0.92)	3.47 (0.74)
P-value	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Grade							
Year 1	2398 (48.80)	3.40 (0.83)	3.32 (0.80)	3.46 (0.88)	3.73 (0.86)	3.58 (0.89)	3.50 (0.73)
Year 2	1489 (30.30)	3.18 (0.81)	3.12 (0.80)	3.16 (0.89)	3.47 (0.87)	3.26 (0.88)	3.23 (0.74)
Year 3 and above	1024 (20.90)	3.27 (0.80)	3.25 (0.81)	3.25 (0.87)	3.61 (0.83)	3.34 (0.91)	3.34 (0.71)
P-value	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Financial assistance							
First class	404 (8.20)	3.23 (0.87)	3.21 (0.84)	3.22 (0.95)	3.53 (0.86)	3.29 (0.95)	3.29 (0.79)
Second class	536 (10.90)	3.29 (0.81)	3.23 (0.78)	3.28 (0.81)	3.52 (0.81)	3.37 (0.85)	3.34 (0.70)
Third class	690 (14.10)	3.26 (0.82)	3.18 (0.79)	3.27 (0.89)	3.56 (0.87)	3.36 (0.90)	3.33 (0.74)
None	3281 (66.80)	3.33 (0.82)	3.25 (0.81)	3.35 (0.89)	3.67 (0.87)	3.47 (0.90)	3.42 (0.74)
P-value	-	0.015	0.161	0.004	< 0.001	< 0.001	< 0.001
Domestic average income							
Below RMB19,600	2338 (47.60)	3.24 (0.83)	3.16 (0.81)	3.23 (0.90)	3.49 (0.88)	3.33 (0.92)	3.29 (0.76)
RMB19,600-27,000	1332 (27.10)	3.29 (0.78)	3.23 (0.76)	3.33 (0.85)	3.63 (0.82)	3.43 (0.85)	3.38 (0.69)
Above RMB 27,000	1241 (25.30)	3.46 (0.83)	3.39 (0.82)	3.50 (0.89)	3.88 (0.82)	3.62 (0.89)	3.38(0.72)
P-value	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

SD, Standard deviation; First class targets specific vulnerable groups, such as families with registered cards, disabled families, families receiving subsistence allowances, and orphans; Second class is for poorer families that do not fall into the above four categories; Third class covers general poor families; None represents families that do not receive any financial assistance.

TABLE 2 Multiple linear regression analysis using the EPOCH scale across different groups.

Variable	Engagement		Perseverance		Optimism		Connectedness		Happiness		EPOCH (total)	
	<i>B</i>	95% <i>CI</i>	<i>B</i>	95% <i>CI</i>	<i>B</i>	95% <i>CI</i>	<i>B</i>	95% <i>CI</i>	<i>B</i>	95% <i>CI</i>	<i>B</i>	95% <i>CI</i>
Sex												
Male	-	-	-	-	-0.13***	-0.18, -0.08	-0.38***	-0.43, -0.33	-0.20***	-0.25, -0.15	-0.14***	-0.18, -0.10
Female†	-	-	-	-	0.000		0.000		0.000		0.000	
Only child status												
Yes	0.06*	0.01, 0.11	0.07*	0.02, 0.12	0.08**	0.03, 0.14	0.10***	0.05, 0.15	0.08**	0.02, 0.13	0.08**	0.03, 0.12
No†	0.000	-	0.000	-	0.000	-	0.000	-	0.000	-	0.000	-
Household registration												
Rural	-0.06*	-0.12, -0.01	-0.07**	-0.12, -0.02	-0.13***	-0.18, -0.07	-0.11***	-0.16, -0.06	-0.07*	-0.13, -0.01	-0.09***	-0.13, -0.04
Urban†	0.000	-	0.000	-	0.000	-	0.000	-	0.000	-	0.000	-
Grade												
Year 1	0.15***	0.09, 0.21	0.08*	0.02, 0.13	0.22***	0.16, 0.28	0.12***	0.06, 0.18	0.24***	0.18, 0.31	0.10***	0.11, 0.21
Year 2	-0.08*	-0.14, -0.01	-0.15***	-0.22, -0.09	-0.07*	-0.14, 0.00	-0.12***	-0.19, -0.05	-0.07	-0.14, 0.00	-0.10**	-0.16, -0.04
Year 3 and above†	0.000	-	0.000	-	0.000	-	0.000	-	0.000	-	0.000	-
Financial assistance												
First class	-0.08	-0.16, 0.01	-	-	-0.08	-0.17, 0.02	-0.09*	-0.18, -0.01	-0.04**	-0.24, -0.05	-0.08*	-0.16, -0.01
Second class	-0.02	-0.09, 0.06	-	-	-0.03	-0.11, 0.05	-0.12**	-0.20, -0.04	-0.08	-0.16, 0.01	-0.05	-0.12, 0.02
Third class	-0.05	-0.12, 0.02	-	-	-0.04	-0.12, 0.03	-0.07	-0.14, 0.00	-0.08*	-0.15, 0.00	-0.06	-0.12, 0.01
None†	0.000	-	-	-	0.000	-	0.000	-	0.000	-	0.000	-

†Reference Group; * < 0.05, ** < 0.01, *** < 0.001 (Significant *p*-values); 95% *CI*, 95% Confidence Interval; *B*, Regression coefficient.

Ryff and colleagues (Ryff and Keyes, 1995; Ahrens and Ryff, 2006; Karasawa et al., 2011) consistently found that women score higher than men in positive relations with others across both Eastern and Western cultures. Women also tend to report greater emotional reactivity and fusion with others (Peleg, 2022), whereas men report higher emotional cutoff and are expected to appear confident and assertive, often suppressing vulnerable emotions (Mahalik et al., 2003; Vandello and Bosson, 2013; Peleg and Peleg, 2023). These tendencies contribute to higher scores in Connectedness and Optimism among female students.

Although research indicates that female students on average experience higher levels of academic stress (Graves et al., 2021; Devchoudhury and Devasagayam, 2022), it also reveals that they are happier at school than males (Pramod, 1996; Bhansali and Trivedi, 2008; Toraman et al., 2022), which is consistent with the findings of this study.

Women were more likely to use adaptive coping strategies (Tamres et al., 2002), whereas men were more likely to use maladaptive and avoidance coping strategies (Gentry et al., 2007). Empirical evidence consistently indicates a positive link between greater social support

and improved mental health outcomes (Özer et al., 2021; McLean et al., 2023). This may have led to female students exhibited higher scores in Connectedness, Optimism, and Happiness, ultimately resulting in higher EPOCH total scores.

Past research on gender differences in Engagement has yielded mixed results. Some studies suggest women exhibit stronger academic Engagement (Zusman et al., 2005; Sax, 2008), possibly varying by field of study (Mastekaasa and Smeby, 2008). Others find males more polarized in Engagement levels (Hu and Kuh, 2002) or no consistent gender pattern (Zhao et al., 2005). Kuh (2003) observed higher female Engagement, while EPOCH research noted higher male Engagement during adolescence (Kern et al., 2016). These inconsistencies likely stem from varying definitions and measurements of Engagement (Hu and Kuh, 2002; Kuh, 2003; Mastekaasa and Smeby, 2008). In our study, no significant gender differences in Engagement were found, supporting its conceptualization as a universal psychological capacity. Further research is needed to explore these findings.

Our research revealed no significant sex difference in Perseverance, aligning with previous findings (Ryan, and andBeamish, P., 2018). Boys

tend to show grit directly, whereas girls exhibit Perseverance indirectly through self-control. This suggests gender differences may be mediated by the expression of Perseverance. Perseverance is more linked to internal motivations than external factors, reducing gender gaps (Zeng and Kern, 2019). As Perseverance is closely tied to school Engagement and self-control, which develop similarly in both sexes, this explains the lack of significant differences. Thus, boys and girls may show similar Perseverance levels when considering internal motivations and self-regulation.

This sex difference indicates that nuanced variations in well-being scores may be influenced by complex, interacting social, cultural, and individual factors, and understanding these differences can help tailor interventions and support.

The results also found that only children reported higher scores across all dimensions, with a significantly higher total EPOCH score. The implementation of the one-child policy led most Chinese families to prioritize investing in their only child, particularly in their education (Lee, 2012; Li, 2001; Zhang and Goza, 2006). Only children receive high levels of parental attention and concentrated family resources, along with more patience and support, which enhances their prosocial behavior (Carlo et al., 2011; Li et al., 2024), thereby enhancing their sense of well-being. Research by Wolke and Skew (2012) suggests that only children may be happier, as they avoid sibling competition and conflicts, thereby reducing psychological pressure (Wolke and Skew, 2012).

This study found that urban students scored significantly higher on psychological well-being compared to rural students. Although there is evidence of significant cross-country and cross-regional variation in rural–urban differences in subjective well-being (Easterlin et al., 2011; Wang and Wang, 2016; Navarro et al., 2020), numerous studies have shown that urban populations generally report higher subjective well-being due to factors like better economic prospects and higher living standards (Easterlin et al., 2011; Wang and Wang, 2016; Navarro et al., 2020; Viganó et al., 2019; Burger et al., 2020). Tripathy and Sahu (2021) further supports this, finding urban students have better mental health compared to rural counterparts, who often lack basic amenities and face frustration from limited social opportunities (Dasinger and Gibson, 2024).

In China, rural students face unique challenges, including heavy family economic burdens and limited parental support due to low education levels and insufficient emotional care (Chen et al., 2020; Pillay et al., 2020; Wu et al., 2024). These factors, combined with fewer educational resources and social support, hinder their academic and psychological development (Li and Ranieri, 2013; Cui et al., 2021; Chow et al., 2019; Yao et al., 2014). The transition to urban universities exacerbates these challenges, creating a cultural gap as rural students struggle with unfamiliar norms, anxiety, and feelings of inadequacy (Sennett, 1973). Financial constraints further isolate them, limiting participation in social events and additional learning opportunities (Li, 2017). Surrounded by wealthier urban peers, rural students are reminded of their social and economic disadvantages, reinforcing exclusion and incompetence (Bourdieu, 1984). These combined factors contribute to the lower well-being reported by rural students compared to their urban counterparts. Based on the findings, universities in China could implement practical interventions such as providing targeted mental health support and financial aid to rural students, along with offering cultural adaptation programs and enhancing social integration opportunities to bridge the rural–urban gap.

A few studies have identified that the significant differences are primarily attributable to the combined effects of resource disparities, social environments and networks (Bosworth and Schaie, 1997; Gaspar et al., 2023), cultural differences (Suh and Oishi, 2002), and psychological stress (Hudd et al., 2000). To improve the mental health of rural students, it is essential to foster collaborative efforts from the government, educational institutions, and various societal sectors (Garbacz et al., 2022).

The study revealed that first-year students reported the highest level of psychological well-being, while second-year students exhibited the lowest. This aligns with previous research indicating that first-year students benefit from greater institutional support, social activities, and the excitement of transitioning into university life, contributing to their elevated well-being (Ahuja and Garg, 2021).

Second-year students face unique and significant challenges that contribute to their decreased well-being. Bewick et al. (2010) observed heightened anxiety among them due to increased academic, developmental, and social demands, coupled with reduced institutional support. This transition period, marked by identity formation and goal re-evaluation (Sterling, 2018), is a critical adjustment phase. Schreiner (2007) termed it a “developmental crisis,” highlighting sophomores’ uncertainty about their future direction and purpose, exacerbated by academic pressures and the need to choose a major (Schreiner and Pattengale, 2000). Other studies support our findings and suggest that among second-year students, a decrease in perceived competence due to first-year demands leads to lower happiness, while higher stress is attributed to increased studying, time management difficulties, and less established social support and coping mechanisms (Shek et al., 2017; Allen and Hiebert, 1991; Misra and McKean, 2000; Liu et al., 2019). These findings highlight the need for targeted, year-specific interventions to address the academic, developmental, and emotional challenges faced by second-year students, supporting their well-being and progression through university.

Students receiving higher levels of financial assistance performed worse on psychological indicators, particularly those receiving first-class financial assistance. This may suggest that while financial aid may alleviate some economic pressures, it alone may not be sufficient to fully compensate for all psychological deficiencies among students. Receiving financial assistance may indicate a lower socioeconomic status. A systematic review revealed that higher socioeconomic status was associated with greater subjective well-being (Tan et al., 2020). Future research could delve deeper into how financial assistance can be made more effective in fostering psychological development among students and how potential adverse effects could be mitigated.

Understanding these factors contributes to the development of targeted strategies and interventions to support the psychological well-being of Chinese university students. While these predictors have been identified in previous studies, our research offers a comprehensive analysis within a specific context, highlighting their combined influence and emphasizing the need for tailored approaches. For instance, gender psychological well-being programs can address societal pressures on male students’ emotional expression. Enhanced collaboration between parents and universities can benefit non-only children, leveraging family resources to boost well-being.

Moreover, our study underscores the criticality of addressing the urban–rural divide by proposing increased investment in rural educational resources and mental health services. We suggest concrete measures, such as establishing scholarships, offering internships, and organizing mental health outreach activities, to support rural students.

Additionally, we propose implementing stress management workshops and academic counseling services to alleviate academic stress for second-year students, which is a unique contribution to practical intervention strategies.

We acknowledge the limitations of this study, including its focus on a single university and the use of convenience sampling, which may affect the generalizability of the findings. Future research should address these limitations by incorporating data from multiple universities, involving more diverse and representative populations, and employing randomized sampling methods. Such approaches will help ensure greater external validity and provide a more comprehensive understanding of psychological well-being among university students in 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 humans were approved by the Chengdu University of Information Technology (Ethics Ref Number 20240110). The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

JW: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Resources, Validation, Writing – original draft, Writing – review & editing. LW: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Validation, Writing – original draft, Writing – review & editing. CS: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Validation,

Writing – original draft, Writing – review & editing. YW: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Writing – original draft, Writing – review & editing.

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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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EDITED BY

Martijn Burger,
Open University of the Netherlands,
Netherlands

REVIEWED BY

Nicholas Pang,
Universiti Malaysia Sabah, Malaysia
Hatime Kamilcelebi,
Kırklareli University, Türkiye

*CORRESPONDENCE

Susan C. Hu
✉ shuhu@mail.ncku.edu.tw

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Well-being trajectories and dynamic resource shifts in the transitions of retirement: a longitudinal study of Taiwanese older adults

Wan-Chen Hsu¹, Nuan-Ching Huang^{2,3} and Susan C. Hu^{4*}

¹Department of Public Health, College of Medicine, National Cheng Kung University, Tainan, Taiwan,

²Department of Public Health, College of Health Care and Management, Chung Shan Medical University, Taichung, Taiwan, ³Department of Family and Community Medicine, Chung Shan Medical University Hospital, Taichung, Taiwan, ⁴Department of Public Health, College of Medicine, National Cheng Kung University, Tainan, Taiwan

Background: Previous literature highlights the heterogeneity of retirement adjustment, emphasizing various life experiences among retirees. The Dynamic Resource-Based Model provides an integrated framework to examine these differences, linking retirement adjustment to subjective well-being. This study applied the framework to Taiwan's unique sociocultural context, in which distinct cultural values and retirement policies may create different adaptation patterns from those observed in Western societies. Thus, the main purposes of the study are to examine the heterogeneity in subjective well-being trajectories among Taiwanese retirees and focus on how various resources influence these diverse adaptation patterns within this specific cultural environment.

Method: This study utilized six waves of datasets from the Taiwanese Longitudinal Study on Aging (TLSA) spanning from 1996 to 2015, with 1,329 valid participants aged 50 and above in the analysis. Retirement was defined as the initiation of pension receipt during the observation period. Subjective well-being was measured using a 10-item Life Satisfaction Index. We first employed a Latent Growth Mixture Model (LGMM) to identify distinct trajectories of subjective well-being. Then, we applied the generalized linear model (GLM) to examine how physical, financial, cognitive, emotional, and social resources influence these trajectories across the following three stages: pre-retirement, transition, and post-retirement.

Results: Our findings revealed two main trajectories of subjective well-being during retirement: a "High-Increase" group and a "Low-Decline" group. Compared with the "Low-Decline" group, individuals in the "High-Increase" group exhibited better health, stronger economic status, greater social participation, more family support, and higher educational attainment. In addition, older adults with fewer illnesses, healthier behaviors, and a spouse/partner were more likely to maintain a high-increased well-being trajectory during the transition to retirement. Our findings further showed the critical importance of volunteering in enhancing subjective well-being after retirement.

Discussion: This study highlights the importance of understanding distinct well-being trajectories and how resources differently influence retirement stages in Taiwan's unique context. Policymakers should recognize this heterogeneity rather than implementing one-size-fits-all solutions. Given the crucial role of family support in early retirement and the growing importance of volunteering

later, policies should strengthen family systems while expanding social participation opportunities.

KEYWORDS

well-being, trajectory, retirement transition, adjustment, pension, latent growth mixture modeling (LGMM), dynamic resource-based model

Introduction

Exploring “well-being” in aging and retirement research is critically important, especially under the context of a globally rapid-growth aging population. According to the definition of the World Health Organization, health should extend beyond the mere absence of disease, encompassing complete physical, mental, and social well-being (World Health Organization, 2015). Therefore, subjective well-being, often measured by life satisfaction, is a pivotal measure representing an individual’s overall evaluation of life and essential in understanding and promoting healthy aging.

Transition into retirement significantly impacts individuals’ subjective well-being. This life course transition fundamentally reshapes multiple aspects of life. Various theoretical frameworks have highlighted potential risks associated with this transition. Role theory views retirement as a crisis of losing work roles (Riley and Riley, 1994), while continuity theory suggests that maintaining self-identity may lead to declined well-being (Atchley, 1971). Life course and conservation of resources theories further emphasize how pre-retirement experiences and available resources affect adaptation outcomes (Elder and Johnson, 2018; Hobfoll, 2002). These theoretical perspectives highlight the critical nature of successful retirement adaptation, as difficulties in this transition process can lead to adverse health outcomes (Henning et al., 2016; Wang et al., 2011). Notably, retirement adaptation exhibits considerable heterogeneity, with individuals showing markedly different patterns of adjustment and well-being changes during this transition.

Comparisons for retirement adaptation trajectories

Research on retirement adaptation trajectories has revealed considerable variability across countries. Studies in the United States have identified three main trajectories. The predominant stability pattern (69–74%) appears among individuals with bridge employment and proactive retirement planning, reflecting the importance of personal preparation in this system. The small recovery pattern (approximately 4%) occurs among those leaving high-stress occupations, suggesting that for a minority, retirement provides relief from demanding work environments. The U-shaped pattern (22–27%) shows initial vulnerability during the retirement transition, particularly among those with health problems or unexpected early retirement, followed by adaptation and recovery through compensatory strategies (Wang, 2007).

A German study also identified three distinct trajectories (Pinquart and Schindler, 2007). The predominant maintaining pattern (76%) shows little change during the retirement transition, followed by a gradual decline, typically observed among married retirees with good health status. The increasing pattern (15%) demonstrates

significant improvement in retirement transition, comprising younger males (average age 59.5) with lower socioeconomic status and high unemployment before retirement, suggesting that Germany’s welfare system effectively supports vulnerable workers through the immediate retirement transition. The declining pattern (9%) exhibits a substantial satisfaction decrease at retirement, followed by subsequent recovery, which is more common among older retirees (average age 63) with higher proportions of women (56.7%) and poorer health. Notably, unlike the US stability pattern, which tends to maintain consistent well-being levels, two of three German trajectories show a tendency toward gradual decline in the long term.

However, Australian research identified four distinct trajectories in the retirement context. The maintaining high-satisfaction group (40%) predominantly comprises older, educated males with good health and partner support. Another two were decreasing patterns: a group starting with high satisfaction but gradually declining (28%) and a group starting with low satisfaction that continued to decrease (18%). The former comprises higher proportions of women with lower education and poorer health, and the latter is characterized by younger individuals forced into retirement without employment or partner relationships. The fourth was the increasing-satisfaction group (14%), which consists of younger, educated males with good health but lower social support (Heybroek et al., 2015).

Although varying retirement systems, Western studies consistently reveal three or more adaptation patterns across countries with different proportions and shapes. The stability trajectory predominates in the above nations (40% in Australia to 76% in Germany), whereas the increasing trajectories represent a smaller but consistent pattern (4–15%). The decreasing trajectory shows the most cross-national variation—appearing as a U-shape in the United States, a simple decline in Germany, and two distinct patterns in Australia.

These variations reflect each country’s institutional system. The US emphasizes individual responsibility and private pensions more, benefiting those with adequate planning and bridge employment. Germany’s welfare system provides stronger initial support that may diminish over time. Australia’s mandatory superannuation system creates more systematic lifetime financial accumulation, possibly explaining its more diverse trajectory patterns than the US market-oriented and German welfare-state models.

The resource-based dynamic model

Despite previous studies emphasizing different factors influencing trajectory membership, they collectively highlight the importance of resources in shaping adaptation trajectories. The resource-based dynamic model provides an integrative framework particularly suitable for understanding retirement adaptation. Drawing from Hobfoll (2002) conservation of resources theory, this model defines resources as individuals’ overall capacity to fulfill their core values and

needs. It emphasizes how resource gains and losses dynamically influence well-being throughout the retirement transition (Hobfoll, 2002; Wang et al., 2011).

The model identifies six types of critical resources that fluctuate during retirement transition: physical resources, financial resources, social resources, emotional resources, cognitive resources, and motivational resources.

Physical and financial resources have consistently been linked to retirees' well-being. Physical resources, including subjective and objective health status, are crucial in retirement adaptation and higher life satisfaction (Barbosa et al., 2016; Yeung, 2018). Research has identified financial resources as the strongest predictor of successful adjustment during the retirement transition (Yeung, 2018). Social and emotional resources impact retirement adaptation differently. Social resources provide informational and practical assistance through family, friends, and partners. However, previous studies showed inconsistent effects and indicated these might be culturally dependent (Barbosa et al., 2016; Yeung, 2018). Emotional resources, including emotional regulation abilities, positive attitudes, and received emotional support, consistently enhance retirees' adaptability through improved stability, stress management, and optimism (Blekesaune and Hansen, 2021).

Cognitive resources show inconsistent effects—some studies find retirement slightly decreases memory function (Celia et al., 2021), while others report weak or no relationship with adjustment (Allerhand et al., 2014; Hansson et al., 2018). Motivational resources consistently predict successful adaptation, with self-control and flexible goal adjustment helping retirees navigate challenges effectively (Barbosa et al., 2016; Heyl et al., 2007). Together, these diverse resources offer a comprehensive framework for understanding the multiple factors influencing retirement adaptation, highlighting the specific contributions of each resource type. However, while previous studies have explored some of these factors, they have largely overlooked the dynamic nature of these resources across different retirement stages. Specifically, they fail to identify which resources play crucial roles in maintaining high well-being after retirement, which is most important during the transition period, and how the relative importance of these resources shifts throughout the retirement process.

Resource adaptation patterns in Taiwan's context

Given the dynamic nature of retirement resources and the influence on adaptation trajectories, Taiwan presents a fascinating case study due to its distinct institutional, economic, social, and cultural context. In other words, Taiwan's retirement context differs fundamentally from Western countries across several key dimensions. The institutional disparities between Taiwan and Western retirement systems significantly impact resource accumulation patterns.

Western nations generally possess more established and comprehensive pension systems facilitating consistent retirement resource accumulation throughout working careers. Conversely, Taiwan's retirement systems developed asymmetrically across occupational sectors and emerged relatively late. Under Taiwan's historical context, retirement benefits emerged in 1943, exclusively for civil servants, military personnel, and teachers—key ruling party

supporters. However, most of Taiwan's workforce consists of private sector laborers, which remained uncovered until the Labor Standards Act (1984) and National Pension (2008) were implemented.

This staggered implementation has created considerable occupational fragmentation with limited system integration and portability. Consequently, the existing structural configuration places many Taiwanese retirees at a significant disadvantage—particularly those from the private sector or those who have navigated multiple career transitions. This situation results in reduced periods for resource accumulation and leaves them with insufficient retirement funds, severely impacting their financial security in later life. Furthermore, Taiwan's labor pension systems are characterized by significantly lower contribution rates and limited investment options, severely hindering the potential for retirement asset growth. These institutional differences significantly contribute to resource disparities, impacting the financial security of Taiwanese labor retirees. As a result, they may face greater challenges in adapting compared to their Western counterparts (Shen, 2024).

Taiwan's economic trajectory from 1960 to 1980 also created distinctive occupational patterns. During rapid industrialization, many Taiwanese workers entered labor-intensive manufacturing and heavy industries such as steel, shipbuilding, and petrochemicals. Workers in these sectors faced chronic exposure to high temperatures, hazardous chemicals, and physically demanding labor conditions, resulting in occupational injuries and accelerated physical deterioration. These cumulative health impacts may affect their physical resources and quality of life during retirement. Financially, Taiwan's export-oriented development strategy necessitated maintaining competitive wages substantially below those of developed nations (manufacturing wages were approximately 1/4 of Japan's and 1/22 of America's during the period; Liang and Wang, 2002). This substantial income differential likely limited workers' lifetime earnings and retirement savings compared to their counterparts in developed economies, potentially constraining their financial resources in retirement.

In addition, Confucian culture socially shapes distinctive retirement dynamics in Taiwan, contrasting sharply with Western individualism. For example, Confucian filial piety expectations foster unique intergenerational interaction patterns, positioning family as a critical source of emotional and social support for retirees (Yasuda et al., 2011). Approximately 60% of older Taiwanese adults lived with adult children in the early 2000s (compared with less than 20% in most Western societies during the 1990s; Yasuda et al., 2011), yielding family support systems that complement formal institutional assistance with medical, financial, and practical aid. Moreover, Taiwan's small and medium enterprises dominated economy (comprising over 95% of enterprises) created distinctive social networks where many retirees transition from leadership roles to advisory positions within family businesses, maintaining status and purpose through continued engagement rather than complete withdrawal from professional life (Chung and Au, 2021).

Additionally, the Confucian doctrine of the "Middle Way" (zhongyong) further influences retirement adaptation in Taiwan. This philosophy emphasizes balance, moderation, and harmony, encouraging individuals to accept life's transitions with equanimity rather than resistance. Such cultural orientation guides people to seek inner equilibrium when facing challenges (Ji et al., 2010). For Taiwanese retirees, this embedded cultural value may promote

acceptance of role transitions and psychological adaptation even amidst limited material resources, potentially shaping unique well-being trajectories that differ from Western retirement patterns.

Study aim

This study aims to investigate the heterogeneity of subjective well-being trajectories among middle-aged and older adults during their retirement transition in Taiwan. Specifically, we have two objectives: first, to identify distinct trajectory patterns of subjective well-being during the retirement transition process; second, to examine how five types of resources (physical, cognitive, financial, social, and emotional) influence these trajectories at different transition stages: pre-retirement, transition to retirement, and post-retirement. Although the resource-based dynamic model includes motivational resources, our dataset did not measure this aspect. By conducting this study in Taiwan, our findings can provide insights into retirement adaptation patterns in an Asian cultural context.

Retirement trajectories hypotheses in Taiwan

In light of Taiwan's unique socioeconomic and cultural context, we propose three distinct well-being trajectories during the retirement transition. Unlike patterns observed in Western literature, we anticipate that the interaction of Confucian family values, the history of rapid economic development, and changing institutional arrangements will generate trajectory patterns that reflect local adaptation strategies.

For the first trajectory, we expect to see a stable but gradually declining well-being pattern, representing most Taiwanese retirees. This trend may reflect traditional values emphasizing harmony and acceptance of life transitions. Although well-being may remain stable during the initial retirement phase, it could gradually decline in later years as retirees encounter inevitable health and financial challenges.

For the second trajectory, we propose a significant increase in well-being among retirees who receive strong family support and actively engage in social activities. Retirement can be transformative, allowing individuals to transition from work obligations to fulfilling roles within their family and community, especially in family-oriented societies. We believe this improvement will be most pronounced for those who seek emotional support from their families and broaden their social connections through volunteering. By participating in these meaningful activities, retirees can rebuild their identity and sense of purpose after leaving the workforce, ultimately leading to a more fulfilling life.

For the third trajectory, we anticipate a decline in well-being among retirees who face resource limitations across various areas. In Taiwan's fast-changing socioeconomic environment, some retirees may encounter significant challenges when support systems are lacking, especially if they simultaneously deal with health and financial difficulties. We expect this decline in well-being to occur when retirees do not have enough social and family resources to help mitigate the losses related to retirement.

Methods

Data source

This study utilized data from the Taiwan Longitudinal Study on Aging (TLSA), a nationally representative survey launched in 1989 through a collaboration between the Taiwan Health Promotion Bureau and the University of Michigan. The TLSA was conducted every 3–4 years, targeting non-institutionalized individuals aged 50 and above, using a three-stage probability sampling method based on Taiwan's national household registry. The survey aims to monitor the aging process of Taiwan's middle-aged and elderly populations by assessing their physiological, psychological, and social well-being. Data were collected through face-to-face interviews using structured questionnaires administered by trained interviewers. Nine waves of the TLSA survey have been completed from 1989 to 2019. New cohorts were added in 1996, 2003, and 2015 to mitigate attrition due to deaths and loss of follow-up.

Study design

This study utilized six waves of the TLSA dataset spanning from 1996 to 2015, as the measurement of subjective well-being was first introduced in 1996 and underwent substantial modification after 2015. We systematically tracked participants' retirement transitions by collecting observations at three critical time points: pre-retirement, transition, and post-retirement. We defined the transition point as when a participant first began receiving a pension and then verified this information through retrospective analysis of previous wave data to confirm genuine non-retirement status in the preceding period.

Figure 1A shows how to define the retirement status of participants and how to track their well-being trajectories. The solid circles represent the wave in which participants first reported receiving a pension, marking their transition into retirement. The dashed circles indicate the retrospective verification of pre-retirement status. The solid lines represent the tracking of well-being trajectories across pre-retirement, transition, and post-retirement periods.

Figure 1B illustrates how samples from different retirement years were pooled for analysis. The final sample comprises four subgroups of individuals who retired in 1999, 2003, 2007, and 2011. These subgroups were integrated into a unified analytical framework, with each participant contributing an equal number of observations. By including participants from various retirement years, this study simultaneously examines the effects of retirement age and retirement year on the transition and post-retirement phases.

Participants

This study began with a robust cohort of 6,039 participants from 1999 to 2011, and we meticulously traced their retirement status from one wave before the baseline in 1996 to one wave following 2011 in 2015. This comprehensive approach ensures a thorough understanding of retirement trends over time. As shown in Figure 2, we applied two selection criteria to identify our final analytical sample. The inclusion criteria were as follows: (1) participants had to report receiving a pension during the study period, with confirmed non-pension status

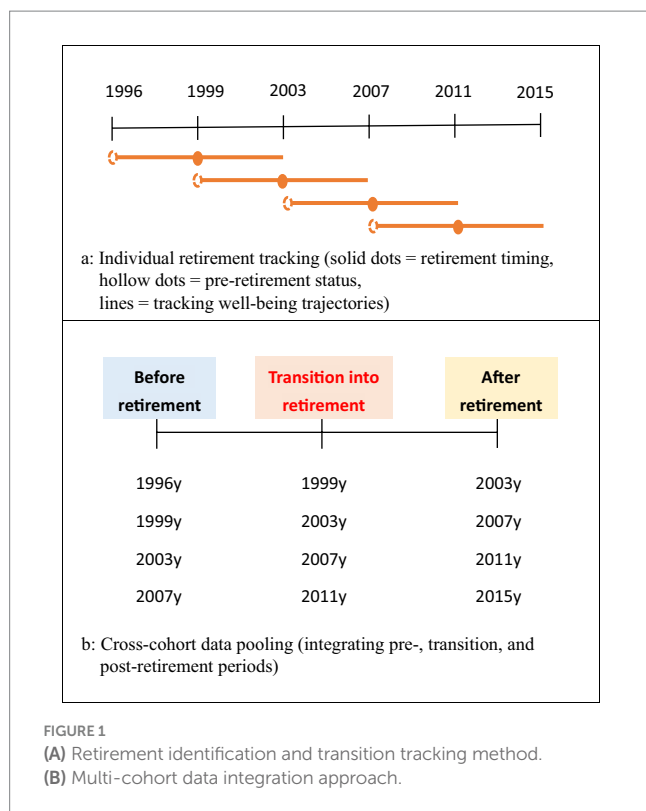


FIGURE 1

(A) Retirement identification and transition tracking method.
(B) Multi-cohort data integration approach.

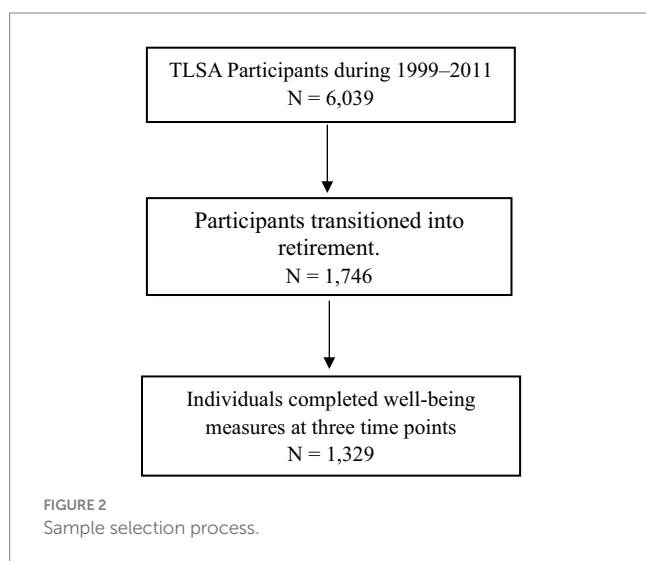


FIGURE 2

Sample selection process.

in earlier waves ($n = 1,746$); and (2) they needed to respond to all 10 items of the life satisfaction questionnaire across all three measurement periods: pre-retirement, transition, and post-retirement. Following these criteria, our final analytical sample comprised 1,329 participants aged 50 and above.

Measurement

Subject well-being

Subjective well-being was measured by overall life satisfaction using the 10-item Life Satisfaction Index (Neugarten et al., 1961).

This instrument is designed with dichotomous scoring for each item (0 = no, 1 = yes), and a higher score indicates a higher level of life satisfaction. The Cronbach's alpha in past studies ranges from 0.85 to 0.92.

Transition into retirement

Transition into retirement refers to the change in status from non-retired to retired. Retirement status was assessed through self-report in response to the question, "Have you ever received a pension for retirement?" Participants could answer with "Yes" or "No." A transition was identified when a participant's status changed from "No" to "Yes" between consecutive waves.

Sociodemographic characteristics

Sociodemographic characteristics were assessed as follows. Gender (male, female), education levels (illiterate, literate and primary school, secondary and above), and retirement year (1999, 2003, 2007, 2011) were measured as time-invariant variables. Age was categorized into two groups: 50–64 and ≥ 65 years. Partner status was determined based on their relationship with their spouse or partner. Those who reported being married or having a cohabiting partner were labeled as "Yes," while participants who reported being never married, divorced, separated, or widowed were categorized as "No."

Resource status

This study utilized the dynamic resource model, which included six essential resources influencing retirement adjustments. Owing to the absence of suitable questionnaires of motivational resources in the dataset, our analysis incorporated only five of the resources.

Physical resources

(a) Self-rated Health:

Participants were asked to rate their current health status, with responses ranging from 5 (very good) to 1 (very poor). We combined "good" and "very good" as well as "poor" and "very poor," and subsequently categorized them into the following three groups: "Good," "Fair," and "Poor."

(b) Number of Diseases:

Participants were asked to report whether they currently have any diseases from a specified list. This list included hypertension, diabetes, heart disease, stroke, cancer, lung disease, arthritis or rheumatism, liver or gallbladder disease, cataracts, kidney disease (including kidney stones), gout, and hip fractures. We summed each disease reported by each participant, yielding a cumulative disease count for each individual, scoring from 0 to 12.

(c) Number of Unhealthy Behaviors:

Participants were queried regarding their engagement in four specific unhealthy behaviors: smoking, alcohol drinking, betel nut chewing, and not engaging in physical exercise. Responses were coded as 1 for "Yes" and 0 for "No." We then summed the codes for each

unhealthy behavior to produce an unhealthy behavior score for each participant, scoring from 0 to 4.

Cognitive resources

Memory recall: Participants were instructed to listen to 10-item objects and then recall and repeat them. The interviewer recorded the number of items each participant accurately recalled. Scores ranged from 1 to 10, with higher scores indicating better memory performance.

Financial resources

(a) Full-time Job:

Participants who reported being currently employed in a full-time job were categorized as “Yes.” Those who were temporarily not attending work, assisting with family farming or business, or serving as homemakers were categorized as “No.”

(b) Financial Difficulty:

Participants were asked whether they (and their spouse, if applicable) found it sufficient or challenging to manage their monthly living expenses. Those who reported their financial situation as “quite sufficient with surplus” or “generally sufficient, without feeling a lack” were categorized as having “No difficulty.” Conversely, those who reported “some difficulty” or “considerable difficulty” were categorized as “Yes, experiencing difficulty.”

Social resources

(a) Social Activities:

Participants were asked concerning their involvement in various social groups and activities. The types of groups included the following: (1) Community groups, (2) Religious groups, (3) Occupational groups, (4) Political groups, (5) Social service clubs, (6) Hometown or kinship associations, and (7) Senior citizen or study groups. Participants who indicated involvement in any of these groups or activities were classified as “Yes” for social participation; otherwise, they were classified as “No.”

(b) Volunteering:

Participants were asked whether they engaged in any social services or voluntary activities. Based on the responses, they were categorized into the following two groups: “Yes” for those involved in such activities and “No” for those not.

Emotional resources

(a) Self-value:

Participants were asked to evaluate themselves as being helpful to their family or relatives with the question, “Generally speaking, do you feel that you are helpful to your family or relatives?” Responses ranged from 1 (not very helpful) to 5 (very helpful). Based on the answers, participants were categorized into two levels: “Not at all or Some,” and “A lot.”

(b) Family Support:

Participants were asked to rate the level of care and concern they received from their family, relatives, and friends. Based on the responses, they were categorized into two levels: “Little or Some” and “A lot.”

Statistical analysis strategy

We employed the Latent Growth Mixture Model (LGMM) in this study. Using LGMM in trajectory analysis has many advantages. First, unlike traditional growth models, LGMM can identify discrete groups within the same population exhibiting distinct growth trajectories. In addition, LGMM goes beyond latent-class growth models (LGM) by incorporating random effects, allowing for individual variations in growth trajectories over time. Moreover, LGMM can have its unique growth parameters in different latent classes. Lastly, LGMM can effectively manage missing data, utilizing all available observations to compute full information maximum likelihood estimates.

The current study estimated the following multiple models to determine their parameters, shapes, and number of subgroups:

- (1) Fixed-intercept models: Assume no growth over time.
- (2) Linear growth models: Capture linear changes in fixed components.
- (3) Quadratic growth models: Account for nonlinear trends by adding quadratic growth to fixed components.
- (4) Linear growth in fixed and mixture components: Address variations within subgroups by including linear growth in both fixed and class-specific components.
- (5) Linear and quadratic growth in fixed and mixture components: Incorporate both linear and quadratic growth in both fixed and class-specific components.

Additionally, we considered time random effects in both linear and nonlinear models. Each model, except the fixed-intercept model, was tested with 1–3 classes to capture the growth patterns and potential subgroups thoroughly. We considered several model fit indices to evaluate and select the optimal model.

First, we used entropy values above 0.8 as a primary indicator of high classification accuracy with higher entropy values suggesting greater precision in model classification. Second, we favored the models with lower values on indices such as the Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), and sample-adjusted Bayesian Information Criterion (SABIC), which indicate effective data representation without overfitting. Third, given the large number of resources considered in this study, we established two criteria for model selection: each class must include at least 20% of the sample to enhance the stability and interpretability of the regression models, and maintain sufficient average latent class posterior probability (ALCPP > 0.8) to ensure classification accuracy. These criteria are interconnected as smaller class sizes often lead to lower ALCPP values, which can compromise the reliability of subsequent analyses (Nylund et al., 2007; Weller et al., 2020).

After determining the best-fitting model, we utilized the Generalized Linear Model (GLM) to identify further predictors

TABLE 1 Demographic characteristics of participants at three different time points (*n* = 1,329).

Variables	Pre-retirement	Transition	Post-retirement	<i>p</i> -value
	n (%)	n (%)	n (%)	
Retirement year				
1999	–	558 (42.0)	–	
2003	–	251 (18.9)	–	
2007	–	329 (24.8)	–	
2011	–	191 (14.4)	–	
Sex				>0.9
Male	975 (73.4)	–	–	
Female	354 (26.6)	–	–	
Education				>0.9
Illiteracy	132 (9.9)	–	–	
Literary/Primary	563 (42.4)	–	–	
Secondary and above	634 (47.7)	–	–	
Age				<0.001
50–64	586 (51.6)	598 (45.0)	371 (27.9)	
65+	550 (48.4)	731 (55.0)	958 (72.1)	
Partner				<0.001
No	242 (18.2)	293 (22.0)	321 (24.2)	
Yes	1,087 (81.8)	1,036 (78.0)	1,008 (75.8)	

“–” indicates that demographic characteristics remained constant throughout the retirement transition period. Bold values indicate statistically significant results (*p* < 0.05).

influencing the longitudinal trajectories of subjective well-being. All analyses were performed using R statistical software (R Core Team, 2022), utilizing the “lcm” package for LGMM and the “stats” package for implementing GLM. We also used a grid search approach, conducting 10 iterations starting from 100 random initializations to determine the optimal number of subgroups and achieve the highest likelihood in the multivariate Gaussian mixture models.

Results

Characteristics of participants

Table 1 presents the demographic characteristics of the participants. The largest proportion of participants retired in 1999 (42%), followed by 2007 (25%). The sample was predominantly male (73%), with 42% having achieved literacy or a primary school education and 48% having attained secondary education or higher. Approximately 55% began receiving pensions at age 65 or older. The proportion of participants without a spouse or partner increased from 18.2% pre-retirement to 24.2% post-retirement.

Table 2 illustrates the dynamics of resource status during the observation period. Health metrics revealed a decline in self-rated good health from 50% pre-retirement to 39% post-retirement. The average number of diagnosed diseases increased from 1.23 to 1.94, while cognitive function scores (out of 10) decreased from 5 to 3.4. Unhealthy behaviors slightly decreased from an average of 1.05 to 0.88. Financial difficulties increased from 21% pre-retirement to 24% post-retirement. Both social participation and volunteering experienced minor fluctuations around retirement; however, these

changes were not statistically significant. Self-value decreased significantly from 56% pre-retirement to 47% post-retirement, while family support showed a non-significant increase from 86 to 88%. Subjective well-being initially averaged 6.71, increased slightly during the transition, and then decreased to 6.53 post-retirement, though these changes were not statistically significant. Notably, 28% of participants continued full-time work while receiving pension benefits. The proportion reporting financial difficulties was slightly lower before retirement (21%) and increased to 24% after retirement; however, this change was not statistically significant.

Model fit and selection

Table 3 presents the tests of fit indices and entropy for the LGMM. We examined both fixed-only and fixed-and-random effect models, explicitly focusing on linear and non-linear (quadratic) forms. The table shows the results for two- and three-class groupings, including multiple fitting indicators. We found that all models in the fixed-and-random effects exhibited entropy values lower than 0.8, indicating relatively lower accuracy in predicting group clustering. Thus, those models were abandoned.

Three models with fixed effects (two-class linear, two-class quadratic, and three-class quadratic) showed high entropy (0.81). In evaluating these models, we applied three selection criteria. First, we examined group sizes and found that in the three-class quadratic model, Groups 2 and 3 each comprised less than 20% of the sample, making them potentially unstable. Second, we compared fit indices (AIC, BIC, and SABIC) and found that the two-class linear and two-class quadratic models had similar values. Third, considering

TABLE 2 Resource status of participants at three different time points (*n* = 1,329).

Variables	Pre-retirement	Transition	Post-retirement	p-value
	n (%)	n (%)	n (%)	
1. Physical Resources				
Self-rated Health				<0.001
Poor	239 (18.2)	280 (21.1)	337 (25.5)	
Fair	424 (32.3)	464 (34.9)	474 (35.9)	
Good	650 (49.5)	585 (44.0)	509 (38.6)	
Number of Disease (M ± SD)	1.23 ± 1.34	1.60 ± 1.49	1.94 ± 1.60	<0.001
Unhealthy Behaviors (M ± SD)	1.05 ± 0.98	0.92 ± 0.91	0.88 ± 0.87	<0.001
2. Cognitive Resources				
Memory recall (M ± SD)	4.95 ± 2.08	4.48 ± 2.10	3.67 ± 2.24	<0.001
3. Financial Resources				
Full-time Job				<0.001
No	643 (48.4)	959 (72.2)	1,079 (81.2)	
Yes	686 (51.6)	370 (27.8)	250 (18.8)	
Financial Difficulty				0.14
No	1,029 (79.4)	998 (76.8)	954 (76.4)	
Yes	267 (20.6)	302 (23.2)	294 (23.6)	
4. Social Resources				
Social activities				0.3
No	697 (52.4)	661 (49.7)	698 (52.5)	
Yes	632 (47.6)	668 (50.3)	631 (47.5)	
Volunteering				0.11
No	1,187 (89.9)	1,160 (87.3)	1,171 (88.1)	
Yes	134 (10.1)	169 (12.7)	158 (11.9)	
5. Emotional Resources				
Self-value				<0.001
None/Some	569 (43.9)	623 (48.0)	663 (53.3)	
A lot	728 (56.1)	675 (52.0)	582 (46.7)	
Family Support				0.5
Little/Some	181 (14.0)	165 (12.7)	155 (12.4)	
A lot	1,116 (86.0)	1,131 (87.3)	1,090 (87.6)	
Well-being (M ± SD)	6.71 ± 2.28	6.78 ± 2.57	6.53 ± 2.86	0.070

Bold values indicate statistically significant results (*p* < 0.05).

parsimony, we selected the two-class linear growth mixture model as our final model due to its straightforward structure and interpretability.

Trajectories of subjective well-being

Table 4 provides the estimates for the two-class linear growth mixture model. Group 1, which we named the “Low-Decline” group, comprises 25.4% of the sample. This group starts with a relatively low well-being score before retirement and then continuously decreases over time (intercept = 6.02, *beta* = −0.99, *p* < 0.0001). Group 2, the “High-Increase” group, encompasses 74.6% of the participants. This group begins with a high initial level of well-being and persistently experiences a slight increase as time progresses (intercept = 8.81,

beta = 0.22, *p* < 0.0001). Both groups have a high average posterior probability of class membership (≥0.9). Figure 3 shows the linear predictions of the two groups’ trajectories on subjective well-being at three different time points.

Pre-retirement characteristics of two latent groups

Table 5 shows the demographic and resource distribution of two latent groups. Gender did not differ between these two groups, with the “Low-Decline” and “High-Increase” groups being approximately 74% male and 26% female. The “High-Increase” group is younger, with 55% aged 55–64 years, compared with 42% in the “Low-Decline”

TABLE 3 Tests of fit indices and entropy of the growth mixture models.

Models	npm	AIC	BIC	SABIC	Entropy	Group 1 (%)	Group 2 (%)	Group 3 (%)
No growth	3	18,356	18,371	18,362	1.00	100		
Fixed effect models								
Linear	3	18,879	18,895	18,885	1.00	100		
Two class	6	18,060	18,091	18,072	0.81	25.4	74.6	
Three class	9	17,969	18,015	17,987	0.79	18.4	71.3	10.2
Quadratic	4	18,878	18,899	18,886	1.00	100		
Two class	8	18,057	18,099	18,074	0.81	25.5	74.5	
Three class	12	17,925	17,987	17,949	0.81	70.4	18.8	10.8
Fixed-and-Random effect models								
Linear	6	18,280	18,312	18,293	1.00	100		
Two class	10	17,882	17,934	17,902	0.67	63.2	36.8	
Three class	14	17,864	17,937	17,892	0.69	63.4	22.3	14.3
Quadratic	7	18,276	18,313	18,291	1.00	100		
Two class	11	17,877	17,934	17,899	0.67	63.2	36.8	
Three class	15	17,859	17,936	17,889	0.69	63.4	22.3	14.3

npm, number of parameters. Bold font indicates candidate models due to higher entropy (0.81). See main text for details.

TABLE 4 Estimates for linear two-class fixed growth mixture models.

	Low-decline (group 1)	High-increase (group 2)
N (%)	338 (25.4)	991 (74.6)
Average posterior probability of class membership	0.90	0.96
Fixed effects		
Latent intercept (SE)	6.02 (0.12)***	8.38 (0.06)***
Linear time effect (SE)	−0.99 (0.09)***	0.22 (0.05)***

SE, standard error. *** $p < 0.001$.

group. Additionally, the “High-Increase” group has a higher proportion of individuals with higher education (secondary school and above 53% vs. 34%), having a spouse (85% vs. 72%), full-time job (58% vs. 34%), and no financial difficulties (63% vs. 34%).

In terms of health factors, the “High-Increase” group has better-perceived health (55% vs. 33%), fewer diseases (1.12 vs. 1.55), fewer unhealthy behaviors (1.03 vs. 1.10), and higher cognitive function scores (5.09 vs. 4.51). They also have higher participation rates in social activities (51% vs. 37%) and volunteering (12% vs. 6%). Moreover, 92% of the “High-Increase” group feel self-valuable, and 90% received substantial family support, compared with 82 and 75% in the “Low-Decline” group.

Predictors of subjective well-being trajectories

Compared with the “Low-Decline” group, the “High-Increase” group consistently showed some significant predictors across the three stages. These predictors included higher education levels (OR = 1.73–2.11, 1.65–2.12, 1.77–2.17, respectively), better self-rated health (OR = 2.82–3.64, 1.89–3.55, 2.76–3.17, respectively), fewer financial

difficulties (OR = 0.45, 0.33, 0.20, respectively), more social activity participation (OR = 1.43, 1.88, 1.50, respectively), and more substantial family support (OR = 1.65, 2.20, 2.26, respectively).

However, some factors were only presented in specific stages of the retirement transition. For example, in the pre-retirement stage, compared with the “Low-Decline” group, significant predictors of the “High-Increase” group included having a full-time job (OR = 1.50) and possessing high self-perceived values (OR = 1.38). In the transition stage, some factors became significant, including having a partner (OR = 1.56), fewer diseases (OR = 0.85), and fewer unhealthy behaviors (OR = 0.81). In the post-retirement stage, volunteering (OR = 2.24) emerged as a significant predictor of the “High-Increase” group. Notably, gender, age, and memory recall were not associated with subjective well-being in any stage of retirement transition. Additionally, based on our results, retirees in 2011 were more likely to report increased well-being (OR = 2.04), indicating that the most recent retirees enjoyed higher levels of subjective well-being (Table 6).

Discussion

This study used a latent growth mixture model to differentiate the relationships between the trajectories of subjective well-being and the experiences with changing retirement resources. We explored life experiences at three stages, pre-retirement, transition into retirement, and post-retirement, to understand how various factors contribute to successful retirement transitions.

Heterogeneity in subjective well-being trajectories

Our study identified only two distinct linear trajectories of subjective well-being among Taiwanese retirees: a “High-Increase” group (75%) and a “Low-Decline” group (25%). This finding partially

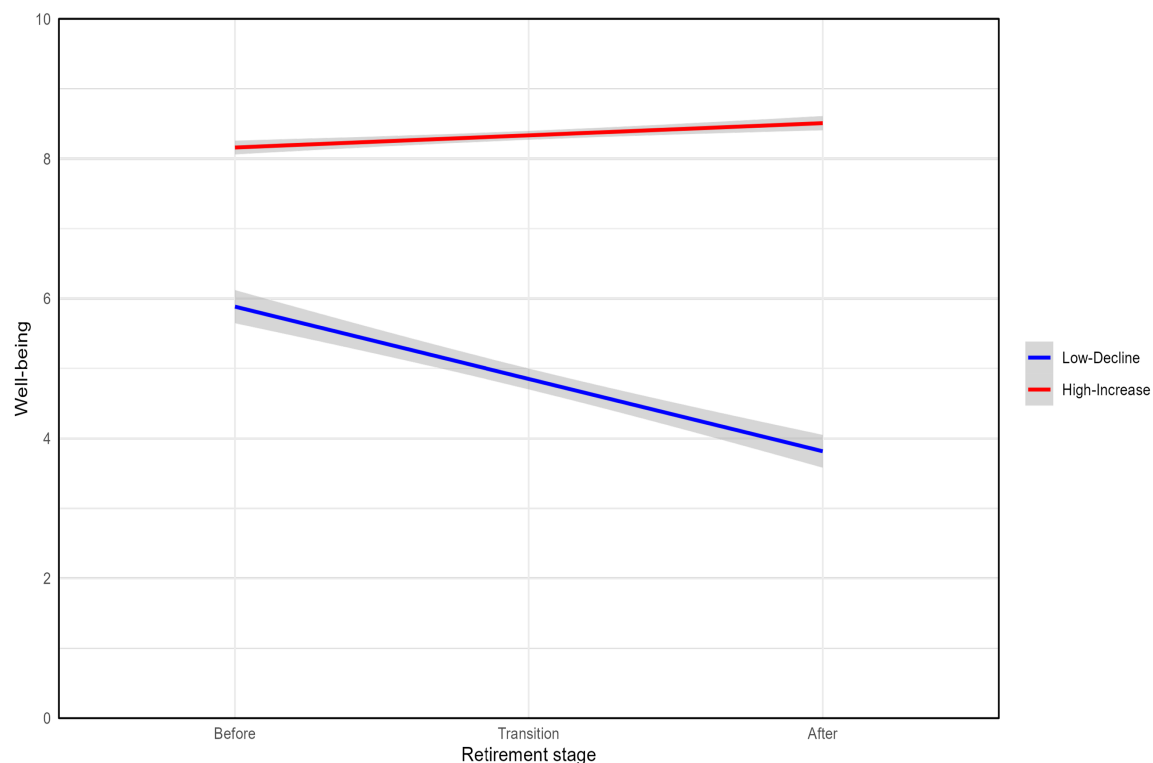


FIGURE 3
Trajectories of subjective well-being.

aligns with our hypothesized patterns, though with fewer distinct trajectories than initially anticipated. While Western studies typically identify three or more trajectory groups (Heybroek et al., 2015; Pinquart and Schindler, 2009; Wang, 2007), our results suggest a more polarized pattern of retirement adaptation in Taiwan's sociocultural context.

The predominant "High-Increase" group combines elements of our hypothesized "Stable but Gradually Declining" and "Increasing Well-being" patterns. Contrary to our expectation that most retirees would experience stability followed by a gradual decline, we found that most Taiwanese retirees demonstrated modest improvement in subjective well-being during and after retirement. This suggests that the influence of family-centered support structures and traditional "Middle Way" (zhongyong) values in Taiwan may provide stronger protective effects than anticipated, enabling most retirees to experience retirement as a positive life transition rather than a challenging one.

The "Low-Dcline" group (25%) aligns with our hypothesized "Decreasing Well-being" pattern. These retirees experienced deteriorating subjective well-being, confirming our hypothesis that a subset of Taiwanese retirees face significant challenges when they lack sufficient resources across multiple domains. This finding highlights the vulnerability of certain retirees in Taiwan's rapidly transforming socioeconomic landscape, particularly when traditional support systems are unavailable.

Our supplementary analyses explored a three-class model with "Low-Increase" (10.8%), "Low-Dcline" (18.8%), and "High-Stability" (70.4%) groups. However, methodological considerations, including classification precision and sample size stability, led us to adopt the more robust two-class solution. The consistency between our two-class findings and the hypothesized patterns suggests that while the specific

number of trajectories differs, the data supports the underlying adaptation mechanisms we proposed (refer to the [Supplementary file](#)).

Resources influencing well-being trajectories

Our findings support the hypothesized framework regarding how different resources influence well-being trajectories across the three transition stages. Particularly noteworthy is how the relative importance of various resources shifted during retirement, revealing distinct adaptation patterns characteristic of Taiwan's unique context.

Family emotional resources emerged as critical during the retirement transition, strengthening their influence compared with pre-retirement. Having a partner significantly increases the likelihood of positive well-being. Specifically, it enhances this likelihood by 16% from pre-retirement to the transition phase and by an additional 22% from the transition phase to post-retirement. Similarly, family support boosts this likelihood by 33% during the transition and continues to have a strong influence afterward. These findings support our central hypothesis that in Taiwan's family-centered cultural context, emotional support from family members serves as a crucial buffer against retirement-related challenges, potentially compensating for limitations in other resources.

We have identified a significant transformation in the sources of family support and social engagement during retirement. In the early stages, the perceived self-worth derived from family was crucial in enhancing well-being; however, this influence diminished in later stages. In contrast, the impact of volunteering surged, accounting for

TABLE 5 Distribution of pre-retirement characteristics by trajectory groups.

Variables	Low-decline (N = 338)	High-increase (N = 991)	<i>p</i> -value
	n (%)	n (%)	
Sex			0.9
Male	249 (73.7)	726 (73.3)	
Female	89 (26.3)	265 (26.7)	
Age			<0.001
50–64	131 (42.0)	455 (55.2)	
65+	181 (58.0)	369 (44.8)	
Education			<0.001
Illiteracy	65 (19.2)	67 (6.8)	
Literary/Primary	159 (47.0)	404 (40.8)	
Secondary and higher	114 (33.7)	520 (52.5)	
Partner			<0.001
No	94 (27.8)	148 (14.9)	
Yes	244 (72.2)	843 (85.1)	
Self-rated Health			<0.001
Poor	125 (37.9)	114 (11.6)	
Fair	96 (29.1)	328 (33.4)	
Good	109 (33.0)	541 (55.0)	
Number of Disease (M ± SD)	1.55 ± 1.57	1.12 ± 1.24	<0.001
Unhealthy behaviors (M ± SD)	1.10 ± 0.98	1.03 ± 0.99	0.2
Memory recall (M ± SD)	4.51 ± 2.26	5.09 ± 1.99	<0.001
Full-time Job			<0.001
No	223 (66.0)	420 (42.4)	
Yes	115 (34.0)	571 (57.6)	
Financial difficulty			<0.001
No	200 (62.9)	829 (84.8)	
Yes	118 (37.1)	149 (15.2)	
Social activities			<0.001
No	214 (63.3)	483 (48.7)	
Yes	124 (36.7)	508 (51.3)	
Volunteering			0.002
No	316 (94.3)	871 (88.3)	
Yes	19 (5.7)	115 (11.7)	
Self-value			<0.001
None/Some	58 (18.2)	75 (7.7)	
A lot	261 (81.8)	903 (92.3)	
Family Support			<0.001
Little/Some	80 (25.0)	101 (10.3)	
A lot	240 (75.0)	876 (89.7)	
Retirement Year			<0.001
1999	157 (46.4)	401 (40.5)	
2003	82 (24.3)	169 (17.1)	
2007	70 (20.7)	259 (26.1)	
2011	29 (8.6)	162 (16.3)	

Bold values indicate statistically significant results ($p < 0.05$).

TABLE 6 Logistic regression models for predicting the membership.

Variables (ref = “Low-Decline” group)	Pre-retirement		Transition		Post-retirement	
	OR	95%CI	OR	95%CI	OR	95%CI
Sex (ref = Male)						
Female	1.07	0.70, 1.64	1.12	0.75, 1.70	1.10	0.72, 1.69
Age (ref = 50–64)						
65+	0.89	0.61, 1.30	0.95	0.66, 1.37	0.93	0.61, 1.40
Education (ref = Illiteracy)						
Literary/Primary	1.73	1.07, 2.80	1.65	1.00, 2.70	1.77	1.03, 3.02
Secondary and higher	2.11	1.26, 3.54	2.12	1.24, 3.60	2.17	1.21, 3.89
Partner (ref = No)						
Yes	1.34	0.91, 1.96	1.56	1.08, 2.26	1.90	1.32, 2.75
Self-rated Health (ref = Poor)						
Fair	2.82	1.86, 4.30	1.89	1.30, 2.77	2.76	1.86, 4.13
Good	3.64	2.36, 5.65	3.55	2.31, 5.49	3.17	2.04, 4.97
Number of Disease	1.00	0.89, 1.13	0.85	0.76, 0.95	0.88	0.79, 0.98
Unhealthy behaviors	0.90	0.76, 1.07	0.81	0.68, 0.96	0.91	0.75, 1.11
Memory Recall	0.97	0.90, 1.05	0.98	0.91, 1.06	1.04	0.96, 1.14
Full-time Job (ref = No)						
Yes	1.50	1.05, 2.16	1.04	0.71, 1.53	0.70	0.44, 1.10
Financial Difficulty (ref = No)						
Yes	0.45	0.32, 0.65	0.33	0.24, 0.47	0.20	0.14, 0.28
Social Activities (ref = None)						
Yes	1.43	1.03, 1.98	1.88	1.36, 2.63	1.50	1.06, 2.11
Volunteering (ref = No)						
Yes	1.25	0.69, 2.38	1.58	0.89, 2.95	2.24	1.15, 4.72
Self-value (ref = None/Some)						
A lot	1.38	1.00, 1.91	1.49	1.08, 2.06	1.36	0.97, 1.92
Family Support (ref = Little/Some)						
A lot	1.65	1.09, 2.49	2.20	1.47, 3.29	2.26	1.47, 3.45
Retirement Wave (ref = 1999)						
2003			0.92	0.61, 1.41		
2007			1.28	0.84, 1.97		
2011			2.04	1.20, 3.55		
	AIC = 1,076		AIC = 1,115		AIC = 983	

Bold values indicate statistically significant results ($p < 0.05$).

approximately 42% of the positive changes observed. This compelling shift underscores our hypothesis about the transition from reliance on family support to a deeper engagement with the community. It highlights that successful adaptation to retirement in Taiwan is not only about receiving familial support but also about actively participating in social activities. This evolution marks a powerful reconstruction of identity and sources of value after leaving the workforce, underscoring the importance of community involvement in shaping a fulfilling retirement (Haslam et al., 2018; Van Solinge and Henkens, 2008).

The changing role of employment status provided further support for our theoretical framework. While full-time employment strongly predicted higher well-being before retirement, this effect disappeared during and after the transition (Heybroek et al., 2015; Pinquart and

Schindler, 2007). This finding challenges traditional continuity theory, which suggests that maintaining pre-retirement activities and roles is essential for successful adaptation. Instead, our results indicate that well-being trajectories among Taiwanese retirees are primarily influenced by emotional and social resource allocation rather than occupational continuity.

Physical and cognitive resources demonstrated varied patterns in their influence on well-being trajectories. Health showed dynamic changes consistent with our resource allocation framework, with retirees having fewer chronic illnesses experiencing approximately 15% greater well-being advantages during the transition period compared to pre-retirement. This highlights the critical role of physical health in successful adaptation. Education level, reflecting a

life course perspective of cumulative advantage, consistently predicted well-being trajectories across all three-time points, with its influence remaining stable throughout retirement. This stability underscores education's enduring protective effect. Interestingly, cognitive resources failed to independently predict well-being trajectories after controlling for education, suggesting that education level may be capturing the influence of cognitive abilities (Lövdén et al., 2020).

The historical context of retirement timing revealed an important temporal trend. The later the retirement year, the greater the likelihood of belonging to the “High-Increase” group, with a clear dose–response effect across retirement cohorts from 1999 to 2011. This finding reflects the evolving retirement landscape in Taiwan, with more recent retirees benefiting from improved institutional arrangements and support systems (Drewelies et al., 2019; Gerstorf et al., 2020).

Overall, our findings regarding resource changes across three time points strongly support our hypothesis that in Taiwan's unique sociocultural context, family emotional resources and social participation play decisive roles in successful retirement adaptation. Despite the economic challenges often associated with retirement, these social and emotional factors remain crucial determinants of well-being trajectories in Taiwan's family-centered society.

Study strengths

This study showed several important strengths that combine theoretical foundations with methodological rigor. First, grounded in the resource-based dynamic model of retirement adjustment, we comprehensively explored five types of resources—physical, financial, cognitive, emotional, and social—across three critical stages: pre-retirement, transition to retirement, and post-retirement. This theoretically driven, stage-sensitive approach allowed us to systematically examine how different resource types influence well-being trajectories and how their relative importance shifts across retirement phases. It offers a dynamic understanding of adaptation processes within Taiwan's unique cultural context.

Second, we utilized longitudinal data from a representative sample of Taiwanese adults, which is particularly valuable for testing our theoretical propositions about retirement trajectories. Compared with other convenience or regional samples, our study used a nationally representative sample, providing more generalizable findings and minimizing sample selection bias. Third, employing latent growth mixture modeling (LGMM) allowed us to empirically identify distinct patterns of subjective well-being changes over time. This advanced modeling technique captured different subgroup trends through unique intercepts and slopes, providing a nuanced understanding of the diverse experiences of retirees that simple aggregate analyses might miss. Lastly, our measurement of subjective well-being using a well-constructed scale rather than a single item improved the reliability and validity of our dependent variable, allowing for more precise trajectory identification.

These strengths powerfully emphasize the theoretical richness and empirical rigor of our study, creating a compelling foundation for understanding retirement adaptation within diverse cultural contexts.

Study limitations

Although this study provides valuable insights into the trajectories of subjective well-being around retirement, it still faces several

limitations due to the constraints of the data source. The Taiwan Longitudinal Study on Aging (TLISA) was not specifically designed to examine retirement transitions and well-being, thus lacking several important predictors. For instance, the dataset did not include key psychological variables, reasons for retirement (particularly whether retirement was due to poor health), pre-retirement working conditions, or the degree of control over retirement decisions. These missing factors could significantly influence well-being trajectories, as research has shown that work mastery affects pre-retirement outcomes and adaptation (Muratore and Earl, 2015), involuntary retirement impacts adjustment and satisfaction (Van Solinge and Henkens, 2008), and job types can moderate effects on subjective well-being (Henning et al., 2022). Thus, future research is suggested to consider the mechanism between these factors and resource changes to explore how they influence well-being trajectories.

The second limitation of this study arises from the intervals between data collection waves, as the survey was conducted every 4 years from 1996 to 2015. These gaps challenge our ability to precisely determine the exact timing of retirement, influencing the assessment of adjustment statuses. For instance, although all participants reported receiving a pension at the second survey point, retirement could have occurred immediately after the first survey or shortly before the second. This timing variation can result in different experiences and adjustments among participants, which are not accurately captured due to the timing of our surveys. This issue highlights the need for more frequent data collection or implementing a time-sensitive tracking method in future studies.

Third, our measurement of resources, while following common approaches in retirement research, captures only partial aspects of these theoretical constructs. For instance, our cognitive resource measure using memory tests, although widely used in previous studies (e.g., Celia et al., 2021; Hansson et al., 2018), represents just one dimension of cognitive functioning. Additionally, while having a spouse emerged as a significant factor in our study and could be considered a form of social resource, it cannot fully capture the complexity of social capital. Future studies should consider including broader measures such as social network size, interaction frequency, and relationship quality, as well as various aspects of cognitive functioning beyond memory tests.

Finally, the two identified retirement trajectories may not universally apply to other countries due to differences in cultural contexts and retirement policies. Nevertheless, our findings support the general principle that retirement adjustment is not a singular pathway or static state. Instead, it is a dynamic and ongoing process of transformation and adjustment, where different resources play varying roles across different stages. This insight highlights the importance of national and cultural heterogeneity in retirement research, especially in Asian countries where retirement research is relatively scarce.

Practical implications and policy recommendations

Based on our findings, we propose several important policy implications. Despite Taiwan's decreasing family size and the rise of single- or double-person households driven by rapid aging and low birth rates, our findings underscore the irreplaceable value of family emotional resources during the transition into retirement. Therefore,

it is imperative that policies should focus on enhancing family support systems instead of relying on the assumption that institutional care can fully substitute for the vital roles traditionally played by families. Initiatives that promote intergenerational communication, empower family caregivers, and strengthen family bonds are essential to preserving these crucial emotional supports during the pivotal early retirement phase.

Second, our findings highlight the critical role of social engagement throughout retirement, with volunteering becoming increasingly significant in later stages. Policy initiatives should expand accessible opportunities for meaningful community participation and structured volunteering programs that accommodate varying health conditions, allowing retirees to maintain social connections and continue making valuable contributions to society.

Third, our findings challenge current international trends promoting extended workforce participation among older adults. While many countries address labor shortages by encouraging post-retirement employment, our results show that continuing full-time work had no significant positive effect on well-being. This suggests that the nature of work itself may not always be enjoyable; instead, policies should focus on creating voluntary and meaningful civic engagement activities that maintain productive value.

Fourth, early resource accumulation during middle age remains crucial, as our results demonstrate that initial resource levels significantly determine subsequent well-being trajectories. Therefore, policies should prioritize supporting diverse resource development during working years, including promoting higher education opportunities, stable employment, financial security, and programs that enhance self-worth and personal development.

By implementing these recommendations, societies can better address the challenges of demographic transitions while leveraging the essential role of emotional and social resources that our research identifies as key factors in maintaining high life satisfaction throughout retirement.

Lacking of contribution part

Contribution

This research makes several important contributions to retirement literature. First, this study advances the resource-based dynamic model by empirically identifying key predictive resources across three critical stages: pre-retirement, retirement transition, and post-retirement, determining which resources are most crucial when examined simultaneously. Second, our study compellingly highlights the significant differences in retirement adaptation patterns across cultural contexts. Notably, Taiwan exhibits two distinct trajectories, starkly contrasting the three or more commonly found in Western societies. This finding reveals how family structure and cultural values significantly shape retirement experiences. In Taiwan's unique context, family emotional resources serve as critical buffers during the transition period, while social participation through volunteering becomes increasingly essential later. This pattern reflects Taiwan's family-centered values and the importance of maintaining social contribution in later life. Fourth, our results show how Taiwan's institutional context influences adaptation, with the dose-response effect across retirement cohorts illustrating how evolving retirement systems have improved outcomes for recent retirees.

Conclusion

This study reveals distinctive retirement adaptation patterns in Taiwan characterized by two well-being trajectories—"High-Increase" (75%) and "Low-Decline" (25%). While economic resources maintain consistent importance across all transition stages, family emotional resources become more crucial during transition, followed by social resources growing increasingly influential in later stages. This temporal transformation reflects Taiwan's unique cultural context, where successful adaptation involves leveraging family networks and reconstructing identity through community engagement. Policymakers should focus on strengthening family support systems during early retirement while expanding opportunities for meaningful social participation later. Our research contributes to a culturally-informed understanding of retirement adaptation relevant to East Asian societies.

Data availability statement

The datasets presented in this article are not readily available due to privacy and confidentiality constraints imposed by the data-collecting organization. Requests to access the datasets should be directed to jenny13929@gmail.com.

Ethics statement

The studies involving humans were approved by Institutional Review Board of National Cheng Kung University Hospital (Approval No.: B-ER-112-498). The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

W-CH: Conceptualization, Data curation, Formal analysis, Methodology, Visualization, Writing – original draft, Writing – review & editing. N-CH: Supervision, Writing – review & editing, Conceptualization. SH: Resources, Supervision, Writing – review & editing.

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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.2025.1449442/full#supplementary-material>

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