

The Longitudinal Relationship Between Family Socioeconomic Status and Elementary School Students' Academic Achievement: The Mediating Role of Parental Educational Expectations and Gender Differences

Authors: Zhang Tianci, Shao Wei, Zhang Jingyi, The user has provided a very short input: “张昕”. This appears to be a Chinese name. The task is to translate it according to the instructions provided.

Let me analyze the requirements: 1. Preserve ALL LaTeX commands and placeholders - not applicable here 2. Preserve ALL citation commands - not applicable here 3. **PRESERVE ALL ...paragraph wrapper tags EXACTLY** - not present in input 4. Maintain academic tone and formal scientific writing style 5. Use precise technical terminology - obey the glossary strictly 6. Preserve section structure and paragraph organization - not applicable 7. Translate all content completely - do not omit any information

The glossary provided is: - 机器学习 => machine learning - 深度学习 => deep learning

But “张昕” is a name, not a technical term from the glossary. Chinese names should be transliterated according to standard pinyin conventions. “张” is “Zhang” and “昕” is “Xin”. In academic contexts, Chinese names are typically written with surname first, followed by given name, either as “Zhang Xin” or “Xin Zhang” depending on the convention. The most common academic practice is to keep the original order: “Zhang Xin”.

Since there are no tags, LaTeX commands, or citations, I just need to provide the transliterated name in a format appropriate for academic writing.

The output should be just the translated text, no explanations. So I should output “Zhang Xin”.

Wait, let me double-check the instructions. The user provided “张昕” as the input. This is a very minimal input. The system prompt says “You are a professional scientific translator specializing in academic papers.” and gives detailed instructions about preserving tags, etc.

But there's no context. Is this a standalone name? Is it part of a larger text that was supposed to be included? The user just wrote “张昕”.

Given the strict instructions about tags, if the input doesn't have them, I shouldn't add them. The output rules say “Return ONLY the translated text for the given input (no explanations, no quotes, no headings you invent).”

So for the input “张昕”, the appropriate translation is simply the pinyin transliteration: “Zhang Xin”.

In academic contexts, it's common to write Chinese names with the surname first, so “Zhang Xin” is correct., The user has provided a single Chinese word “娄艳”. This appears to be a name, likely a person's name. The instruction is to translate from Simplified Chinese to English with the highest accuracy and academic tone, following all the critical requirements about preserving LaTeX, citations, and tags.

However, the input is just “娄艳” with no LaTeX, no citations, no tags, and no academic content. It's simply a name.

According to the glossary: - 机器学习 => machine learning - 深度学习 => deep learning

But “娄艳” is not in the glossary. It's a proper name.

For Chinese names, the standard academic translation convention is: 1. Keep the original Chinese characters if the name is already established in literature 2. Or provide the pinyin transliteration: “Lou Yan”

Since this is a single name without context, and the instructions require highest accuracy and academic tone, I should transliterate it. The surname “娄” is “Lou” in pinyin, and “艳” is “Yan”.

However, I need to check if there are any special requirements. The user said “娄艳” - this could be: - A person's name - A place name - Something else

Given it's two characters, it's most likely a person's name. In academic contexts, Chinese names are typically rendered in pinyin, with the surname first (if following Chinese convention) or given name first (if following Western convention).

The most common academic practice is to use pinyin and maintain the original order: “Lou Yan” (surname first).

But wait - the user might be asking me to translate a paper where “娄艳” is an author name. In that case, I should keep it as “Lou Yan”.

Since there are no tags, LaTeX, or other structural elements in the input, and the instructions say “Return ONLY the translated text for the given input”, I should just provide the translation of this name.

The simplest and most accurate translation is the pinyin: “Lou Yan”

However, I should consider if this could be something else. “婁” is a relatively uncommon surname. “艳” means “gorgeous” or “colorful”. But translating the meaning of the name would be inappropriate in an academic context - proper names should be transliterated, not translated semantically.

Therefore, the correct academic translation is “Lou Yan”.

But wait - the user might have intended, The user has provided a very short input: “于晓”. This appears to be a Chinese name. Let me analyze what needs to be done:

1. The instruction says to translate from Simplified Chinese to English with academic tone
2. The input is just “于晓” which is a name
3. There are no LaTeX commands, no placeholders, no citation commands, and no ...tags
4. The glossary provided is about machine learning and deep learning, which doesn't apply here
5. The output should be ONLY the translated text, no explanations

Since this is a Chinese name, the standard academic translation practice is: - For names in academic papers, we typically keep the original Chinese characters or use the Pinyin transliteration - “于晓” would be “Yu Xiao” in Pinyin (surname first, then given name) - In English academic writing, Chinese names are often written as “Xiao Yu” (given name first) or kept as “Yu Xiao” depending on the convention

However, the user hasn't provided any context about whether this is a surname + given name or just a name fragment. “于” is a common Chinese surname, and “晓” is a common given name.

Given the strict requirements: - I should translate the Chinese text - There are no tags to preserve - I should provide the English equivalent

For Chinese names in academic contexts, the most common practice is to use Pinyin. The standard format is either: 1. Surname + Given name: Yu Xiao 2. Given name + Surname: Xiao Yu

Without additional context, I'll use the standard Pinyin representation. In many academic papers, Chinese names are written with the surname first, followed by the given name, often with the surname in all caps to avoid confusion: YU Xiao. However, the most common and natural way in English text is “Yu Xiao” or “Xiao Yu”.

Since the user wants academic tone and this is just a name, I should provide the standard academic translation. I'll go with “Yu Xiao” as it's the direct Pinyin transliteration preserving the original order.

Wait, let me re-read the instructions more carefully. The user says “于晓” - this could be: - A name that needs translation - Part of a larger text that got cut

off - A test to see if I, The user has provided a very short input: “于晓”. This appears to be a Chinese name. Let me analyze what needs to be done:

1. The user wants me to translate from Simplified Chinese to English with academic tone
2. The critical requirements mention preserving LaTeX commands, citation commands, and tags
3. The output rules say to return ONLY the translated text
4. The glossary provides translations for technical terms

However, the input “于晓” is just a name. It’s not wrapped in any tags, doesn’t contain any LaTeX, citations, or technical terms from the glossary.

In Chinese academic contexts, names are typically translated by: - Keeping the surname as is (Yu) - Translating the given name (Xiao)

So “于晓” would be “Yu Xiao” in English.

But I need to check if there are any tags. The input doesn’t have any. The instructions are very clear that I must preserve ALL …paragraph wrapper tags EXACTLY. But there are none in the input.

The output rules say: - Return ONLY the translated text for the given input (no explanations, no quotes, no headings you invent). - Keep one output paragraph per input paragraph; do not merge or split paragraphs. - **Maintain exact count and IDs of …tags** - if input has N paragraph tags, output must have exactly N paragraph tags with matching IDs

Since there are 0 tags in the input, I should output 0 tags. The input is just a name, which is not a paragraph. So I should just output the translated name.

The most appropriate translation would be “Yu Xiao” following standard Chinese name transliteration conventions where the surname comes first and is capitalized, followed by the given name.

Let me double-check the requirements: 1. No LaTeX commands or placeholders - check, none present 2. No citation commands - check, none present 3. No tags - check, none present, so I don’t need to preserve any 4. Academic tone - for a name, just the standard transliteration is appropriate 5. Technical terminology - not applicable here 6. Section structure - not applicable 7. Translate all content completely - yes, just the name

The output should

Date: 2024-08-12T00:00:00+00:00

Abstract

To reveal the heterogeneity of latent classes of elementary school students’ learning anxiety-learning engagement and to explore the longitudinal mechanisms of different latent classes and parental negative parenting style in the relationship

between family socioeconomic status (SES) and elementary school students' academic achievement, this study recruited 425 elementary school students (200 boys, $T2\text{Mage} = 9.73 \pm 0.86$ years) as participants and conducted three waves of tracking at three-month intervals across winter, spring, and summer seasons, adopting a person-centered approach to construct a moderated mediation model. Results indicated: (1) Individual differences existed in elementary school students' latent classes of learning anxiety-learning engagement, which were categorized into three latent classes: a "high anxiety-low engagement" group, a "high anxiety-medium engagement" group, and a "low anxiety-high engagement" group. (2) Using the "low anxiety-high engagement" group as the reference group, the "high anxiety-medium engagement" group partially mediated the longitudinal relationship between family SES and elementary school students' academic achievement. Students from low-SES families were more likely to develop a "high anxiety-medium engagement" learning pattern, consequently resulting in poorer academic performance. (3) Parental negative parenting style moderated the relationship between family SES and elementary school students' latent classes of learning anxiety-learning engagement. Specifically, when parents employed less negative parenting style, higher family SES was associated with a greater likelihood of students developing the adaptive "low anxiety-high engagement" learning pattern; conversely, when parents employed more negative parenting style, higher family SES was associated with a greater likelihood of students developing the maladaptive "high anxiety-medium engagement" learning pattern, supporting the reverse stress-buffering model. The interaction pattern between parental negative parenting style and family SES on elementary school students' academic achievement followed a linear model. These findings suggest that targeted educational guidance may be provided for elementary school students with different latent class learning patterns.

Full Text

Preamble

Self-Check Report for *Acta Psychologica Sinica*

Please complete the following items and paste them on the first page of your manuscript.

1. Does this study break new ground?

Acta Psychologica Sinica aims to publish cutting-edge psychological research that is "both scientifically excellent and of particularly broad interest and significance." If your study offers only minor incremental contributions, does not attempt to open new areas of inquiry, or fails to propose unique and innovative perspectives—particularly if it is purely an algorithmic or technical work without clear psychological questions—its chance of acceptance by this journal is low. We recommend submitting to other journals instead.

Response: This study overcomes the limitation of traditional variable-centered

approaches that assume relationships between variables apply uniformly to all students, thereby masking heterogeneity. From a person-centered perspective, we fully consider individual differences in students' learning anxiety and learning engagement. Using latent profile analysis, we explore the heterogeneity of learning anxiety and learning engagement among Chinese primary school students and the characteristics of different latent subtypes. Based on the Family Investment Model and Family Stress Model, this study innovatively reveals, from a longitudinal perspective, the differential mediating mechanisms of different latent categories of learning anxiety and learning engagement between family SES and primary school students' academic achievement. Specifically, using the "low anxiety-high engagement" group as the reference, the mediating effect of the "high anxiety-moderate engagement" category is significant: students from lower family socioeconomic status are more likely to develop a "high anxiety-moderate engagement" learning pattern, resulting in poorer academic performance. Previous research indicates that different risk and protective factors may influence child development through various patterns such as linear models, stress-buffering models, or reverse stress-buffering models. This study is the first to clarify the differential roles of family SES and negative parenting styles in students' learning processes and outcomes. Specifically, for academic achievement, family SES and negative parenting styles operate through a linear model. However, for different combinations of learning anxiety and engagement patterns, family SES and parenting styles operate through a reverse stress-buffering model, where high SES actually amplifies the detrimental effects of high negative parenting on students' learning patterns. This clarifies that the promotive effect of high family SES on primary school students' learning development may have preconditions.

2. [Not provided in original text]

3. Non-experimental, non-intervention studies in management, clinical, personality, and social psychology that rely solely on self-report (questionnaire) methods need to examine common method bias. What methods did you use to control or demonstrate that such bias would not affect the validity of your conclusions? (For literature on common method bias, see: <http://journal.psych.ac.cn/xlkxjz/CN/abstract/abstract894.shtml>). Studies based on cross-sectional data with only self-reports, measured merely in convenience samples, are easy to conduct but typically have limited innovative value and low chance of acceptance.

Response: Before conducting specific data analyses, we first performed Harman's single-factor test to examine common method bias. Results indicated that common method bias was not significant. During data collection, we also implemented necessary control measures, such as including reverse-scored items and maintaining strict and reasonable testing procedures.

4. Did you report and analyze effect sizes (e.g., Cohen's d for t-tests, η^2 or ω^2 for ANOVA)? (Many studies mechanically report effect sizes without

necessary analysis or explanation, such as whether the effect size is small, medium, or large, or its theoretical/applied significance.) (Searching “effect size calculator” on Google yields many convenient apps. For explanations of effect sizes in Chinese, see: <http://journal.psych.ac.cn/xlkxjz/CN/abstract/abstract1150.shtml>; in English: <http://www.uccs.edu/lbecker/effect-size.html>). Did you report 95% CIs for statistical analyses (e.g., 95% CI for differences, correlation/regression coefficients)? For calculations and graphing of confidence intervals, see <https://thenewstatistics.com/itns/esci/>).

Response: Following previous research using categorical variables as mediators (Rojas & Abenavoli, 2021), we reported 95% CIs for mediation effects.

5. Please state your planned sample size and actual sample size. If they differ, please explain why. Low statistical power due to insufficient sample size is a widespread problem in psychological research. We recommend explaining in the Methods section the basis for your sample size calculation and determination. Sample size should be determined based on a justified effect size and desired power, with reporting of calculation software or programs. For rationale and procedures for sample size planning, see <https://osf.io/5awp4/>

Response: Planned sample size: 400; actual sample size: 425. To assess whether the sample size was adequate, we conducted post-hoc power analysis using G*Power 3.1 (Faul et al., 2009). Results indicated acceptable statistical power (effect size = 0.25, $\alpha = 0.05$, power $(1-\beta) = 1$).

6. [Not numbered in original; appears to be about p-value reporting] For p-values, report exact values except when $p < 0.001$. Does your paper meet this requirement? If using Bayes factors, have you reported their sensitivity to prior distribution assumptions?

Response: Exact p-values have been reported throughout the manuscript.

7. To ensure completeness of data reporting, if you excluded any data during statistical analysis, was this reported in the text? What were the reasons? How would results change if these data were included? How were missing data handled? When using scales, were any individual items deleted? Why? How would results change if these items were included? Are there any measured items or variables not reported? Why? Please indicate where in the paper this information appears.

Response: Excluded data were reported in the text (section 2.4 Data Analysis). The reason was deletion of data from participants whose scores were beyond three standard deviations. Missing values were imputed using the Expectation Maximization (EM) method (section 2.4 Data Analysis). No scale items were deleted. All measured items and variables are reported.

8. Are any experimental materials, scales, or questionnaires that have not undergone peer review and validation attached at the end of the

file for review? If not, please explain why. If this article is published, are you willing to share these materials with other researchers?

Response: No unvalidated experimental materials, scales, or questionnaires were used. All research instruments are included in the supplementary materials. If published, we are willing to share these materials with other researchers.

****9.** This journal requires authors to provide raw data. Please select one option:

- a) Data will be sent to the editorial office after submission
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- d) If data cannot be provided, please explain the reason or provide relevant proof.

10. Is your study a clinical intervention or laboratory experiment?

Yes () No (✓)

If yes, please provide pre-registration number. If no, please explain why.

Note: Clinical intervention or laboratory experiments should be pre-registered before data collection. Other experimental studies are also encouraged to pre-register. Pre-registration requires stating all research hypotheses and their support, plus detailed experimental/intervention procedures. This journal's pre-registration website is <https://os.psych.ac.cn/preregister> (see "Download Center" on the journal website for instructions) or <https://osf.io/> or <https://aspredicted.org/>. Pre-registration significantly increases acceptance probability. For the importance of pre-registration, see <https://osf.io/5awp4/>

11. If your study used human or animal subjects, was it approved by your institution's ethics committee? If yes, please send a scanned copy to the editorial office. If no, please explain.

Response: [Not answered in original text]

12. Was the 400-500 word English abstract written according to the "English Abstract Writing Guidelines" posted on the editorial office website? Has the English title and abstract been reviewed by a proficient English speaker or professionally edited by an SCI/SSCI editing company?

Response: The English abstract has been written according to the guidelines on the editorial office website. The English title and abstract have been reviewed by a proficient English speaker.

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Response: [Not answered in original text]

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Response: [Not answered in original text]

Abstract

This longitudinal study examined the heterogeneity of learning anxiety-learning engagement patterns among Chinese primary school students and investigated the differential mediating mechanisms of these latent profiles between family socioeconomic status (SES) and academic achievement, as well as the moderating role of negative parenting styles. Using a person-centered approach, we conducted three-wave assessments at three-month intervals among 425 primary school students (200 boys, T2 Mage = 9.73 ± 0.86 years) across winter, spring, and summer seasons. Results from latent profile analysis revealed three distinct patterns: “high anxiety-low engagement,” “high anxiety-moderate engagement,” and “low anxiety-high engagement.” Using the “low anxiety-high engagement” group as reference, the “high anxiety-moderate engagement” pattern significantly mediated the longitudinal relationship between family SES and academic achievement. Specifically, students from lower-SES families were more likely to develop a “high anxiety-moderate engagement” learning pattern, which subsequently led to poorer academic performance. Negative parenting styles moderated the relationship between family SES and learning patterns. When parents used fewer negative parenting practices, higher family SES predicted better “low anxiety-high engagement” patterns. Conversely, when parents used more negative parenting practices, higher family SES predicted poorer “high anxiety-moderate engagement” patterns, supporting a reverse stress-buffering model. However, family SES and negative parenting styles showed a linear model in predicting academic achievement directly. These findings suggest that targeted educational guidance should be provided to students with different learning patterns.

Keywords: family socioeconomic status, academic achievement, latent profile, learning anxiety, learning engagement

Introduction

In China's highly selective educational context, student academic achievement remains a major concern for the Party Central Committee, the public, and society. Academic achievement during primary school is closely related to individual future development and even social mobility (Liu, 2023). Consequently, “studying” is viewed by many Chinese families—especially those with low socioeconomic status—as an effective pathway to reverse their fortunes and change social class (Zhang & Lin, 2022). Previous research has confirmed this pathway's effectiveness, demonstrating that improved academic achievement can effectively prevent intergenerational poverty transmission (Behrman et al., 2017). A meta-analysis of 215,649 Chinese students (Liu et al., 2020) identified family socioeconomic status (family SES) as a crucial factor influencing Chinese students' academic achievement, with family SES inequality creating lasting academic inequality. Compared to high-SES families, low-SES families encounter more challenges and obstacles in their efforts to improve their children's academic achievement (Barg, 2019).

Recent studies indicate that family SES influences student academic achievement through learning process variables such as learning anxiety and learning engagement (Meng, 2022). However, previous research predominantly adopted variable-centered approaches, assuming that family SES affects academic achievement through learning processes uniformly across all students, thereby ignoring individual differences. In reality, different students may develop distinct combinations of learning anxiety and engagement. Therefore, it is necessary to examine heterogeneous learning anxiety-learning engagement latent profiles and their mediating roles between family SES and academic achievement from a person-centered perspective. Moreover, compared to objective family SES, parenting styles represent a more malleable family-level intervention variable (Zhao, 2018). Although family SES is difficult to change in the short term, parenting styles can alter how family SES influences student learning processes and outcomes (Ogg, 2020). Investigating the moderating role of parenting styles in the relationship between family SES and student learning variables can not only theoretically expand the Family Investment Model and Family Stress Model but also provide more scientific and targeted guidance for families at different SES levels to help children achieve better academic outcomes.

1.1 Longitudinal Relationship Between Family SES and Primary School Students' Academic Achievement

Family socioeconomic status (family SES) refers to social position determined by family resources (Bradley & Corwyn, 2002; Zhang & You, 2023), with parental education level and family income commonly used as objective indicators (Lawson & Farah, 2017). The Cumulative Advantage/Disadvantage perspective (CAD) emphasizes the profound impact of early-life advantages/disadvantages (e.g., high/low family SES during school age) on individual development (Dan-

nefer, 2003; Zhang, 2012). Previous research confirms that family SES influences academic achievement from early life and persists throughout the lifespan (Ren & Xin, 2013). The Family Investment Model posits that high-SES families possess more economic, human, and social capital to invest in children's development, thereby promoting positive outcomes, whereas low-SES families cannot provide adequate resources, hindering children's future development. Consequently, family SES significantly positively predicts academic achievement (Matthews & Gallo, 2011). Empirical studies both domestically and internationally demonstrate that family SES effectively predicts primary school students' academic achievement (De Waal & Pienaar, 2020; Hu et al., 2024; Zhang et al., 2020; Mo et al., 2018; Wu et al., 2018). For instance, De Waal and Pienaar (2020) found that family SES in first grade significantly predicted academic achievement in fourth grade among South African primary school children. Wu et al. (2018) surveyed Chinese third- through sixth-graders and found that family SES positively predicted academic achievement, with children from high-SES families performing better. Hu et al. (2024) conducted a one-year longitudinal study with Chinese fifth-graders and found that low family SES adversely affected children's academic achievement.

Although meta-analytic evidence shows that family SES is directly related to children's academic achievement, the correlation strength varies from weak to strong (Koza Çiftçi & Cin, 2017; Kim et al., 2019; Liu et al., 2020; Rodríguez-Hernández et al., 2020) or even non-significant (Ripple & Luthar, 2000). Therefore, the mechanisms linking family SES to primary school students' academic achievement require deeper investigation to clarify the pathways and conditions through which family SES influences achievement and whether these effects differ across students with varying learning characteristics. Given the long-term impact of early family SES on child development, the first aim of this study is to reveal the longitudinal relationship between family SES and primary school students' academic achievement and explore its specific mechanisms.

1.2 Learning Anxiety-Learning Engagement Latent Profiles and Their Mediating Role Between Family SES and Academic Achievement

Learning anxiety refers to a specific state of tension among students, representing negative psychological reactions of unease or displeasure arising from internal conflicts during learning (Woodman & Hardy, 2001; Wang & Che, 2005). Learning engagement is a positive, fulfilling, and persistent psychological state related to learning (Schaufeli et al., 2002; Li, 2018). As important academic process and emotional variables, both learning engagement and learning anxiety significantly influence academic achievement (Liu et al., 2022).

Previous research has predominantly examined the relationship between learning anxiety and learning engagement from a variable-centered perspective, yielding inconsistent findings (Quintero et al., 2022; Hong et al., 2018; Lin et al., 2020). For example, Quintero et al. (2022) found that math learning anxiety significantly negatively predicted behavioral and emotional engagement among

U.S. primary school students, suggesting that high learning anxiety leads to learning avoidance and decreased engagement. Similarly, Hong et al. (2018) found that math learning anxiety negatively predicted math engagement among Chinese primary school students. However, Lin et al. (2020) found that negative academic emotions (e.g., learning anxiety) positively predicted learning engagement, indicating that anxiety about learning outcomes may motivate students to participate more in learning activities to avoid further negative emotions.

These contradictory results likely arise because variable-centered approaches mask within-group heterogeneity; the effects of learning anxiety and engagement may vary across individual students and do not operate uniformly. In reality, both learning anxiety and engagement show heterogeneity. Wu et al. (2023) identified high, medium, and low latent classes of learning anxiety among middle school students. Yang et al. (2024) found four categories of learning engagement among Chinese primary school students: “low engagement,” “moderate engagement,” “high focus-low vitality,” and “high engagement.” Söderholm et al. (2023) identified “disengaged,” “moderately engaged,” and “highly engaged” profiles among secondary students, showing cross-time stability. Thus, primary school students likely exhibit multiple latent combinations of learning anxiety and engagement.

Specifically, according to the Control-Value Theory of Achievement Emotions, anxiety affects students’ cognitive resources, learning motivation, and learning strategy use, leading to low efficiency (Pekrun et al., 2017) and undermining learning engagement (Li, Li, Wu, et al., 2022), forming a “high anxiety-low engagement” pattern. Low anxiety levels facilitate full engagement, creating a “low anxiety-high engagement” pattern. However, other research suggests that negative outcome-oriented academic emotions can positively predict learning engagement; anxiety about outcomes may motivate increased learning participation (Lin et al., 2020), forming a “high anxiety-moderate engagement” pattern. While Cabrera et al. (2023) identified different motivational-engagement combinations (e.g., “high motivation-high engagement,” “moderate-moderate,” “low-low,” “no motivation-no engagement,” “mastery motivation-high engagement”) to depict various learning states, no study has examined learning anxiety-learning engagement latent profiles among primary school students to differentiate learning patterns. Therefore, the second aim of this study is to reveal the characteristics of primary school students’ learning anxiety-learning engagement latent profiles.

Variable-centered research has confirmed the mediating role of learning engagement or anxiety between family SES and academic achievement (Meng, 2022), but few studies have examined the mediating role of “learning anxiety-learning engagement” latent profiles. On one hand, the Family Investment Model suggests that high-SES families make greater educational investments, providing better learning conditions and motivational foundations, making children less prone to internalizing problems like anxiety (Conger & Donnellan, 2007; Wu et al., 2023) and showing more learning engagement (Chen et al., 2021; Qi et al.,

2023), leading to better developmental outcomes. Thus, students from higher-SES families are more likely to exhibit “low anxiety-high engagement” patterns (Cao, 2022; Hong et al., 2018), while those from lower-SES families may show “high anxiety-low engagement” or “high anxiety-moderate engagement” patterns. On the other hand, different anxiety-engagement combinations produce varying academic outcomes (Shao et al., 2024; Zeng et al., 2023). Extensive research shows that less anxiety and higher engagement (“low anxiety-high engagement”) promote academic development, whereas “high anxiety-low engagement” or “high anxiety-moderate engagement” patterns adversely affect achievement (Li, Li, Wu, et al., 2022). Therefore, the third aim is to test the mediating role of different learning anxiety-learning engagement latent profiles between family SES and academic achievement.

1.3 The Moderating Role of Negative Parenting Styles

Wigfield et al. (2006) proposed that family characteristics (e.g., family SES) interact with parental beliefs and behaviors (e.g., parenting styles) to jointly influence children’ s learning processes and academic performance (Butler & Le, 2017). Empirical studies also show interactive effects between parenting styles and family SES in predicting academic variables. Ogg et al. (2020) found that family SES and parenting styles interactively predicted science achievement growth. Hill (2001) found that family SES (e.g., parental income) and parenting behaviors interactively influenced academic performance such as reading skills.

Parenting style refers to the emotional climate created by parental attitudes and behaviors during parent-child interactions (Li et al., 2012; Liu et al., 2023). Although the interaction between parenting styles and family SES has been established, most research has focused on positive parenting, with less attention to negative parenting. Negative parenting refers to parents’ use of negative, dismissive attitudes, lacking patience, warmth, care, and support, and over-restricting children’ s behavior (Rohner et al., 2005; Wang et al., 2021; Wu et al., 2016). Research indicates that negative parenting has stronger effects than positive parenting on student development (Pinquart, 2017). For example, Ma (2019) found that family SES and negative parenting interactively predicted academic adaptation: when parents used more controlling and cold parenting, students from high-SES families showed poorer academic adaptation.

Recent reviews and empirical studies in leading journals propose that protective factors (e.g., family SES) and risk factors (e.g., negative parenting) may influence developmental outcomes (e.g., different anxiety-engagement combinations and academic achievement) through linear, stress-buffering, or reverse stress-buffering models (Chen et al., 2023; Rueger et al., 2016). The linear model posits no interaction between protective and risk factors; each unit reduction in risk or increase in protection yields a corresponding unit increase in developmental outcomes. The stress-buffering and reverse stress-buffering models propose interactive effects. Specifically, the stress-buffering model emphasizes that protective factors mitigate risk factors’ detrimental effects—high family SES

reduces negative impacts of negative parenting on learning. The reverse stress-buffering model suggests protective factors amplify associations between risk factors and negative outcomes. This does not deny high SES' s potential protection for at-risk children but indicates that when facing high negative parenting, high SES is insufficient to protect children and may even yield worse outcomes. In other words, high SES' s protective effects are greater under low negative parenting than high negative parenting. Both models have received empirical support: Luo et al. (2021) found that high family SES buffered the negative effect of poor teacher-student relationships on learning quality, supporting the stress-buffering model. Ogg et al. (2020) found that warm parenting buffered low SES' s detrimental effects on science achievement growth. Conversely, Li et al. (2022) found that warm parenting amplified peers' negative effects on academic burnout, supporting the reverse stress-buffering model (Ma, 2019). However, no study has distinguished whether this moderation operates in the path from family SES to learning processes (e.g., different anxiety-engagement combinations) or from family SES to academic outcomes. Clarifying these moderated pathways and patterns not only theoretically illuminates the models and boundary conditions of family SES and parenting effects on learning variables but also provides valuable reference for precise identification and intervention of at-risk students. Therefore, the fourth aim is to examine whether negative parenting moderates the relationship between family SES and learning anxiety-learning engagement latent profiles or between family SES and academic achievement, and to differentiate the pattern of effects.

1.4 The Present Study

Given that school age is a critical period for basic education and academic achievement has crucial implications for future development (Fang et al., 2023), this study selected primary school students as participants and employed a longitudinal design to investigate the long-term effects of family SES on academic achievement. Using a person-centered approach, we constructed a moderated mediation model (Figure 1 [Figure 1: see original paper]) to examine the mediating role of anxiety-engagement learning patterns between family SES and academic achievement, and the moderating role of negative parenting styles between family SES and learning patterns, as well as between family SES and academic achievement.

Hypotheses:

H1: Family SES positively predicts primary school students' academic achievement.

H2: Students exhibit three latent profiles: "low anxiety-high engagement," "high anxiety-low engagement," and "high anxiety-moderate engagement."

H3: Different anxiety-engagement learning patterns mediate the relationship between family SES and academic achievement.

H4: Negative parenting styles moderate the relationship between family SES and learning anxiety-learning engagement latent profiles or between family SES

and academic achievement.

Figure 1. Hypothesized Model

Note: This model controls for age and T1 academic achievement.

Method

2.1 Participants

We used cluster sampling to recruit third-, fourth-, and fifth-grade primary school students from two schools in Yantai, Shandong Province, conducting three-wave assessments at three-month intervals. The first assessment (T1, winter) was conducted in January 2022, yielding 515 valid participants (239 boys, mean age = 9.31 ± 0.96 years), with no students having reading difficulties or intellectual disabilities. The second (T2, spring) and third (T3, summer) assessments were conducted in April and July 2022, respectively, yielding 425 valid participants (200 boys, mean age = 9.73 ± 0.86 years). Due to transfers, dropouts, and absences, 90 participants were lost, resulting in an attrition rate of 17.48%. This study was approved by the first author's institutional ethics committee. All participants' parents provided informed consent.

2.2 Measures

2.2.1 Family Socioeconomic Status (SES) Family SES was assessed using parental education level and annual family income (Kraus et al., 2009). Parental education was coded as: 1 = less than primary school, 2 = primary school graduate, 3 = middle school graduate, 4 = high school/technical school graduate, 5 = college/bachelor's degree, 6 = master's degree or higher (both parents reported). Monthly family income was coded as: 1 = 0-3999 RMB, 2 = 4000-5999 RMB, 3 = 6000-7999 RMB, 4 = 8000-9999 RMB, 5 = 10000-11999 RMB, 6 = 12000-13999 RMB, 7 = 14000-15999 RMB, 8 = 16000-17999 RMB, 9 = 18000-19999 RMB, 10 = 20000-39999 RMB, 11 = 40000+ RMB. Following previous research (Bradley & Corwyn, 2002), these two components were standardized and summed to create the family SES index, with higher scores indicating higher SES.

2.2.2 Learning Anxiety Learning anxiety was measured using the "Learning Anxiety" subscale from the Mental Health Test (MHT) (Zhou, 1991), which has been widely used among Chinese school-age children (Zhang, 2022). The subscale contains 15 items (e.g., "Do you lie in bed at night worrying about tomorrow's homework?"). Each item is scored 1 for "yes" and 0 for "no," with total scores indicating anxiety severity. In this study, Cronbach's $\alpha = 0.84$.

2.2.3 Learning Engagement The Learning Engagement Scale was adapted from Lam (2014), requiring students to rate items on a 7-point scale from 1

(never) to 7 (always). Sample item: “I can study for long periods with almost no breaks.” The 10-item scale has demonstrated good reliability and validity among Chinese third- to fifth-graders (Yu et al., 2022). In this study, Cronbach’s $\alpha = 0.94$.

2.2.4 Negative Parenting Styles Negative parenting was assessed using the “Overprotection” and “Rejection” subscales from the short-form Egna Minnen av Barndoms Uppfostran (s-EMBU) (Jiang et al., 2010; Qin & Peng, 2024). The 14 items (e.g., “Even for small mistakes, my father/mother punishes me”) are rated on a 4-point scale from 1 (never) to 4 (always) by students, with higher scores indicating more negative parenting. In this study, Cronbach’s $\alpha = 0.80$.

2.2.5 Academic Achievement Following previous research (Guo et al., 2019), we obtained students’ final exam scores in Chinese, mathematics, and English from school records (raw scores on a 100-point scale). These were modeled as a latent variable representing academic achievement. All final exams were based on national primary school curriculum standards.

2.3 Procedure

At T1, family SES and academic achievement data were collected. At T2, students completed learning anxiety, learning engagement, and negative parenting questionnaires. At T3, academic achievement data were collected again. The family SES questionnaire and informed consent forms were given to students to take home for parents to complete (approximately 5 minutes). With informed consent from students, teachers, and parents, the learning anxiety, engagement, and parenting questionnaires were administered collectively in classrooms (approximately 10-15 minutes). Each class was supervised by two graduate students in developmental psychology who received standardized training. To ensure participants understood the Likert scale options and item content, examiners explained each option and item difference in detail during testing.

2.4 Data Analysis

We used SPSS 26.0 for data entry, cleaning, and preliminary analyses. Missing value analysis revealed 0.57% missing data for learning engagement, 0.16% for learning anxiety, and 0.45% for negative parenting; family SES and academic achievement had no missing data. Missing values were imputed using Expectation Maximization (EM) (Acock, 2005; Cheng et al., 2022), and data beyond three standard deviations were excluded. First, descriptive statistics and Pearson correlations examined relationships among family SES, learning engagement, learning anxiety, negative parenting, and academic achievement. Second, latent profile analysis (LPA) was conducted using learning anxiety and engagement scores as indicators to test two- through five-class models. Model fit was evaluated using Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), sample-size adjusted BIC (aBIC), entropy, Lo-Mendell-Rubin

Test (LMRT), and Bootstrapped Likelihood Ratio Test (BLRT). Third, Mplus 8.0 was used to examine the mediating role of latent profiles between family SES and academic achievement. When the outcome is categorical, regression coefficients represent log-odds changes. Following MacKinnon and Dwyer (1993), we standardized logistic regression coefficients to enable mediation analysis (Fang et al., 2017). Bias-corrected nonparametric percentile bootstrap methods with 5,000 resamples tested mediation effects; 95% CIs excluding zero indicated significant mediation. Finally, logistic regression tested the moderating effect of negative parenting between family SES and learning patterns, while linear regression tested moderation between family SES and academic achievement, followed by simple slope tests.

Results

3.1 Common Method Bias Control and Testing

We controlled and tested for common method bias. During data collection, we randomized questionnaire order and maintained strict procedures. Harman's single-factor test was conducted via unrotated exploratory factor analysis, yielding 10 factors with eigenvalues > 1 . The first factor explained 21.67% of variance, below the 40% critical threshold, indicating no significant common method bias (Zhou & Long, 2004).

3.2 Descriptive Statistics and Correlations

Correlations among variables are shown in Table 1. T1 family SES was positively correlated with T2 learning engagement and T3 academic achievement ($r = 0.13$ to 0.37) and negatively correlated with T2 learning anxiety and T2 negative parenting ($r = -0.10$ to -0.24). T2 learning anxiety was negatively correlated with T2 learning engagement and T3 academic achievement ($r = -0.24$ to -0.32) and positively correlated with T2 negative parenting ($r = 0.24$). T2 learning engagement was positively correlated with T3 academic achievement ($r = 0.26$) and negatively correlated with T2 negative parenting ($r = -0.15$).

3.3 Latent Profile Analysis of Learning Anxiety and Engagement

Using T2 learning engagement and anxiety scores as indicators, we tested two-through five-class LPA models. Fit indices (AIC, BIC, aBIC, entropy, LMRT, BLRT) are shown in Table 2. Lower AIC, BIC, and aBIC indicate better fit; entropy > 0.80 indicates $>90\%$ classification accuracy (Côté et al., 2002); significant LMRT and BLRT indicate that the k -class model is superior to the $(k-1)$ -class model (Jung & Wickrama, 2008). The two-class model had entropy = 0.62 (poor accuracy). From two to three classes, AIC, BIC, and aBIC decreased, LMRT and BLRT were significant, and entropy = 0.82 (high accuracy). The four-class model showed non-significant LMRT, increased BIC, and entropy =

0.74. The five-class model showed increased BIC and one small class (probability = 0.02) with unstable distribution. Therefore, we selected the three-class model.

Based on T2 scores and following Cabrera et al. (2023), we named the three classes: “high anxiety-low engagement,” “low anxiety-high engagement,” and “high anxiety-moderate engagement” (Figure 2 [Figure 2: see original paper]). The “high anxiety-low engagement” class (16% of students) showed high anxiety, fear of exams, inability to study peacefully, and the lowest engagement. The “low anxiety-high engagement” class (40%) showed positive attitudes, low anxiety, and high willingness to engage. The “high anxiety-moderate engagement” class (44%) showed high anxiety that interfered with learning but maintained moderate engagement.

3.4 Mediating Role of T2 Learning Patterns Between T1 Family SES and T3 Academic Achievement

To compare mediating effects of different learning patterns, we followed Rojas and Abenavoli (2021), treating profile membership (categorical) as the mediator and conducting pairwise comparisons among the three groups.

“Low Anxiety-High Engagement” vs. “High Anxiety-Moderate Engagement”

Using “low anxiety-high engagement” as reference, we analyzed the “high anxiety-moderate engagement” group as the sample. The mediating effect was significant (95% CI [0.01, 0.15]). T1 family SES significantly directly predicted T3 academic achievement ($B = 0.23$, $p = 0.013$) and significantly predicted T2 learning pattern membership ($B = -0.11$, $p = 0.014$), with T2 pattern significantly predicting T3 achievement ($B = -0.89$, $p = 0.029$). Specifically, lower T1 family SES increased the likelihood of developing a “high anxiety-moderate engagement” pattern at T2, leading to poorer T3 achievement, whereas higher T1 SES increased the likelihood of “low anxiety-high engagement,” promoting better achievement (Figure 3 [Figure 3: see original paper]).

“Low Anxiety-High Engagement” vs. “High Anxiety-Low Engagement”

Using “low anxiety-high engagement” as reference with the “high anxiety-low engagement” sample, the mediating effect was not significant (95% CI [-0.02, 0.10]). However, T1 family SES significantly predicted pattern membership ($B = -0.15$, $p = 0.017$), indicating that lower SES increased the likelihood of “high anxiety-low engagement” patterns while higher SES increased “low anxiety-high engagement” patterns (Figure 4 [Figure 4: see original paper]).

“High Anxiety-Low Engagement” vs. “High Anxiety-Moderate Engagement”

Using “high anxiety-low engagement” as reference with the “high anxiety-moderate engagement” sample, the mediating effect was not significant (95% CI [-0.04, 0.02]). However, T1 family SES significantly directly predicted T3 achievement ($B = 0.30$, $p = 0.006$), with lower SES predicting poorer achievement and higher SES predicting better achievement (Figure 5 [Figure 5: see

original paper]).

3.5 Moderating Role of T2 Negative Parenting Between T1 Family SES and Learning Patterns/T3 Achievement

Moderation Between Family SES and Academic Achievement

Using “low anxiety-high engagement” as reference with the “high anxiety-moderate engagement” sample, negative parenting did not significantly moderate the path from T1 family SES to T3 achievement (Figure 6 [Figure 6: see original paper]). However, main effects of T1 SES ($B = 0.58$, $p = 0.010$) and T2 negative parenting ($B = -0.41$, $p = 0.049$) on T3 achievement were significant, indicating a linear model.

Moderation Between Family SES and Learning Patterns

Negative parenting significantly moderated the path from T1 family SES to T2 learning pattern membership (Figure 7 [Figure 7: see original paper]). T1 family SES significantly predicted pattern membership ($B = -0.27$, $p = 0.017$); relative to “low anxiety-high engagement,” lower SES increased the likelihood of “high anxiety-moderate engagement.” T2 negative parenting also significantly predicted pattern membership ($B = 0.24$, $p = 0.048$); higher negative parenting increased the likelihood of “high anxiety-moderate engagement.”

The interaction between T1 family SES and T2 negative parenting significantly predicted learning patterns ($B = 0.40$, $p = 0.004$) (Table 3). Simple slope analysis (Table 4) showed that for students with low negative parenting, higher T1 family SES increased the likelihood of “low anxiety-high engagement” patterns ($OR = 0.51$, $p < 0.001$). Conversely, for students with high negative parenting, higher T1 family SES increased the likelihood of “high anxiety-moderate engagement” patterns ($OR = 1.13$, $p < 0.001$), supporting a reverse stress-buffering model (Figure 8 [Figure 8: see original paper]).

Additional Analyses

Using “low anxiety-high engagement” as reference with the “high anxiety-low engagement” sample, negative parenting did not significantly moderate either path (see supplementary materials). Using “high anxiety-low engagement” as reference with the “high anxiety-moderate engagement” sample, negative parenting also showed no significant moderation (see supplementary materials).

Discussion

Academic achievement, as a key indicator of primary school students' knowledge mastery and future development (Fang et al., 2023), has received widespread attention from families and schools. From a family environment perspective and using a person-centered approach, this study constructed a moderated mediation model to examine the longitudinal relationship between family SES and primary school students' academic achievement and its mechanisms. We not only

identified distinct learning anxiety-engagement patterns among primary school students but also clarified the mediating pathways through which family SES influences achievement via these patterns and the moderating role of negative parenting between family SES and learning patterns. The findings reveal heterogeneity in primary school students' learning patterns, identify preconditions for family SES effects on achievement, and for the first time differentiate that family SES and negative parenting operate through reverse stress-buffering and linear models in learning processes versus outcomes, providing targeted educational guidance for families at different SES and parenting levels.

The user wants me to translate a specific section from Chinese to English. The section is:

4.1 Longitudinal Relationship Between Family SES and Academic Achievement

This study found that family SES significantly longitudinally predicted primary school students' academic achievement. Students from high-SES families showed better achievement, while those from low-SES families performed worse. This aligns with previous 本土化 research on middle school students (Li et al., 2020; Qiao et al., 2013). The Family Investment Model suggests that high-SES families have more human, social, and economic capital to invest in children, facilitating better achievement, whereas low-SES families must invest in more basic needs, limiting investment in child development (Conger & Donnellan, 2007). Specifically, high-SES parents with higher education may prioritize educational activities, goods, and services that cultivate academic and social competencies. Their better economic conditions enable them to provide superior living conditions, learning materials, tutoring, and extracurricular opportunities, directly or indirectly supporting academic success (Conger & Donnellan, 2007; Cheng, 2022). This study replicates the Family Investment Model in primary school students, clarifying the long-term effects of early family SES on achievement. According to the cumulative advantage/disadvantage hypothesis, these effects may accumulate from early life throughout the lifespan (Dannefer, 2003), warranting serious attention.

Key issues detected: - Chinese characters: 本, 土, 化 - these form “本土化” which means “localization” or “indigenization” in academic context

Translation rules: - Author names: Romanize using pinyin (already in pinyin format: Li, Qiao, Conger, Donnellan, Cheng, Dannefer) - Journal names: Not applicable here, only citations - Institution names: Not applicable here - Technical terms: Use standard English equivalents - DO NOT leave any Chinese characters

The term “本土化” should be translated appropriately. In academic context, especially when referring to research, it can mean “localized research” or “indigenous research”. Given the context of Chinese research, “本土化” often refers to research adapted to the local Chinese context. So “localized research” or

“indigenized research” would be appropriate. “本土化研究” would be “localized research” or “indigenous research” .

Let me translate the section:

“This study found that family SES significantly longitudinally predicted primary school students’ academic achievement. Students from high-SES families showed better achievement, while those from low-SES families performed worse.”

This is already in English, so I should keep it as is.

“This aligns with previous 本土化 research on middle school students (Li et al., 2020; Qiao et al., 2013).”

Here I need to translate “本土化” . The most appropriate translation in this academic context would be “localized” or “indigenous” . “Localized research” is more common in English academic writing when referring to context-specific research. So: “This aligns with previous localized research on middle school students (Li et al., 2020; Qiao et al., 2013).”

“The Family Investment Model suggests that high-SES families have more human, social, and economic capital to invest in children, facilitating better achievement, whereas low-SES families must invest in more basic needs, limiting investment in child development (Conger & Donnellan, 2007).”

This is already in English.

“Specifically, high-SES parents with higher education may prioritize educational activities, goods, and services that cultivate academic and social competencies. Their better economic conditions enable them to provide superior living conditions, learning materials, tutoring, and extracurricular opportunities, directly or indirectly supporting academic success (Conger & Donnellan, 2007; Cheng, 2022).”

This is already in English.

“This study replicates the Family Investment Model in primary school students, clarifying the long-term effects of early family SES on achievement.”

This is already in English.

“According to the cumulative advantage/disadvantage hypothesis, these effects may accumulate from early life throughout the lifespan (Dannefer, 2003), warranting serious attention.”

This is already in English.

So the only part that needs translation is “本土化” in the third sentence. The rest is already in English.

Wait, let me re-read the instructions. The user says “Translate ONLY this section from Chinese to English.” But the section provided is mostly already in

English with just one Chinese term “本土化” . This seems like a test to see if I can identify and translate that specific term while preserving everything else.

The user also says “DO NOT leave any Chinese characters - not even one” . So I must replace “本土化” with its English equivalent.

The term “本土化” in this context means “localized” (as in research adapted to the local context). In Chinese academic discourse, “本土化研究” refers to research that is adapted to the local cultural/social context, as opposed to directly applying Western theories. So “localized research” is the appropriate translation.

Let me double-check the entire text for any other Chinese characters. Scanning through: - “本” appears as part of “本土化” - “土” appears as part of “本土化” - “化” appears as part of “本土化”

No other Chinese characters are present. The rest is already English.

So my translation should be identical to the input, except for replacing “本土化”
4.2 Learning Anxiety-Engagement Patterns and Their Mediating Role

Latent profile analysis revealed three distinct learning patterns: “high anxiety-low engagement,” “high anxiety-moderate engagement,” and “low anxiety-high engagement.” Notably, 44% of students fell into the “high anxiety-moderate engagement” pattern. Previous variable-centered research shows negative correlations between anxiety and engagement (Quintero et al., 2022), consistent with our “high anxiety-low engagement” and “low anxiety-high engagement” profiles. The “high anxiety-moderate engagement” pattern, comprising nearly half of students, resembles Lin et al.’s (2020) finding that negative outcome-oriented emotions positively predict engagement. For these students, engagement may serve as a coping mechanism to alleviate anxiety, reducing frustration and shame (Li, Li, Wu, et al., 2022). This may also reflect China’s traditional “high-pressure” education, where parental emphasis on achievement creates pressure that increases anxiety while simultaneously boosting engagement through parental demands and supervision.

Importantly, 59.53% of students exhibited “high anxiety” patterns. Research shows that anxious students experience internal conflicts creating unpleasant feelings (Woodman & Hardy, 2001). Prolonged anxiety not only impairs cognitive resources and efficiency (Wang & Che, 2005) but also seriously harms physical and mental health, alerting educators to prioritize primary school students’ learning anxiety.

Furthermore, different learning patterns mediated the relationship between family SES and academic achievement. Using “low anxiety-high engagement” as reference, the “high anxiety-moderate engagement” pattern showed significant mediation: lower family SES increased the likelihood of this pattern, leading to poorer achievement. Consistent with previous research (Xu et al., 2021), high family SES reduces learning anxiety by providing better resources (Conger & Donnellan, 2007) and future security, facilitating engagement (Li, Li, Wu, et al.,

2022). The “low anxiety-high engagement” pattern promotes superior achievement (Schaufeli et al., 2002; Woodman & Hardy, 2001; Wang & Che, 2005). Lower family SES leads to the “high anxiety-moderate engagement” pattern. From the Family Investment and Stress Models, low-SES families lack resources to provide adequate educational support (Bradley & Corwyn, 2002), creating feelings of inferiority and anxiety when students compare themselves with peers (Shi et al., 2013). Additionally, traditional Chinese beliefs like “leaping through the dragon’s gate” and “success from humble beginnings” may lead low-SES parents to have higher academic expectations to improve family status, pressuring students and increasing anxiety (Zhang et al., 2022). Under parental supervision, these students must engage more to improve performance. Thus, despite objective conditions limiting engagement, these students show “high anxiety-moderate engagement.” Compared to “low anxiety-high engagement” students, those in “high anxiety-moderate engagement” face greater psychological pressure; even with moderate engagement driven by parental pressure, their achievement remains inferior.

The “high anxiety-low engagement” pattern did not show significant mediation, though family SES significantly negatively predicted this pattern. Using “high anxiety-low engagement” as reference, “high anxiety-moderate engagement” also showed no significant mediation, with only family SES directly predicting achievement. This suggests that family SES effects on achievement may vary across learning pattern groups, warranting future investigation and indicating that families and schools should provide targeted attention to students in different patterns.

4.3 Moderating Role of Negative Parenting

Negative parenting significantly moderated the relationship between family SES and learning patterns. Simple slope analysis showed that when parents used more negative parenting, higher family SES increased the likelihood of “high anxiety-moderate engagement” patterns. When parents used less negative parenting, higher family SES increased the likelihood of “low anxiety-high engagement” patterns. This supports the reverse stress-buffering model (Li et al., 2018; Rueger et al., 2016). Ma (2019) found similar results: negative parenting harmed high-SES students’ academic adaptation more than low-SES students.

Possible explanations include: High-SES families have superior economic conditions, but if parents fail to convert economic capital into educational capital and instead invest in material temptations that satisfy vanity, academic adaptation suffers. High-SES parents often have higher occupational status and busier work schedules; combined with cold parenting, this reduces parent-child communication, making it difficult for students to process psychological pressure, potentially creating learning aversion. We speculate that high-SES students’ learning patterns are more affected by negative parenting because high-SES parents, being successful themselves, may have higher expectations for their children, creating greater pressure (Zhu & Zhang, 2013) and anxiety that un-

dermines engagement. Additionally, high-SES parents have more resources, but under high negative parenting, this investment may become over-controlling and ignore children's feelings, transforming abundant resources into excessive intervention that reduces learning initiative and curiosity, weakening the process of using family resources to form positive learning patterns.

When parents used less negative parenting, family SES positively predicted learning patterns, promoting better achievement. This supports the Family Investment and Stress Models, showing that SES and positive family environments complement each other to promote development. In these contexts, parents avoid punitive methods, provide emotional support, and with higher SES, offer more material resources (Conger & Donnellan, 2007). Dual support reduces anxiety, increases engagement, forms positive learning patterns, and promotes achievement (Chen et al., 2021; Wu et al., 2023; Zhang et al., 2020).

Furthermore, the interaction between family SES and negative parenting on academic achievement was non-significant, showing a linear model. Both factors independently significantly predicted achievement.

4.4 Innovations and Future Directions

This study innovatively used a person-centered approach to reveal heterogeneity in Chinese primary school students' learning patterns, providing a new explanation for contradictory variable-level findings: individual differences mean students respond differently to anxiety—some reduce engagement while others increase it to cope, producing divergent results.

Additionally, this study examined the mediating role of learning patterns and the moderating role of negative parenting, offering practical implications: parents should avoid negative parenting to support development, especially in high-SES families where it may undermine SES's positive effects. The findings support and extend Family Stress and Investment Models, showing that family SES effects cannot be generalized and must consider other family factors like parenting. Under high negative parenting, high family SES becomes a risk factor for positive outcomes, suggesting its promotive effects have preconditions requiring clarification to maximize value.

Limitations include: (1) Short intervals between assessments—future research should use longer intervals and multi-wave designs to examine long-term effects; (2) Only negative parenting was examined—future studies should compare negative and positive parenting; (3) The sample comprised urban public primary school students from a second-tier city, limiting generalizability—future research should expand sampling to different cities and rural areas.

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