Development and Aging

Family socioeconomic status and Chinese high school students' test anxiety: Serial mediating role of parental psychological control, learning resources, and student academic self-efficacy

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It is widely documented that students with lower family socioeconomic status (SES) tend to have higher test anxiety than their peers from higher SES families. However, few studies have empirically examined the underlying mechanism whereby family SES shapes students' test anxiety. To bridge this gap, the present study proposed and tested a serial mediation model in which family SES is associated with students' test anxiety through the indirect effect of parental psychological control, access to learning resources, and academic self-efficacy. The sample comprised 354 Chinese high school students (134 boys; mean age = 16.15 years old). The results were as follows: (1) higher family SES was associated with increased access to learning resources, higher academic self-efficacy, lower parental psychological control, and lower test anxiety. In contrast, test anxiety was associated with decreased access to learning resources, lower academic self-efficacy, and higher parental psychological control; and (2) the mediation model indicated parental psychological control, learning resources, and academic self-efficacy functioned as serial mediators in the relationship between family SES and students' test anxiety (i.e., family SES → psychological control and learning resources → academic self-efficacy → test anxiety). The findings are discussed in the framework of the family stress/investment models and social cognitive theory. Concrete suggestions for how low SES parents can help decrease their children's test anxiety are provided.

Key words: Academic self-efficacy, family SES, learning resources, parental psychological control, test anxiety.

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INTRODUCTION

Test anxiety – a multidimensional construct that includes components such as worry (e.g., self-deprecating thoughts in test situations; Liebert & Morris, 1967), emotionality (e.g., affective distress and physiological hyperarousal in test situations; Liebert & Morris, 1967), and social concerns (e.g., fear of social derogation accompanied with possible failure in test situations; Friedman & Bendas-Jacob, 1997; Lowe, Grumbein & Raad, 2011) – appears to be quite universal in contemporary society (Lee, 2009; Nie, Lau & Liau, 2011; Putwain & Daly, 2014). Students with high test anxiety were found to have a series of maladaptive outcomes, including poorer academic achievement, lower learning engagement, and more intense feelings of helplessness (Balogun, Balogun & Onyencho, 2017; Cassady, 2004; Peleg, 2009; Raufelder, Hoferichter, Ringeisen, Regner & Jacke, 2015). Given these outcomes, test anxiety has received considerable attention from educational and psychological researchers (Brandmo, Bråten & Schewe, 2019; von der Embse, Hoferichter, Ringeisen, Regner & Jacke, 2018; Zeidner, 1998).

Individuals from low family socioeconomic status (SES) backgrounds may be more prone to suffer from test anxiety (Zeidner, 1998). In general, family SES refers to the economic status and social class of a family, and is usually measured by parental education, parental occupation, and household income (Bradley & Corwyn, 2002). Besides a few studies that identified non-significant (Aydin, 2013; Segool, 2009) or positive (Chen,

2012; Chukwuorji & Nwonyi, 2015) associations between family SES and students' test anxiety, the majority of research has identified negative associations between these two variables in diverse cultures, showing that lower SES students tend to report greater levels of test anxiety than their higher SES counterparts (Akanbi, 2013; Cheema & Galluzzo, 2013; Guida & Ludlow, 1989; Hembree, 1988; OECD, 2017; Putwain, 2007, 2008). For example, in a cross-cultural sample consisting of 1144 Chilean and 546 American seventh- and eighth-grade students, Guida and Ludlow (1989) found that students from low SES backgrounds in both cultures reported significantly higher levels of test anxiety than those from high SES backgrounds. In another large-scale international program assessing hundreds of thousands of 15-year-old students, low SES participants reported more frequent experiences of test anxiety than their high SES counterparts in most participating countries and economies (OECD, 2017). However, little is known about the specific mechanism whereby family SES influences student test anxiety.

There are two important theoretical frameworks that have guided the majority of recent research on family SES: the family stress and family investment models (Bradley & Corwyn, 2002; Conger & Donnellan, 2007). These two models provide insights into the stresses and resources that could be mechanisms associating family SES and student test anxiety. According to the family stress model, family stresses associated with the long-term financial pressure inherent to low SES contexts render parents

more vulnerable to suffering emotional distress and marital conflict, which makes low SES parents more likely to use destructive rather than supportive parenting behaviors (Conger & Donnellan, 2007). These destructive parenting behaviors may increase low SES students' punitive experiences, thus leading to elevated levels of test anxiety (Katz, 1967; Zeidner & Safir, 1989). In the present study, we focused on psychological control – parenting behaviors that intrude on the psychological and emotional development of children (Barber, Xia, Olsen, McNeely & Bose, 2012) – as a possible destructive parenting mechanism associating family SES and student test anxiety. Prior studies have found that low SES parents tend to use higher levels of psychological control during parent-child interactions (Tamis-LeMonda, Briggs, McClowry & Snow, 2009; Tynkkynen, Vuori & Salmela-Aro, 2012). In addition, high levels of psychologically controlling parenting behaviors, usually accompanied with excessively high expectations and punitive attitudes (Barber *et al.*, 2012; Xu, Lou, Wang & Pang, 2017), will render children fearful of possible failures (Deneault, Gareau, Bureau, Gaudreau & Lafontaine, 2020) and lead them to experience elevated levels of test anxiety (Vansteenkiste, Zhou, Lens & Soenens, 2005). Therefore, we expect that parental psychological control mediates the association between family SES and students' test anxiety.

The family investment model proposes that investments (e.g., in learning stimulations, higher standard of living, etc.) associated with financial prosperity can better equip children for social and academic demands, thus leading them to experience more success in schooling and making them less likely to experience test anxiety (Bradley & Corwyn, 2002; Rhine & Spaner, 1983). Prior studies have found that families with more learning stimulations and home learning resources (e.g., books, CDs, academic tools, newspapers, etc.) significantly promote a variety of their children's cognitive competences and academic outcomes (Dearing & Tang, 2013; Ji, 2019; Longo, McPherran Lombardi & Dearing, 2017; Pang, Xu, Lin & Ren, 2013; Yeung, Linver & Brooks-Gunn, 2002). Learning resources have also been directly examined as a mediator between family SES and academic outcomes. For example, Ni, Zhang, Hu and Gao (2016) found that learning resources available to middle school students (e.g., learning software, computers, desks, study rooms, etc.) significantly mediated the association between family SES and reading performance. In line with the above literature, we expect that diversified learning resources provided by high SES parents will better equip children for the school's demands, enabling greater academic success and thus decreasing the likelihood of developing test anxious feelings.

In addition to parental psychological control and learning resources, we propose that academic self-efficacy may be another important mediator – a proximal outcome of family factors (i.e., family SES, parental psychological control, and family learning resources) and a direct precursor of decreased test anxiety. According to social cognitive theory (Bandura, 2001), self-efficacy is a critical agency through which the external environment can influence individual behaviors (Xiao & Liu, 2017). In academic scenarios, students' judgement of their own ability to solve given academic tasks or achieve given academic goals (i.e., academic self-efficacy; Schunk, 1989) may be an important agency through which family factors influence students' test anxiety (Bandura, Barbaranelli, Caprara & Pastorelli, 1996).

The literature supports the relevance of our proposed mediational paths between family SES and students' test anxiety. Specifically, studies of diverse cultural backgrounds have documented a positive association between family SES and students' academic self-efficacy (Artelt, Baumert, Julius-McElvaney & Peschar, 2003; Bandura *et al.*, 1996; Shi, Chen Hou & Gao, 2013), because high SES families can provide more cultural, material, and behavioral investments to support the development of their children's academic self-efficacy. Moreover, prior research has provided evidence on the mediational role of psychological control and learning resources on the association between family SES and academic self-efficacy. Several studies have confirmed that psychologically controlling parenting behaviors (e.g., being over-critical of children's academic mistakes and ignoring their efforts devoted to learning activities) render children more doubtful about their academic competence and thus restrict their development of academic self-efficacy (Lu, Walsh, White & Shield, 2017; Xu *et al.*, 2017; Xu *et al.*, 2019). Meanwhile, Schunk and Pajares (2002) claimed that parents who provide enriching learning materials enable their children to develop a higher level of intellectual and academic self-efficacy.

In addition to the empirical support for self-efficacy as a proximal outcome of family SES via different paths, another line of research has consistently documented negative associations between academic self-efficacy and test anxiety (e.g., Bonaccio & Reeve, 2010; Nie *et al.*, 2011; Pintrich & de Groot, 1990). According to the control-value theory of achievement emotions, students' perception on self-efficacy can largely influence their achievement emotions (such as test anxiety) during learning events (Pekrun, Frenzel & Goetz, 2007). Specifically, highly self-efficacious students are more capable of using self-regulating strategies to achieve goals and overcoming learning difficulties, thus they tend to experience a lower level of test anxiety (Caprara, Fida, Vecchione *et al.*, 2008; Filippello, Sorrenti, Buzzai & Costa, 2015). Taken together, we predict that academic self-efficacy mediates the relationship between family SES, parental psychological control, learning resources, and students' test anxiety (i.e., family SES → psychological control, learning resources, and academic self-efficacy → test anxiety).

Research hypotheses

This study focused on Chinese high school students, who have a high risk of test anxiety due to the tremendous pressure of the College Entrance Examination, an essential test that directly determines whether students can move on to higher education (Tang, 2018; Zheng, 2008). There were two primary goals in the present study. First, we examined whether the negative association between family SES and test anxiety, as observed in diverse cultures, can be replicated in a Chinese sample. Second, based on the family stress/investment models and social cognitive theory, we proposed a serial mediation model, where the association between family SES and test anxiety were serially mediated by parental psychological control, family learning resources, and students' academic self-efficacy (see Fig, 1 for the conceptual framework). There were two hypotheses:
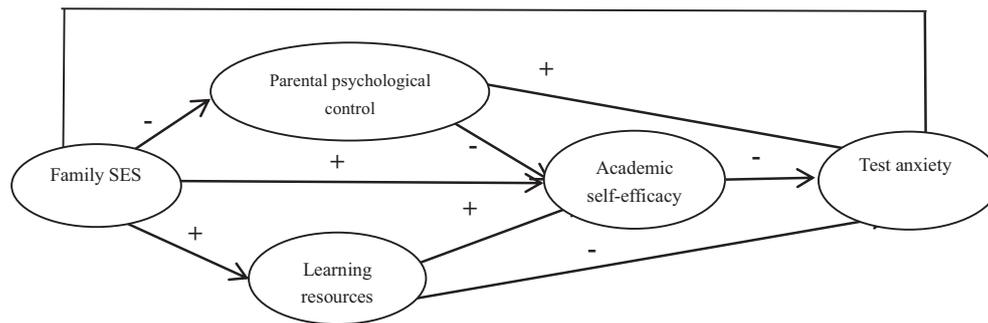
Fig. 1. Conceptual framework: how family SES affects students' test anxiety.

Hypothesis 1: Higher family SES is associated with lower student test anxiety.

Hypothesis 2: Parental psychological control, learning resources, and academic self-efficacy serially mediate the effect of family SES on students' test anxiety (i.e., family SES → psychological control and learning resources → academic self-efficacy → test anxiety)..

METHOD

Participants

Using the convenience sampling method, this study recruited 429 students from three high schools located in Guangdong (southern China), Hubei (central China), and He'nan province (central China). After careful checks, we deleted 37 participants who did not provide complete information regarding their family SES, 31 participants who did not finish at least one of other key measures (i.e., parental psychological control, learning resources, academic self-efficacy, and test anxiety), and four participants who gave a same response to all items in scales that contained both positively and negatively worded items (i.e., intra-individual response variation = 0, Dunn *et al.*, 2018). In addition, for each continuous variable, we removed values surpass three absolute deviations from the median (Leys *et al.*, 2013; Sunavsky & Poppenk, 2020), which further resulted in the exclusion of three participants from data analysis. After deleting the above-mentioned incomplete or invalid data, the final sample constituted of 354 participants. Among them, 134 were male students and 220 were female students. Their ages ranged from 15 to 18 years old (M = 16.15, SD = 0.87). Regarding SES characteristics, 9.04% of fathers and 12.15% of mothers had primary or lower educational backgrounds; 63.56% of fathers and 70.90% of mothers had secondary educational backgrounds; and 27.40% of fathers and 16.95% of mothers had college diplomas or above. In addition, the median monthly household income of our sample was 5000–6000 RMB (about US$774–928). To examine whether the sample size was appropriate for the analytic plan, we performed a Monte Carlo power analysis (Muthén & Muthén, 2002) using the final sample (*n* = 354) with setting each factor loadings at 0.80, a correlation of 0.25 between factors, and the strength of the direct and indirect paths between the factors at 0.20. The results showed that the current sample size had sufficient power (above 0.80) to detect all the parameters of interest (in our case, factor loadings, correlations, direct and indirect paths) with α at 0.05 level.

Measurements

Family SES. Consistent with previous studies (Shi *et al.*, 2013; Xu & Pang, 2020), family SES was measured by five indicators: paternal occupation, maternal occupation, paternal education, maternal education,

and family monthly income. Parental occupation comprised five categories: (1) the unemployed, temporary workers, unskilled workers, and farmers; (2) manual workers, construction workers, and lower level technicians; (3) white-collar workers and middle level technicians; (4) middle-class managers and civil servants; (5) senior executives, senior technicians, and leaders of government agencies. Parental education was classified into five levels: (1) elementary school or below; (2) junior middle school; (3) senior middle school; (4) college or undergraduate; (5) graduate or above. Furthermore, family monthly income was classified into 10 levels (RMB): (1) less than 2,000; (2) 2,000–3,000; (3) 3,000–4,000; (4) 4,000–5,000; (5) 5,000–6,000; (6) 6,000–7,000; (7) 7,000–8,000; (8) 8,000–9,000; (9) 9,000–10000; (10) more than 10,000. Prior studies have validated the appropriateness of using these items to measure family SES (Shi *et al.*, 2013; Xu & Pang, 2020). In the current study, the internal consistency of this measurement, as indicated by McDonald's Omega (McDonald, 1999), was satisfactory (0.82). In addition, confirmatory factor analysis (CFA) indicated acceptable fit indices for the latent factor of family SES (χ^2 (3) = 6.69, p = 0.08; CFI = 0.99; TLI = 0.99; RMSEA = 0.06).[1] In order to examine the distribution characteristic of overall family SES, we calculated an aggregated SES score based on the standardized factor loadings of its five ordinal indicators (Vyas & Kumaranayake, 2006; Yang, Xu, Liu & Pang, 2020).

Psychological control-disrespect scale

The Chinese version of the Psychological Control-Disrespect Scale (PCDS; Xu *et al.*, 2017), originally developed by Barber *et al.* (2012), was used to evaluate parental psychological control. This scale includes eight types of parenting behaviors that intrude on children's individuality (i.e., ridiculing, embarrassing in public, invalidating, violating privacy, guilting, excessive expectations, comparing with others, and ignoring). Example items are "Expects too much of me" (e.g., to do better in school, to be a better person, etc.) and "often unfairly compares me to someone else" (e.g., to my brother or sister, to her/himself). Participants were asked to rate their mothers and fathers separately on a 6-point Likert scale (from 1 = *definitely disagree* to 6 = *definitely agree*). Prior studies showed good reliability and validity of this scale (e.g., Barber *et al.*, 2012; Xu *et al.*, 2017). In the current study, the internal reliability coefficient (McDonald's Omega) of this scale was satisfactory for both paternal (0.84) and maternal (0.87) data. In addition, CFA indicated good fit indices for the latent factor of paternal (χ^2(12) = 26.34, p = 0.01; CFI = 0.98; TLI = 0.96; RMSEA = 0.06; SRMR = 0.03) and maternal (χ^2(12) = 21.38, p = 0.05; CFI = 0.99; TLI = 0.98; RMSEA = 0.05; SRMR = 0.03) psychological control. The mean of all the items was taken to examine the distribution characteristic of overall parental psychological control.

Learning Resources. With reference to previous studies (Foy, Arora & Stanco, 2013; González-Such, Sancho-Álvarez & Sánchez-Delgado, 2016; Ni *et al.*, 2016), a multiple-choice question was used to investigate the availability of learning resources at home. Specifically, participants reported whether they had the following items: a desk for study, a

computer, reference books, internet access, a room to study, a dictionary, learning software, and classic works of literature. One point was assigned for each item. Prior studies have validated the appropriateness of using these items to measure family educational resources (Foy *et al.*, 2013; González-Such *et al.*, 2016). In the current study, the internal reliability coefficient of this measurement was acceptable (McDonald's Omega = 0.79). In addition, CFA indicated satisfactory fit indices for the latent factor of learning resources ($\chi^2(17) = 18.92$, $p = 0.33$; CFI = 0.99; TLI = 0.99; RMSEA = 0.02)[2]. Similar as family SES, we created an aggregated score (based on the standardized factor loadings of its eight indicators) to examine the distribution characteristic of overall learning resources.

Academic self-efficacy. The academic self-efficacy scale, developed by Liang (2000), was employed to measure students' self-evaluation of their ability to achieve given learning goals and use effective learning strategies. There are 22 items in this scale, item examples include "I can solve difficult learning problems" and "I use self-questioning techniques to facilitate understanding." Participants responded to each item on a six-point Likert scale (from 1 = *definitely disagree* to 6 = *definitely agree*). Generally, prior studies reported good reliability and concurrent validity of this scale (e.g., Lin, Liu & Peng, 2020; Shi, Gao & Shen, 2011; Wang, Lei & Wang, 2016). In the current study, the internal reliability coefficient of this scale was satisfactory (McDonald's Omega = 0.88). In addition, CFA indicated satisfactory fit indices ($\chi^2(172) = 288.79$, $p < 0.001$; CFI = 0.95; TLI = 0.93; RMSEA = 0.04; SRMR = 0.05) for the latent factor of academic self-efficacy. The mean score of all the items was computed to examine the distribution characteristic of overall academic self-efficacy.

Test anxiety scale. We employed the Chinese version of the Test Anxiety Scale (TAS; Wang, 2001), originally developed by Sarason (1978), to assess participants' attitudes and feelings about test anxiety (e.g., "I often think about possible failure during an exam"). There were 37 items in this scale, including seven reverse-scored items (items 3, 15, 26, 27, 29, 33, and 35). Participants were asked to answer on a six-point Likert scale (from 1 = *definitely disagree* to 6 = *definitely agree*). Prior studies generally reported good reliability and validity of this scale (e.g., Sarason, 1978; Wang, 2001; Wei & Zhou, 2020). In the current study, the internal reliability coefficient was satisfactory for this scale (McDonald's Omega = 0.89). In addition, CFA indicated acceptable fit indices ($\chi^2(511) = 799.16$, $p < 0.001$; CFI = 0.93; TLI = 0.91; RMSEA = 0.04; SRMR = 0.06) for the latent factor of test anxiety. The average score of all the items was calculated to examine the distribution characteristic of overall test anxiety.

Procedure

Data were collected by convenience sampling, with the help of three trained teachers working in the high schools mentioned above. This study strictly followed ethical guidelines related to human research participants – all participants were informed that: (1) they could withdraw at any time during the research process; and (2) all the data were strictly confidential and would only be used for research purposes. All questionnaires were administered in a fixed sequence: family SES, learning resources, academic self-efficacy, test anxiety, and parental psychological control. The entire study was conducted by paper and pencil and took about 15 minutes.

Analytic plan

In the current study, we used SPSS 19.0 (IBM, Armonk, NY) to perform data screening (e.g., the absolute median deviation) and descriptive analyses (i.e., mean, standard deviation, skewness, kurtosis, minimum, and maximum). For primary analyses, we used R (R Core Team, 2012) with the psych package (Revelle, 2017) to compute the McDonald's Omega; and Mplus 7.0 (Muthen & Muthen, 1998–2013) to conduct the CFA analyses, examine the correlations between latent variables (H1), and test the proposed serial mediation model (H2).

In CFA, parameters were estimated using the maximum likelihood method (ML; for continuous variables; Kline, 2016) or the mean- and variance-adjusted weighted least squares (WLSMV; for categorical/ordinal variables; Kline, 2016). In measurement model and structural equation model (SEM), parameters were estimated using the ML. The model fitness was evaluated by the following four indicators: (1) Ccomparative fit index (CFI) of 0.90 or above; (2) Tucker–Lewis index (TLI) of 0.90 or above; (3) Root-mean-square error of approximation (RMSEA) lower than 0.08; and (4) standardized root mean square residual (SRMR) lower than 0.08 (Hu & Bentler, 1999; McDonald & Ho, 2002). Comparison of alternative models were based on the Akaike information criteria (AIC; Akaike, 1974) and the sample-size adjusted Bayesian information criterion (ssBIC; Henson, Reise & Kim, 2007), with lower values suggesting better fitting models (Kline, 2016).

To reduce various sources of sampling error, increase model parsimony, as well as improve the power and stability of parameter estimates, we used the parceling approach to aggregate items as observed indicators for each construct (Little, Cunningham, Shahar & Widaman, 2002, 2013; MacCallum, Widaman, Zhang & Hong, 1999). Specifically, five ordinal variables (i.e., paternal occupation, maternal occupation, paternal education, maternal education, and family monthly income) were used as observed indicators for the latent variable of family SES. In addition, two composite scores of paternal and maternal psychological control were used as observed indicators for the latent variables of parental psychological control. Furthermore, we used the item-to-construct balance technique (i.e., balance items with the highest and lowest standardized factor loadings across the parcels; Little *et al.*, 2002) to form two parcels for the latent variable of learning resources, and three parcels for the latent variable of academic self-efficacy and test anxiety.

Significance of the correlation coefficient, direct effect, and indirect effect were examined using the bootstrapping approach ($n = 1000$ bootstrap samples). When the 95% bias-corrected confidence interval (CI) of a given effect size do not include zero, it can be considered as significant (MacKinnon, Lockwood & Williams, 2004).

RESULTS

Test of common method bias

The Harman single factor test was conducted to examine whether the current study had common method bias (Podsakoff *et al.*, 2003). The results revealed seven factors with eigenvalues greater than 1, while the first factor only explained 23.58% of the total variance. Therefore, our study did not suffer from common method biases.

Descriptive statistics

Table 1 presents the descriptive statistics (i.e., mean, standard deviation, skewness, kurtosis, minimum, and maximum) of the key variables. As shown in this table, the distribution of these variables can be considered as normal since all the absolute values of the skewness (ranges from −1.23 to 0.48) and kurtosis (ranges from −0.65 to 1.42) scores are smaller than 3 and 8 (Kline, 2016), respectively.

Measurement model

The measurement model for the five latent variables (family SES, learning resources, parental psychological control, academic self-efficacy, and test anxiety) revealed an excellent fit to the data: (χ^2/df = 2.13, $p < 0.001$, CFI = 0.96, TLI = 0.94, RMSEA = 0.06, SRMR = 0.04). All the standardized factor loadings for the

Table 1. *Descriptive statistics of the key variables (n = 354)*

	M	SD	skewness	kurtosis	minimum	maximum
1. Family socioeconomic status	9.32	2.95	0.48	−0.33	3.03	17.36
2. Parental psychological control	2.82	0.82	0.01	−0.65	1.00	4.81
3. Learning resources	3.93	1.02	−1.23	1.42	0.34	4.93
4. Academic self-efficacy	3.91	0.50	0.22	−0.05	2.41	5.55
5. Test anxiety	3.39	0.54	0.01	0.08	1.92	4.92

Table 2. *Bivariate correlations and their 95% confidence interval between all the latent variables (n = 354)*

	1	2	3	4
1. Family socioeconomic status	–			
2. Parental psychological control	−0.21** [−0.35, −0.06]	–		
3. Learning resources	0.65*** [0.53, 0.75]	−0.18** [−0.33, −0.05]	–	
4. Academic self-efficacy	0.36*** [0.23, 0.47]	−0.29** [−0.41, −0.17]	0.39***[0.28, 0.50]	–
5. Test anxiety	−0.22*** [−0.36, −0.09]	0.29***[0.17, 0.41]	−0.10 [−0.22, 0.04]	−0.35*** [−0.46, −0.22]

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

ordinal/parceled indicators on the latent variables were statistically significant (λ ranging from 0.59 to 0.90, all ps < 0.001).

Table 2 lists the correlation coefficients and their 95% confidence intervals of all the latent variables. Consistent with H1, family SES was associated with lower test anxiety (r = −0.22, p < 0.001). And all other variables were significantly correlated in the expected directions, which validated the feasibility of further mediational analysis. Specifically, family SES was associated with lower parental psychological control (r = −0.21, p < 0.01), more learning resources (r = 0.65, p < 0.001), and higher academic self-efficacy (r = 0.36, p < 0.001). In contrast, test anxiety was associated with higher parental psychological control (r = 0.29, p < 0.001) and lower academic self-efficacy (r = −0.35, p < 0.001).

SEM model

Overall, the hypothesized serial mediation model (model 1) had good fitness (see Table 3). To avoid confirmation bias, we also conducted alternative models for model fit comparison. Accordingly to Liu and Ling (2009), two alternative mediation models were also worthwhile to examine when there are multiple mediators. The first one (model 2) was a sequential mediation model in which three paths (i.e., family SES→academic self-efficacy, psychological control→test anxiety, and learning resources→test anxiety) were removed from the hypothesized theoretical model. The second one (model 3) was a parallel mediation model in which two paths (i.e., psychological control→ academic self-efficacy, and learning resources→academic self-efficacy) were removed from the hypothesized theoretical model. As shown in Table 3, each model had an acceptable fit; however, the hypothesized serial mediation model (model 1) had the lowest AIC and ssBIC, suggesting it is the model with best fit (Kline, 2016).

As shown in Fig. 2, other than three path coefficients (i.e., family SES→test anxiety, β = −0.17, p = 0.10; family SES→ academic self-efficacy, β = 0.13, p = 0.21; and learning

resources→test anxiety, β = 0.16, p = 0.13), all other path coefficients in this serial mediation model were significant (βs > 0.19 or < −0.21, ps <0.05). Furthermore, the results revealed three significant mediating paths from family SES to students' test anxiety via psychological control, learning resources, and academic self-efficacy (see Table 4): 1) family SES→ psychological control→test anxiety, β = −0.030, SE = 0.014, 95% CI [−0.067, −0.009]; 2) family SES→psychological control→academic self-efficacy→test anxiety, β = −0.010, SE = 0.005, 95% CI [−0.025, −0.003]; and 3) family SES→ learning resources → academic self-efficacy → test anxiety, β = −0.036, SE = 0.019, 95% CI [−0.086, −0.009]. The total effect from family SES to test anxiety is also significant, β = −0.150, SE = 0.051, 95% CI [−0.266, −0.061].

DISCUSSION

The present study had two primary objectives. First, we aimed to examine whether the widely documented negative association between family SES and test anxiety, as observed in many previous research, can be replicated in a Chinese sample consisting of 354 high school students (H1). Second, we were interested to investigate whether the family stress/investment models and social cognitive theory can be used to disentangle the underlying processes whereby family SES shapes the development of children's test anxiety. Specifically, the present study proposed and tested a serial mediation model in which both environmental variables (i.e., parental psychological control and learning resources) and an intrapersonal variable (i.e., academic self-efficacy) function as serial mediators in the relationship between family SES and test anxiety (H2).

Consistent with previous studies conducted in many countries that have found an inverse family SES-test anxiety association (Akanbi, 2013; Guida & Ludlow, 1989; Hembree, 1988; OECD, 2017; Putwain, 2007, 2008), the present study revealed a negative correlation (r = −0.22, p < 0.001) between family SES and Chinese high school students' test anxiety, showing that lower

Table 3. *Fit indices of the hypothesized serial mediation model and two alternative models (n = 354)*

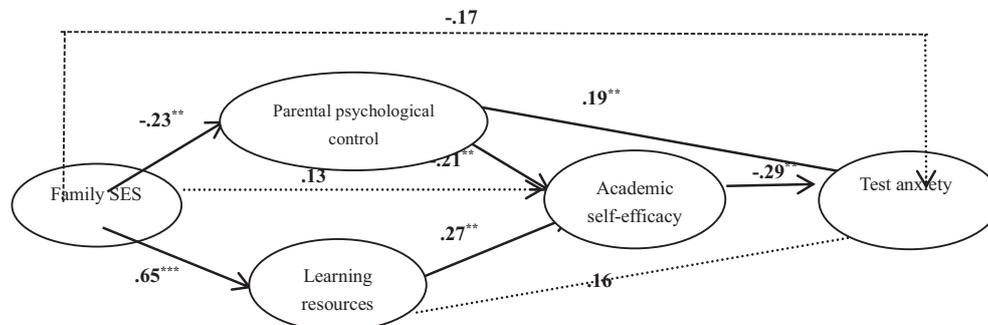|	χ^2	*df*	*p*	*CFI*	*TLI*	*SRMR*	*RMSEA [90% CI]*	*AIC*	*ssBIC*
Model 1	211.61	91	<0.001	0.94	0.92	0.04	0.06 [0.05, 0.07]	10623.22	10665.73
Model 2	225.31	94	<0.001	0.94	0.92	0.05	0.06 [0.05, 0.07]	10630.93	10671.35
Model 3	230.70	93	<0.001	0.93	0.91	0.05	0.07 [0.05, 0.08]	10638.32	10679.43

Fig. 2. The serial mediation model: how family SES affects high school students' test anxiety, with gender included as a dummy coded control variable.
Note: ** $p < 0.01$, ***$p < 0.001$. Dashed pathways are not significant.

Table 4. *Dirent, indirect, and total effects and confidence intervals of mediation analyses, with gender included as a dummy coded control variable*

Indirect pathways	Effect value	SE	95% CI Lower	95% CI Upper
SES→TA (dirent effect)	−0.170	0.103	−0.388	0.023
SES→PPC→TA	−0.030[a]	0.014	−0.067	−0.009
SES→LR→TA	0.070	0.050	−0.004	0.190
SES→ASE→TA	−0.027	0.023	−0.080	0.009
SES→PPC→ASE→TA	−0.010[a]	0.005	−0.025	−0.003
SES→LR→ASE→TA	−0.036[a]	0.019	−0.086	−0.009
SES→TA (total effect)	−0.150[a]	0.051	−0.266	−0.061

Notes: SES = family socioeconomic status; PPC = parental psychological control; LR = learning resources; ASE = academic self-efficacy; TA = test anxiety. CI = confidence interval.
[a]95% CI does not overlap with zero.

SES students are more likely to be test anxious than their higher SES counterparts. Therefore, H1 was supported. This indicates that the negative association between family SES and test anxiety may be culturally universal, as already suggested in several cross-cultural studies (Diaz-Guerrero, 1976; Guida & Ludlow, 1989; OECD, 2017). The few inconsistent findings that have uncovered a non-significant (Aydin, 2013; Segool, 2009) or positive (Chen, 2012; Chukwuorji & Nwonyi, 2015) relationship between family SES and students' test anxiety may relate to their sample characteristics and other moderators. For example, the age of participants may function as a moderator in the family SES-test anxiety association. That is, while the negative family SES-test anxiety association is well established in secondary school students (OECD, 2017; Putwain, 2007), family SES tends not to be associated with elementary students' test anxiety (Aydin, 2013; Segool, 2009), given that the evaluative stress is usually less salient in elementary school years than in secondary education

(Zeidner, 1998). In addition, the influence of family SES on students' test anxiety may be moderated by some extraneous variables (e.g., personal coping resources, social support, etc.) that did not receive full attention in prior studies. For these reasons, it is not surprising that family SES is not always negatively associated with students' test anxiety.

In line with previous studies examining the influence of family SES on cognitive/academic outcomes (e.g., Iruka, LaForett & Odom, 2012; Simons & Steele, 2020; Vrantsidis, Clark, Chevalier, Espy & Wiebe, 2020; Yeung *et al.*, 2002), our study confirmed the relevance of the family stress/investment models and extended the literature by additionally investigating the association between family SES and test anxiety. Consistent with H2, we found that the family stress-related variable (i.e., parental psychological control) both directly (i.e., the "family SES→ parental psychological control→test anxiety" path) and indirectly (i.e., the "family SES→parental psychological control→academic self-efficacy→test anxiety" path) mediates the family SES-test anxiety association. That is, low SES parents are more likely to employ psychologically controlling behaviors (e.g., setting unrealistic goals for children, making horizontal comparisons, and over-criticizing children's mistakes) during parent-child interactions, which in turn, can decrease children's academic self-efficacy and render them more likely to suffer from test anxiety. These findings provide empirical support to Katz's (1967) viewpoint that destructive parenting behaviors inherent in low SES contexts may lead children to experience elevated levels of test anxiety. In addition, we also found that parental investment (i.e., providing learning resources) indirectly (i.e., the "family SES→learning resources→academic self-efficacy→test anxiety" path) mediates the family SES-test anxiety relationship. This indicates that the diversified learning resources inherent in high SES contexts can decrease students' test anxiety when these resources are utilized to enhance students' academic self-efficacy. This finding extends Rhine and Spaner's (1983) claim that high

SES parents can decrease the prevalence of children's test anxiety by providing varied types of academic support.

Moreover, the present study highlighted the indirect mediating role of academic self-efficacy in the family SES-test anxiety association. According to social cognitive theory, environmental factors (e.g., family SES, parental psychological control, and learning resources) primarily shapes children's developmental outcomes through its impact on self-processes (Bandura *et al.*, 1996). In line with this theory, our results revealed that academic self-efficacy may serve as a "gate keeper" through which parental psychological control and learning resources serially mediated the influence of family SES on students' test anxiety. To the best of our knowledge, although previous studies have separately established significant associations between academic self-efficacy and family SES (e.g., Artelt *et al.*, 2003; Bandura *et al.*, 1996), parental psychological control (e.g., Lu *et al.*, 2017; Xu *et al.*, 2017; Xu *et al.*, 2019), learning resources (e.g., Schunk & Pajares, 2002; Waldman, 2003), and test anxiety (e.g., Bonaccio & Reeve, 2010; Nie *et al.*, 2011; Pintrich & de Groot, 1990), the present study is the first to incorporate these variables into a serial mediation model. This enriches our understanding of the underlying familial (i.e., parental psychological control and learning resources) and intrapersonal (i.e., academic self-efficacy) processes through which can higher family SES relates to lower test anxiety.

The results of this study provide some practical insights for low SES parents on how to alleviate children's test anxiety. First, low SES parents need to be mindful about the detrimental influence of psychological control on child development, and try to engage in more positive, warm, and supportive parent-child interaction patterns (e.g., trusting children's ability to accomplish academic tasks, praising their academic efforts, and helping them find ways to cope with setbacks). Second, prioritizing the use of limited financial resources to meet children's need for diversified learning resources (e.g., reference books, computers, educational software, desks, and study rooms) may be a way for low SES parents to better equip their children for academic demands. Finally, finding ways to improve children's academic self-efficacy is important for lowering their test anxiety. For example, they can help children set suitable learning goals, discuss possible solutions to learning problems, and encourage children to seek academic help when necessary.

There are some limitations in this study. First, the measure of family stress only focused on parental psychological control but did not assess other intraparental or interparental indicators (e.g., parental psychological distress and parental conflict). Similarly, the measure of family investment only included home learning resources but did not evaluate parents' behavioral investment (e.g., teaching the child learning skills and strategies, stimulating their intrinsic motivation towards learning, and serving as positive role models). Therefore, future studies with a broader measure of family stress and investment are encouraged to elaborate the serial mediation model verified in the current study. Second, although our results show that family SES can influence high school students' test anxiety through the mediating path of parental psychological control, learning resources, and academic self-efficacy, the causality of this serial mediation model is still undetermined due to the cross-sectional characteristic of our data. Therefore, longitudinal studies are encouraged to examine the causal order of variables included in our serial mediation model. Finally, although the majority of studies have revealed a negative association between family SES and test anxiety, the existence of a few studies revealing null or positive associations between these two variables may suggest the existence of some systematic moderators. Future studies should additionally include moderators, such as personal coping resources (e.g., optimism, hope, and resilience), and social support (e.g., teacher/peer support), to add nuance to our understanding of the relationship between family SES and students' test anxiety.

AUTHORS' CONTRIBUTIONS

Xiaobo Xu and Weiguo Pang contributed to the study conception and design. Material preparation, data collection and analysis were performed by Xiaobo Xu and Mengya Xia. The first draft of the manuscript was written by Xiaobo Xu. Mengya Xia and Weiguo Pang revised the manuscript substantially. All authors read and approved the final manuscript.

DECLARATIONS

Compliance with ethical standards

All procedures involving human participants in this study were performed in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

CONFLICTS OF INTEREST

The authors declare that they have no conflict of interest.

DATA AVAILABILITY STATEMENT

Data is only available upon reasonable request.

NOTES

[1] The mean- and variance-adjusted weighted least squares (WLSMV; Kline, 2016) estimation – in which standardized root mean square residual (SRMR) was not available – was used to evaluate the model fit of latent factor of family SES given the ordinal nature of its five indicators.

[2] Similar as family SES, the WLSMV estimation – in which SRMR was not available – was used to evaluate the model fit of latent factor of learning resources given the categorical nature of its eight indicators.

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