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# Assessment of the Psychometric Properties of the Perceived Empathic and Social Self-Efficacy Scale in Chinese Adolescents

Yanhua Zhao[1], Jiahui Niu[1], Yuguo Wang[1], Ping Wang[2]

[1]School of Psychology, Henan University, Jinming Campus, Kaifeng, 475001, People's Republic of China; [2]Center for Teacher Education, School of Education Sciences, Henan University, Jinming Campus, Kaifeng, 475001, People's Republic of China

Correspondence: Ping Wang, Center for Teacher Education, School of Education Sciences, Henan University, Jinming Campus, Kaifeng, 475001, People's Republic of China, Tel +86 1833 7192 620, Fax +086 2388 1801, Email yz@vip.henu.edu.cn



**Purpose:** There is a burgeoning interest in nurturing adolescents' social and emotional skills, acknowledging the significant influence these abilities have on adolescents' social development and overall well-being. The Perceived Empathic and Social Self-Efficacy Scale (PESSE) emerges as a promising tool designed to capture adolescents' self-perceptions regarding their self-efficacy in empathic and social domains. This study seeks to investigate the psychometric properties of the Chinese Version of the Perceived Empathic and Social Self-Efficacy Scale (PESSE) by examining its factor structure, measurement invariance across gender and age groups, along with its predictive validity concerning adolescent subjective and social well-being.

**Participants and Methods:** A sample of 512 adolescents (233 boys, 265 girls) aged 10–16 years old (M = 12.69, SD = 1.49) from mainland China participated in this study. Confirmatory factor analysis (CFA) and multi-group CFA were employed to assess the two-factor structure and the measurement invariance of the PESSE across gender and age groups.

**Results:** The results demonstrate that the Chinese PESSE maintains robust psychometric properties as the original version, establishing its reliability (Cronbach's alpha for empathic self-efficacy scale was 0.82, for social self-efficacy scale was 0.85) and validity for assessing adolescents perceived empathic and social self-efficacy. Additionally, findings consistently highlight positive correlations between perceived empathic and social self-efficacy and indicators for adolescents' subjective well-being (self-esteem, positive and negative affect, and symptoms of depression and anxiety) and social well-being (perceived peer support online prosocial behavior, school connectedness, and social relationship).

**Conclusion:** This study supports that the PESSE is a valid and reliable instrument for assessing adolescent perceived empathic and social self-efficacy, underlining the importance of fostering empathic and social self-efficacy skills in adolescence.

**Keywords:** the perceived empathic and social self-efficacy scale, validity, measurement invariance, adolescents, well-being

## Introduction

Adolescence is a pivotal stage in human development marked by profound cognitive, emotional, and social changes.[1] During this period, adolescents are faced with the complex task of forging their identities, forming relationships, and developing a sense of competence in various life domains.[2] The extent to which adolescents perceive themselves as competent in various life domains becomes a critical aspect of their identity development.[3,4] Adolescents' beliefs about their ability to understand and relate to others significantly influence their interpersonal relationships.[5] Perceived self-efficacy in empathic and social domains has a profound influence on adolescents' overall well-being. Perceived empathic self-efficacy is the capacity to understand and respond to others' emotions, show sympathy, and be aware of how one's actions impact others' feelings, whereas perceived social self-efficacy involves the ability to communicate in groups, initiate social connections, and facilitate the integration of others into one's social circle.[2,6,7] Adolescents who possess higher levels of self-efficacy in these areas exhibit improved coping mechanisms in the face of challenges and tend to experience greater life satisfaction,[8] optimism, and happiness.[7,9–11] Therefore, understanding and measuring adolescent

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self-efficacy in empathic and social contexts warrants further attention from researchers and practitioners, particularly in China, a society that emphasizes interpersonal harmony.

## Tools Measuring Perceived Empathic and Social Self-Efficacy

To assess perceived empathic and social self-efficacy, Caprara et al introduced a tool consisting of two scales.[6] One is a 12-item Perceived Empathic Self-Efficacy Scale (PESE), which was designed to gauge the capacity to comprehend and respond to others' emotions, empathize with their perspectives, and consider the impact of one's actions on others. Another is a 14-item Perceived Social Self-Efficacy Scale (PSSE), to evaluates the ability to articulate one's views within a group, share personal experiences, organize social gatherings, navigate new social environments, and assist others in integrating into one's social circle. These two scales have been applied to investigate the connection between self-efficacy and the social development of adolescents.[12,13] Furthermore, during the literature review and analysis, we found that research on adolescent empathy in China primarily utilizes the Chinese version of the 20-item Basic Empathy Scale (BES), originally developed by Jolliffe and Farrington in 2006 and validated by Li et al in 2011.[14,15] This scale mainly assesses cognitive and affective empathy in adolescents. Additionally, Chinese scholars Wang and Su (2011) developed a 17-item Cognitive and Empathy Scale to evaluate the cognitive and affective empathy abilities of Chinese adolescents.[16] To date, no Chinese version of a scale specifically measuring adolescent empathy self-efficacy has been identified. The available Chinese version of the social self-efficacy scale is predominantly the 18-item scale developed by Smith and Betz in 1999 (The Scale of Perceived Social Self-Efficacy) and later revised by Meng and Fan,[17,18] which primarily measures university students' perceived self-efficacy in social behaviors. These Chinese adaptations are widely used in research involving Chinese samples, but their limitation lies in their length, which imposes a response burden on participants.

A brief Perceived Empathic and Social Self-Efficacy Scale (PESSE) was developed by Di Giunta et al based on the above-mentioned longer versions of PESE and PSSE.[7] This brief scale, containing 11 items (6 for PESE and 5 for PSSE), was validated using three college student samples from Italy, the US, and Bolivia. The findings confirmed the two-dimensional structure of the brief PESSE scale across these different cultural samples. Several studies utilizing the brief PESSE scale have consistently supported its two-factor structure of perceived empathic and social self-efficacy.[10] These studies, which include diverse participant groups spanning ages 14 to 80, have affirmed the reliability and validity of both PESE and PSSE.[10,19,20] However, despite some research involving adolescents, our understanding of the state and development of empathetic and social self-efficacy during adolescence remains limited. Therefore, testing the applicability of PESSE among adolescents will help us quickly understand their perceived empathy and social self-efficacy. Moreover, applying PESSE to different cultures may enable easier comparisons of empathy and social self-efficacy among youths and adolescents from various cultural backgrounds. For instance, Chinese adolescents, influenced by a collectivist culture, are likely to exhibit different traits compared to their Western peers, who are shaped by an individualist culture.

Furthermore, although there is a dearth of studies addressing the importance of testing measurement equivalence across groups,[21,22] it remains unclear whether PESE and PSSE exhibit similar measurement properties across gender and age groups of adolescents. Establishing measurement invariance is crucial for researchers to appropriately use and interpret scores based on these measures. Previous studies have provided evidence for possible group differences in PESE or PSSE across cultural and gender groups.[7,23,24] To understand and compare PESE and PSSE among different adolescent groups, establishing measurement invariance is a necessary prerequisite. Therefore, this study aims to examine the measurement invariance of PESE and PSSE across different age and gender groups and compare the latent mean differences of these groups.

## Perceived Empathic and Social Self-Efficacy and Adolescent Well-Being

To examine the validity of the PESSE, we examined the relationship between PESE and PSSE and well-being indicators. According to the World Health Organization (WHO), well-being is a positive state that enhances daily functioning and encompasses both quality of life and a sense of meaning and purpose in contributing to society. Well-being is well recognized as a multidimensional concept.[25,26] Subjective well-being (SWB) includes individuals' long-term levels of positive affect, an absence of negative affect, and overall life satisfaction, rather than merely the absence of negative emotions.[27] Additionally, a happy individual should also be characterized by high self-esteem and a broad range of intellectual abilities.[28] Social well-being, as a psychological construct, refers to an individual's cognitive evaluation of

the quality of their close interpersonal relationships, including those with family, peers, and school environments.[29] In this study, we combine meaningful components of well-being to represent its different dimensions.

In terms of subjective well-being, previous studies have found that perceived empathic self-efficacy is moderately positively correlated with self-esteem, efficacy in expressing positive emotions, and efficacy in managing negative emotions.[7,30] High perceived empathic self-efficacy in adolescents is prospectively associated with low depression and low climate change anxiety.[2,31] It was also found in an intervention study that subjects' higher levels of perceived empathic and social self-efficacy were accompanied by lower levels of anxiety symptoms.[32] Similarly, relevant findings suggest that perceived social self-efficacy is positively correlated with self-esteem, positive affect, mental health, and negatively correlated with negative affect, depressive symptoms, and social anxiety.[17,18,33–36]

In terms of social well-being, perceived empathic and social self-efficacy were significantly positively correlated with friend support, social support, prosocial behavior, and online prosocial behavior, respectively.[10,12,20,37,38] Previous research has shown that empathy self-efficacy and social self-efficacy are necessary to develop the social skills needed to build friendships, as well as to strengthen student-teacher relationship, and community integration, employment, and job retention.[20,39,40] In addition, some studies have found that self-efficacy and self-efficacy in different fields are significantly positively correlated with school connectedness.[41–43] In a recent study, researchers found that students with higher empathic self-efficacy reported more helping behavior when they perceived their peer's achievement as a result of effort, compared to students with lower empathic self-efficacy.[44] Based on existing evidence, we also wanted to investigate how perceived empathic and social self-efficacy assessed by PESSE could help explain adolescents' subjective and social well-being.

## Assessing Perceived Empathic and Social Self-Efficacy in Chinese Adolescence

Chinese society places a strong emphasis on relationships, which permeate all aspects of life. Skillfully navigating these relationships is essential for personal development.[45] In such a cultural environment, young people are expected to develop competencies in managing social relationships and learn to navigate social interactions to maintain social harmony.[46] These cultural nuances may influence adolescents' perceptions of self-efficacy, as adolescents often evaluate their abilities based on their capacity to sustain social harmony and gain approval from peers and significant others, which may lead to differing levels of confidence compared to those in more individualistic cultures. In a recent cross-cultural study,[47] the empathy had a significant impact on the mental well-being of Chinese but not Canadian adolescents, empathy exerted a significantly stronger effect on friendship quality for Chinese than for Canadian adolescents, whereas interpersonal trust had a significantly stronger impact on friendship quality among Canadian than among Chinese adolescents. These cultural differences informed further investigation of adolescents' empathy and social functions.

Recent findings from the OECD Survey on Social and Emotional Skills have underscored the predictive value of social and emotional skills, as adaptable personal traits, for key life outcomes in adolescents. The findings indicate that students' social and emotional skills are associated with better life outcomes, such as academic achievement, higher life satisfaction, healthier behaviors, reduced anxiety related to tests and classes, and more ambitious career aspirations.[48] Similar predictive outcomes have been observed in adolescent samples from China who participated in this global survey.[49] Moreover, empathy and general self-efficacy have been linked to depressive symptoms in Chinese adolescents.[50–53] Several studies have demonstrated that empathy-focused interventions can reduce depressive symptoms in adolescents.[54,55] A recent meta-analysis reported the prevalence of depressive symptoms among secondary and university students in China to range between 24.5% and 51.9%.[56,57] Given the rising prevalence of depressive symptoms among Chinese adolescents in recent years, effective prevention and intervention programs targeting depression could greatly benefit from reliable screening tools that assess adolescent empathy and social self-efficacy. Furthermore, several studies have identified significant correlations between empathy and social self-efficacy and various aspects of well-being among Chinese adolescents, including loneliness, social exclusion, online social behavior, and prosocial behavior.[58–61] Therefore, examining the Chinese version of the PESSE is crucial for understanding the emotional and social well-being of adolescents within the context of Chinese society.

## The Present Study

This study aims to assess the psychometric properties of the PESSE scale in a sample of Chinese adolescents. Initially, we scrutinized the structural validity of the Chinese iteration of the PESSE scale to ascertain its alignment with the

established two-factor structure observed in previous samples from various cultures. Subsequently, we investigated the measurement invariance of the PESSE scale across gender and age groups. Finally, we explored the correlation patterns between PESE and PSSE with measures of subjective well-being (including self-esteem, positive and negative affect, depressive symptoms, and anxiety symptoms) and social well-being (comprising friendship support, online prosocial behavior, school connectedness, and social relationships).

# Materials and Methods

## Participants and Procedure

Before data collection, the required power and sample size were estimated using the RMSEA approach proposed by Kim.[62] The degrees of freedom for the proposed models were calculated (df = 43) to determine the minimum necessary sample size. To achieve 80% power for rejecting the null hypothesis of poor model fit (RMSEA $\leq$ 0.05) at a 5% significance level, the optimal sample size was determined to be 266 participants. The study recruited a total of 512 adolescents, including 233 boys and 265 girls, with 14 participants not reporting their gender. Participants ranged in age from 10 to 16 years (M = 12.69, SD = 1.49). Of the total sample, 222 were 4th- and 5th-grade students from an Urban Primary School, while 290 were 7th- and 8th-grade students from an Urban junior high school. Both schools are public institutions located in the same city in central mainland China and were selected as convenient samples. The distribution of age groups was as follows: 10 years old (16%), 11 years old (21.3%), 12 years old (7.2%), 13 years old (15.2%), 14 years old (31.8%), 15 years old (6.8%), and 16 years old (0.6%). Additionally, 5 participants (1%) did not provide their age information. Among the participants, 96.5% of them reported their ethnicity as Han Chinese, 3.6% as a minority.

Participants completed a questionnaire during after-school programs in the Spring semester of 2023. The survey was administered in a classroom setting under the supervision of the university research team, utilizing a self-report format. Primary school students were provided with a packet that included the PESSE scale and measures of subjective well-being, while junior high school students received a packet containing the PESSE scale alongside instruments assessing social well-being. The survey was anonymous to ensure confidentiality, and participants were informed of their voluntary participation rights. Consent letters were obtained from each participant and their parents. Each participant received a small gift as appreciation. Ethical approval was obtained from the authors' University Research Ethics Committee.

## Measurement

### Perceived Empathic and Social Self-Efficacy

The Perceived Empathic and Social Self-Efficacy Scale containing 11 items (6 items for PESE, 5 items for PSSE) was selected to assess adolescents perceived self-efficacy in empathic and social domains. The English version of the PESSE underwent a standard translation and back-translation process. Three professional psychologists and two school teachers reviewed the items and approved the pre-test version. This pre-test version was then administered to 17 students (10 primary school and 7 middle school students) to assess their comprehension of the items. Following minor adjustments in wording, the final Chinese version of the PESSE was developed. The scale was rated on a 5-point Likert-type scale ranging from 1 (*not well at all*) to 5 (*very well*), a higher score indicated a higher self-efficacy in empathic and social domains. The reliability of the scale was demonstrated by a Cronbach's alpha of 0.82 for the PESE scale and 0.85 for the PSSE.

### Subjective Well-Being

The following scales were used as indicators of subjective well-being. *Self-esteem*. The Chinese Rosenberg's Self-Esteem Scale (SES) was used to assess students' self-worth with 10 items.[63] The scale was rated on a 4-point Likert-type scale from 1 (*strongly disagree*) to 4 (*strongly agree*). The Cronbach's alpha for SES was 0.75. *Positive and negative affect*. Participants' affective states over the past one to two weeks were assessed using a Chinese version of the Positive and Negative Affect Scale.[64] This 10-item scale comprises two dimensions: positive affect (eg, enthusiastic) and negative affect (eg, scared). Participants rated their feelings on a 5-point Likert scale ranging from 1 (*almost none*) to 5 (*extremely many*). The reliability of the scale was demonstrated by a Cronbach's alpha of 0.89 for the positive affect scale and 0.77 for the negative affect. *Depressive symptoms*. The Chinese Centre for Epidemiological Studies Depression Scale for Children (CES-DC) was used to assess students' depressive symptoms during the past one to two weeks.[65] The 20-item scale was rated on a 4-point Likert-type

scale from 1 (*not at all*) to 4 (*a lot*). The Cronbach's alpha for CES-DC was 0.85. *Anxiety symptoms*. Three subscales from the Chinese Spence Children's Anxiety Scale (SCAS) were used to evaluate the children's anxiety symptoms.[66] They were separation anxiety (6 items), social anxiety (6 items), and generalized anxiety (6 items) subscale. The scale was rated on a 4-point scale: 0 (*Never*), 1 (*Sometimes*), 2 (*Often*), 3 (*Always*). The total mean score of these three dimensions was used to indicate participants' symptoms of anxiety. The Cronbach's alpha for all items was 0.94.

### Social Well-Being

The following scales were used as indicators of social well-being. *Perceived peer support*. The 4-item Friends' support subscale in the Chinese Version of Perceived Social Support Scale was used to assess students' perceived support from peers (eg, "My friends try to help me").[67] The scale was rated on a 5-point Likert-type scale from 1 (*extremely disagree*) to 5 (*completely agree*). The Cronbach's alpha for the scale was.83. *Online prosocial behavior*. A brief version of the Internet Altruistic Behavior Scale (IABS) was utilized to evaluate students' online prosocial behavior. The original IABS comprises 30 items,[68] which were reduced to 12 items in this study to lessen the response burden on participants. Similar to the original version, the brief IABS was rated on a 5-point scale, encompassing online prosocial behaviors across the domains of internet support, internet guidance, internet sharing, and internet reminding. Confirmatory factor analysis was conducted to validate the one-factor structure of the brief IABS, which demonstrated a good model fit, $\chi^2 = 180.55$, df = 54, CFI = 0.903, RMSEA = 0.090 [0.076, 0.105], SRMR = 0.049. The Cronbach's alpha for the brief IABS was 0.91. *School connectedness*. The Psychological Sense of School Membership Scale-Brief (PSSM-Brief) was used to assess their School connectedness, which consisted of 11 items and was scored with a 5-point Likert-type, with choices ranging from 1 (*not at all true*) to 5 (*completely true*) and a higher score indicating more school connectedness.[68] The scale has demonstrated strong psychometric properties in samples of Chinese adolescents.[69] The Cronbach's alpha for this scale was 0.91. *Social relationship*. The present study used a subscale of friendly relationship from the Chinese Multiple Happiness Questionnaire to examine the social relationship of secondary school students.[64] The subscale consists of 3 items, rated on a 6-point scale ranging from 1 (*completely disagree*) to 6 (*completely agree*). Higher scores indicate more secure and enduring interpersonal relationships. The Cronbach's alpha for this scale was 0.87.

## Data Analyses

We initially screened the data set and identified that less than 1% of the values were missing. These missing values were subsequently replaced using the expectation maximization (EM) method. The mean differences of the variables before and after the replacement of the missing values were less than 0.001. All structural model estimations were carried out using *Mplus* 8.3. We initially conducted an exploratory factor analysis (EFA), testing both a one-factor and a two-factor model, utilizing Geomin rotation to determine the optimal number of factors to retain. Then, we examined the two-factor structure of PESSE using confirmatory factor analysis (CFA) and conducted multi-group analyses to test for measurement invariance across gender and age groups. The following model fit indices were employed in this study: Comparative Fit Index (CFI), Tucker–Lewis Index (TLI), Root-Mean-Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR). According to the cutoff values suggested by Hu and Bentler,[70] a CFI $\geq$ 0.95, RMSEA $\leq$ 0.06, and SRMR $\leq$ 0.08 indicate an excellent model fit. For model comparison, changes in CFI > 0.01 and changes in RMSEA > 0.015 or SRMR > 0.030 (with metric invariance and scalar invariance changes > 0.015) indicate significant model changes.

# Results

## Factor Structure

Based on the theoretical framework of the PESSE, we conducted an exploratory factor analysis (EFA) using *Mplus* 8.3 to evaluate the model fit for one- and two-factor solutions. The two-factor EFA model ($\chi^2 = 135.04$, df = 34, $p = 0.001$, CFI = 0.955, RMSEA = 0.076, 90% CI [0.063, 0.090], SRMR = 0.030) demonstrated superior fit compared to the one-factor model ($\chi^2 = 461.06$, df = 44, $p < 0.001$, CFI = 0.813, RMSEA = 0.136, 90% CI [0.125, 0.147], SRMR = 0.075). In the two-factor model, all items loaded significantly onto their intended factors ($\lambda$s > 0.57), and no items exhibited cross-loadings greater than 0.30 (see Table 1). These results support the two-factor structure of the PESSE, as confirmed through subsequent confirmatory factor analysis in the present data.

**Table 1** Factor Loadings for the Two-Factor Exploratory Factor Analysis Model

| Items | PESE | PSSE |
|---|---|---|
| 1. Read your friends' needs? | **0.59** | 0.09 |
| 2. Recognize when someone wants comfort and emotional support, even if (s)he does not overtly exhibit it? | **0.75** | −0.07 |
| 3. Recognize whether a person is annoyed with you? | **0.50** | −0.01 |
| 4. Recognize when a person is inhibited by fear? | **0.58** | 0.07 |
| 5. Recognize when a companion needs your help? | **0.57** | 0.19 |
| 6. Recognize when a person is experiencing depression? | **0.79** | −0.001 |
| 7. Express your opinion to people who are talking about something of interest to you? | 0.01 | **0.72** |
| 8. Work or study well with others? | −0.01 | **0.80** |
| 9. Help someone new become part of a group to which you belong? | 0.12 | **0.67** |
| 10. Share an interesting experience you had with other people? | 0.12 | **0.60** |
| 11. Actively participate in group activities? | −0.03 | **0.75** |

**Note**: The factor loadings for the target factor are highlighted in bold.
**Abbreviations**: PESE, perceived empathic self-efficacy; PSSE, perceived social self-efficacy.

The proposed two-factor model of PESSE was estimated in *Mplus* 8.3 with a robust maximum likelihood (MLR) which did not assume the multivariate normality of data. The fit indices for all measurement models are presented in Table 2. As expected, the proposed model provided an acceptable model fit, $\chi^2 = 127.72$, df = 43, $p < 0.001$, CFI = 0.948,

**Table 2** Model Fit

| Model | $\chi^2$ | *df* | CFI | RMSEA (90% CI) | SRMR | ΔCFI | ΔRMSEA | ΔSRMR |
|---|---|---|---|---|---|---|---|---|
| Total Sample | 127.72 | 43 | 0.948 | 0.062 [0.050, 0.075] | 0.040 | | | |
| Measurement invariance across gender | | | | | | | | |
| Boys (*n* = 233) | 77.66 | 43 | 0.958 | 0.059 [0.037, 0.079] | | | | |
| Girls (*n* = 265) | 94.43 | 43 | 0.934 | 0.067 [0.049, 0.068] | | | | |
| Configural model | 171.079 | 86 | 0.947 | 0.063 [0.049, 0.077] | 0.047 | | | |
| Metric model | 180.303 | 95 | 0.947 | 0.060 [0.047, 0.073] | 0.056 | 0.000 | −0.003 | 0.009 |
| Scalar model | 195.024 | 104 | 0.943 | 0.059 [0.046, 0.072] | 0.057 | −0.004 | −0.001 | 0.001 |
| Measurement invariance across age | | | | | | | | |
| 10–12 (*n* = 228) | 59.48 | 43 | 0.981 | 0.041 [0.004, 0.065] | 0.037 | | | |
| 13–16 (*n* = 279) | 84.94 | 43 | 0.935 | 0.059 [0.040, 0.078] | 0.050 | | | |
| Configural model | 143.25 | 86 | 0.963 | 0.051 [0.036, 0.066] | 0.044 | | | |
| Metric model | 153.33 | 95 | 0.962 | 0.049 [0.034, 0.063] | 0.055 | 0.001 | −0.002 | 0.011 |
| Scalar model | 196.85 | 104 | 0.940 | 0.059 [0.047, 0.072] | 0.070 | −0.022 | 0.010 | 0.015 |
| Modified scalar model | 171.13 | 102 | 0.955 | 0.052 [0.038, 0.065] | 0.061 | −0.007 | 0.003 | 006 |

**Abbreviations**: $\chi^2$, chi square; *df*, degrees of freedom; CFI, Comparative fit index; RMSEA, root mean square error of approximation; 90% CI, 90% confidence interval for the RMSEA; SRMR, standardized root-mean-square residual.

RMSEA = 0.062, 90% CI [0.050, 0.075], SRMR = 0.040. Factor loadings for PESE (λ = 0.49–0.78, M = 0.65) and PSSE (λ = 0.69–0.79, M = 0.74) were moderate to high, indicating two well-defined factors (see Figure 1). The factor correlation between PESE and PSSE was 0.68. The composite reliability was demonstrated by an omega coefficient of 0.82 for the PESE and 0.85 for the PSSE, indicating robust internal consistency for both scales. Compared to previous studies that utilized samples of adolescents from Italy, the United States, and Bolivia,[7] the Chinese version of the PESSE demonstrated higher factor loadings and improved internal consistency.

## Measurement Invariance Across Gender and Age Groups

We conducted multiple group analyses to test the measurement invariance across gender and age groups. For gender groups, the proposed model provided an acceptable model fit for both boys and girls. The measurement invariance tests indicated that the configural, scalar (factor loadings and residuals invariance), and strict models (factor loadings, residuals, and errors invariance) for gender groups showed adequate fit to the data (see Table 2). Compared with configural models, the detected change of CFIs and RMSEAs in the strict model or scalar model were lower than the cutoff value (ΔCFI < 0.01, ΔRMSEA < 0.015), supporting the structure invariance of the PESSE across gender groups.[70] Based on the measurement invariance across gender, the latent means of PESE and PSSE were compared between boys and girls. The latent means of boys were set to zero in the strict invariance model, and the latent mean values of girls were then compared. Findings showed that girls appeared to encompass similar level of PSSE to boys (point estimate = −0.03, $p < 0.05$) but higher PESE than boys (point estimate = 0.12, $p < 0.05$).

As for age groups, the proposed model provided an acceptable model fit for both early (10–12) and middle (13–16) adolescent groups. The measurement invariance tests indicated that the configural, scalar (factor loadings and residuals invariance), and strict models (factor loadings, residuals, and errors invariance) for age groups showed adequate fit to the data (see Table 2). Compared with configural models, the detected change of CFI and RMSEA in the strict model were lower than the cutoff value (ΔCFI < 0.01, ΔRMSEA < 0.015). However, compared with the metric model for age groups, the scalar model showed a decreased CFI value of 0.022 and a decreased SRMR value of 0.015, which suggested that the fit of the scalar model was significantly worse than that of the metric model. To test for partial scalar invariance, we found that the change in model fit between the metric invariance model and the partial scalar invariance model became non-significant only when the equality constraint was lifted from the intercept parameters associated with Item 6 (PESE) and Item 10 (PSSE). This finding suggests that partial scalar invariance holds across different age groups.

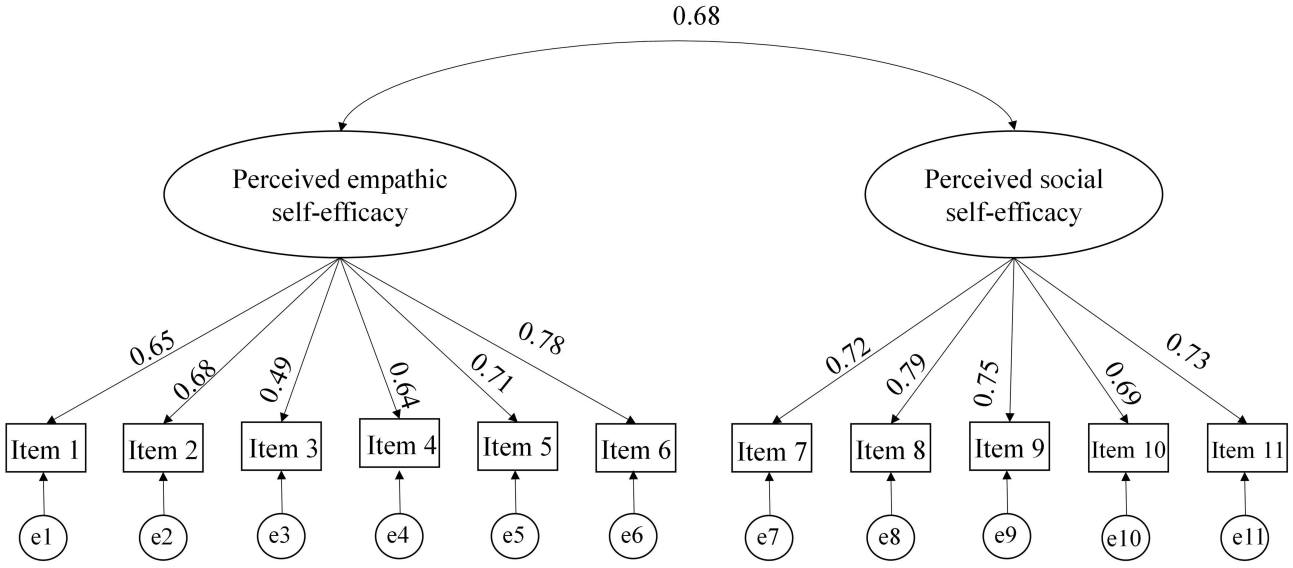


**Figure 1** The two-factor model for the Perceived Empathic and Social Self-efficacy Scale.

**Table 3** Correlations and Regression Analyses

| Variables | *M* | *SD* | PESE | PSSE | PESE | | | PSSE | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | $R^2$ | β | t | $R^2$ | β | t |
| *Subjective well-being* (Primary school students, *n* = 222) | | | | | | | | | | |
| Self-esteem | 3.17 | 0.45 | 0.29** | 0.34** | 0.12 | 0.32 | 4.81** | 0.14 | 0.34 | 5.28** |
| Positive affect | 4.26 | 0.91 | 0.26** | 0.36** | 0.07 | 0.27 | 4.00** | 0.14 | 0.37 | 5.64** |
| Negative affect | 8.98 | 0.76 | −0.08 | −0.18** | 0.01 | −0.07 | −0.97 | 0.03 | −0.17 | −2.48* |
| Depression symptoms | 1.51 | 0.42 | −0.20** | −0.31** | 0.07 | −0.23 | −3.41** | 0.13 | −0.34 | −5.12** |
| Anxiety symptoms | 0.67 | 0.64 | −0.11 | −0.20** | 0.02 | −0.13 | −1.78 | 0.04 | −0.20 | −2.85** |
| PESE | 4.16 | 0.77 | | | | | | | | |
| PSSE | 4.25 | 0.84 | 0.63** | | | | | | | |
| *Social well-being* (Middle school students, *n* = 290) | | | | | | | | | | |
| Perceived peer support | 4.01 | 0.77 | 0.38** | 0.37** | 0.15 | 0.38 | 6.73** | 0.15 | 0.37 | 6.65** |
| Online prosocial behavior | 3.05 | 0.98 | 0.28** | 0.29** | 0.08 | 0.29 | 4.91** | 0.08 | 0.29 | 5.01** |
| School connectedness | 3.64 | 0.82 | 0.27** | 0.42** | 0.10 | 0.28 | 4.88** | 0.20 | 0.42 | 7.85** |
| Social relationship | 4.87 | 1.12 | 0.30** | 0.31** | 0.09 | 0.30 | 5.14** | 0.10 | 0.30 | 5.29** |
| PESE | 3.89 | 0.62 | | | | | | | | |
| PSSE | 3.68 | 0.82 | 0.46** | | | | | | | |

**Notes**: *$p < 0.05$, **$p < 0.01$.
**Abbreviations**: PESE, perceived empathic self-efficacy; PSSE, perceived social self-efficacy.

## Predictive Validity

Means, standard deviations, and correlations among PESE, PSSE, and indicators of subjective and social well-being are presented in Table 3. As expected, the correlations between PESE, PSSE, and well-being indicators were all significant, except for the correlations between PESE and negative affect and anxiety symptoms. To predict subjective and social well-being, we conducted several regression analyses controlling for gender and age (Table 3). Both PESE and PSSE significantly contributed to predicting indicators of subjective and social well-being. Specifically, PESE positively predicted self-esteem and positive affect while negatively predicting depression symptoms. PSSE positively predicted self-esteem and positive affect and was negatively associated with negative affect, depression, and anxiety symptoms. Regarding social well-being, both PESE and PSSE were significant positive predictors of perceived peer support, online prosocial behavior, school connectedness, and social relationships.

# Discussion

The present study assessed the psychometric properties of the Chinese version of the PESSE in a sample of Chinese adolescents. Results from both exploratory and confirmatory factor analyses supported the two-factor structure of the scale, indicating its appropriateness for measuring empathic and social self-efficacy in this population. These findings align with the original version of the scale, further confirming that empathic and social self-efficacy are distinct yet related constructs. Findings support the robustness of the theoretical structure across different cultural contexts, aligned with previous studies focusing on the factor structure of PESSE.[10,19,20] The Chinese version of PESSE possesses good internal consistency, suggesting that the translation and cultural adaptation process did not compromise the internal consistency of the instrument.

Multiple group analyses supported the measurement invariance of the PESSE across gender, Consistent with previous findings using U. S. and Bolivian college student samples.[7] The measurement equivalence across gender supports the latent mean level comparison between boys and girls.[71] Findings showed that girls and boys appeared to encompass similar level of PSSE. These findings were consistent with previous findings suggesting there were no significant difference in social self-efficacy between boys and girls.[7,72] Additionally, girls presented higher PESE than boys, supporting previous findings suggesting girls are more empathetic than boys but inconsistent with existing studies suggesting no gender differences.[7,23,24,73] Findings demonstrate a partial invariant measurement structure for PESSE across age groups. The Measurement invariance across age groups was supported at the factorial structure and the pattern level, whereas it was only partially supported at the intercept level. Overall, the PESE and the PSSE constructs do not have the same meaning across early and middle adolescence. Thus, these different understandings of items should be considered before the scale is used to compare the differences of different age groups of adolescents. These results extend the prior findings that have indicated an invariant measurement structure for PESSE in different age samples.

Additionally, our findings confirmed that both PESE and PSSE significantly correlate with various indicators of subjective and social well-being, further validating the scale's construct validity. In the aspect of subjective well-being, PESE positively affects positive indicators of subjective well-being (self-esteem, positive affect) and negative predictors of depressive symptoms. These findings are consistent with previous research suggesting that individuals with high levels of PESE tend to report a higher level of self-esteem and efficacy in expressing positive emotions and a lower level of depressive symptoms.[2,7,30] PSSE positively predicts self-esteem and positive affect and negatively predicts negative affect, depressive symptoms, and social anxiety, which is consistent with the findings of the former claiming a positive relationship between PSSE and a higher level of self-esteem and positive affect,[18] and decreased negative affect, depressive symptoms and anxiety symptoms.[17,33,34] In the aspect of social well-being, PESE and PSSE were all positive predictors of social well-being indicators (perceived peer support, online prosocial behavior, school connectedness, and social relationships). Consistent with previous findings, individuals with high PESE and high PSSE, can obtain more social support, display more prosocial behaviors and online prosocial behavior, and have better school connectedness and social relationships.[10,20,37–39,61] In overall, PSSE explains more variance of the invariance of subjective and social well-being indicators when compared with PESE. This might be because the positive effects of empathy without further action are inherently weaker than those of empathy accompanied by positive action.

The validated Chinese version of the PESSE can be a valuable tool for the reliable assessment of empathic and social self-efficacy, which can inform preventions and interventions aimed at enhancing these competencies to improve mental health and social outcomes. First, incorporating these skills into policy frameworks, especially within social-emotional education, is essential for fostering adolescents' holistic development and well-being in both Chinese and broader cultural contexts. Second, given the strong links between empathic and social self-efficacy and well-being indicators, educators and mental health professionals should focus on building students' confidence and self-efficacy in empathy and social interaction domains. Enhancing these areas can benefit students struggling with social challenges. Third, findings on gender differences in empathy underscores the importance of considering how empathy distinctly influences the well-being of boys and girls. Designing gender-sensitive interventions that enhance the efficacy of empathy could lead to improved mental health outcomes and overall well-being for both groups. Fourth, the PESSE's validation lays a foundation for its use in cross-cultural research, enabling comparative studies on how cultural factors shape empathic and social self-efficacy. This understanding helps tailor interventions to meet adolescents' social-emotional needs globally. In summary, the PESSE is a valuable tool for assessing key social-emotional competencies and informing broader educational and psychological efforts to support adolescent development.

Despite the strengths of this study, some limitations should be acknowledged. Firstly, the sample was drawn from a region sample from China, which may limit the representation of the findings. Future research should aim to validate the Chinese PESSE in diverse demographic groups. Secondly, the test-retest reliability and measurement invariance across time were lacked in the current sample, future studies are suggested to examine the reliability and stability of the scale over time and its predictive validity for long-term outcomes. Furthermore, the predictive validity in the current study was established using cross-sectional data. Future studies could expand on this by employing longitudinal or experimental designs to investigate potential causal relationships between empathic self-efficacy, social self-efficacy, and well-being indicators. Finally, future research should explore the scale's applicability across diverse contexts and populations, which could offer further insights into its potential for psychological assessment and educational interventions.

## Conclusion

In conclusion, this study provides robust evidence supporting the two-factor structure of the Chinese version of the Perceived Empathic and Social Self-Efficacy (PESSE) scale. The validation of this scale opens up opportunities for future research to further investigate the correlates of empathic and social self-efficacy, and to explore the potential of targeting these constructs in educational and clinical interventions. The Chinese PESSE demonstrated excellent reliability and strong construct validity, confirming its utility as a reliable and valid instrument for measuring empathic and social self-efficacy among Chinese-speaking populations. Overall, this study contributes a valuable tool for assessing these constructs in Chinese adolescents, thereby facilitating cross-cultural research on empathic and social self-efficacy.

## Data Sharing Statement

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

## Ethics Approval

The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Medical and Scientific Research Ethics Committee of Henan University (No.: HUSOM-2023-427).

## Consent for Publication

Informed consent was obtained from all individual participants included in the study.

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## Disclosure

The authors report no conflicts of interest in this work.

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