

RESEARCH ARTICLE

Parental factors and academic self-efficacy:
A demographic study of junior high school
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Abstract

Recent educational reforms in China have placed greater emphasis on students' holistic development and well-being, highlighting the growing importance of understanding family educational processes. However, little is known about how students' perceptions of parental psychological resources and educational processes vary across demographic groups in the current educational context. This study aimed to examine demographic differences in junior high school students' perceptions of parental psychological capital, parental educational involvement, parent-child relationships, and academic self-efficacy. A total of 472 junior high school students completed self-report questionnaires. Independent-samples t-tests and one-way ANOVAs revealed several significant demographic differences. Female students reported higher academic self-efficacy and perceived higher levels of mother's psychological capital and both father's and mother's educational involvement. Significant cross-sectional differences across grade levels were observed, with Grade 7 students reporting higher levels of academic self-efficacy, parental psychological capital, parental educational involvement, and parent-child relationships than students in higher grades. Urban students generally reported higher levels of several measured variables than town and rural students, whereas only children reported higher perceived PPC and PEI than children with siblings; these differences varied across domains. These findings highlight the importance of considering demographic characteristics in understanding family educational processes and suggest the value of targeted family support strategies and context-sensitive educational practices.

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1. Introduction

In recent years, basic education in China has undergone a profound transformation, driven by national policies aimed at reducing academic burden, strengthening family education, and promoting students' holistic development and mental well-being (General Office of the State Council of the People's Republic of China, 2021; National People's Congress of the People's Republic of China, 2021). These reforms mark a shift from a narrow emphasis on academic achievement toward a more comprehensive developmental framework that prioritizes psychological health, character development, and overall well-being.

Within this changing educational ecology, the role of the family has been substantially redefined. School–family collaboration has become an institutionalized practice, placing families at the center of students’ developmental support systems. However, under the “Double Reduction” policy, many parents face increasing uncertainty regarding how to effectively support their children’s learning and development (General Office of the State Council of the People’s Republic of China, 2021). While school workload has been reduced, educational anxiety, unclear guidance, and ineffective parenting strategies remain prevalent, raising concerns about how families can foster students’ competence, motivation, and personal growth without creating new forms of pressure.

However, focusing solely on external family resources, such as time and financial investment, may be insufficient to meet the current developmental goals. Internal psychological resources and relational processes within families are important correlates of students’ academic and psychological outcomes. Guided by ecological systems theory, which highlights the central influence of the family microsystem, this study focuses on parental psychological capital (PPC), parental educational involvement (PEI), parent–child relationships (PCR), and students’ academic self-efficacy (ASE) as key indicators of family functioning and student development.

Given China’s pronounced urban–rural disparities, diverse family structures, and rapid developmental changes during early adolescence, it is essential to examine whether parental factors and students’ ASE vary systematically across different demographic groups. Accordingly, this study aims to investigate differences in junior high school students’ perceptions of PPC, PEI, PCR, and ASE across gender, grade level, family residence, and only-child status to provide empirical evidence for differentiated family education guidance and more targeted school–family–community collaboration.

2. Literature review

2.1. Ecological systems theory

Ecological systems theory proposes that individual development is shaped by multiple nested environmental systems, among which the family microsystem exerts the most immediate and sustained influence on students’ academic and psychological outcomes (Bronfenbrenner, 1979; P. Tong & An, 2024). Within this framework, proximal processes, such as parental behaviors, emotional resources, and interaction patterns, are central mechanisms through which environmental influences are transmitted to students’ competence development and psychological adjustment.

Although ecological systems theory emphasizes the influence of family environments on students’ development, existing studies have rarely examined how students’ perceptions of different parental resources vary across demographic characteristics. For example, family socioeconomic status has been linked to students’ academic adaptability and buoyancy, with parenting processes operating as important mediating pathways (Chen *et al.*, 2025; Q. Liu *et al.*, 2020). Longitudinal evidence further suggests that motivational beliefs and self-perceptions show systematic changes across the school years, reflecting the continuing influence of family environments during adolescence (Scherrer & Preckel, 2019). In addition, PEI has been found to mediate the association between family background and students’ academic outcomes (Gu *et al.*, 2024; Martinez-Yarza *et al.*, 2024). However, although ecological systems theory emphasizes the complexity and interconnectedness of environmental influences, existing empirical studies have largely focused on isolated parental or family factors, leaving it unclear how students’ perceptions of multiple family resources and their ASE vary across demographic contexts.

2.2. Academic self-efficacy

Academic self-efficacy refers to students’ beliefs about their ability to successfully perform academic tasks and achieve learning goals (Bandura, 1997). Extensive evidence indicates that ASE is a robust predictor of academic achievement, engagement, and intrinsic motivation (Affuso *et al.*, 2023; Affuso *et al.*, 2025; Honicke & Broadbent, 2016).

Parental factors play an important role in the development of ASE. Parental support, monitoring, and involvement have been associated with higher self-efficacy among students (Fan & Williams, 2010; Hung *et al.*, 2025). Shao and Kang (2022) showed that PCRs are associated with learning engagement through ASE, highlighting the mediating role of motivational beliefs. L. Wang and Yu (2023) further found that gender moderates the effects of academic self-concept on motivation and self-efficacy. Collectively, these studies suggest that family environments are closely associated with ASE through both emotional support and behavioral involvement. Therefore, ASE provides an important outcome indicator for examining how different dimensions of family functioning contribute to student development.

2.3. Parental psychological capital

Psychological capital, comprising self-efficacy, hope, resilience, and optimism, is conceptualized as a developable positive psychological resource that enhances individuals’ adaptive functioning and coping capacity (Luthans *et*

al., 2007; Luthans & Youssef-Morgan, 2017). Originally developed within organizational psychology, psychological capital has been shown to buffer stress, reduce burnout, and promote well-being among adults (Avey *et al.*, 2009).

Recent studies have extended this construct to the family domain, emphasizing parents' psychological resources as an important foundation for effective parenting and a supportive family climate. Yue *et al.* (2023) reported that mother's psychological capital (MPC) mediated the relationship between social support and parenting competence, indicating that parents' internal psychological resources are closely linked to their parenting capacity. An *et al.* (2025) further demonstrated that components of PPC can buffer the negative effects of parental neglect on students' problematic behaviors. These findings suggest that PPC is not only beneficial for parents themselves but also functions as an important family resource associated with parenting practices and the emotional environment in which children develop.

Nevertheless, most previous studies have examined PPC using parents' self-reports, whereas students' perceptions of parental psychological resources remain relatively underexplored. Because students interpret and respond to family environments through their own experiences, perceived PPC may provide a different perspective on family resources. Furthermore, fathers and mothers may provide different forms of psychological and educational resources, yet many studies continue to treat parents as a homogeneous group. Although current findings consistently support the positive role of PPC, relatively little is known about whether students perceive their father's psychological capital (FPC) and MPC differently or whether these perceptions vary across demographic groups.

2.4. Parental educational involvement

Parental educational involvement refers to parents' participation in and support for their children's learning activities at home and in school (Seginer, 2006). A substantial body of research has demonstrated positive associations between PEI and students' academic achievement, motivation, and self-efficacy (Fan & Williams, 2010; Hill & Tyson, 2009).

Meta-analytic evidence indicates that the academic benefits of PEI vary across involvement types and according to parental socioeconomic status (Tan *et al.*, 2020; Tan *et al.*, 2025). In Chinese samples, PEI has been shown to mediate the relationship between family socioeconomic status and students' academic achievement and adaptability (Chen *et al.*, 2025; Gu *et al.*, 2024). X. Liu *et al.* (2024) further found that PEI was associated with

children's subjective well-being through an enhanced sense of security and autonomous motivation. Longitudinal studies have also identified reciprocal associations between PEI and academic performance during early adolescence (Yang, 2025). These findings suggest that PEI represents an important behavioral dimension of family involvement through which parents may influence adolescents' educational experiences. Despite substantial evidence supporting the importance of PEI across cultures, previous studies have mainly emphasized the amount or frequency of involvement, whereas less attention has been paid to whether students' perceptions of PEI differ across demographic groups within the same sample.

2.5. Parent-child relationships

The quality of PCRs provides an emotional context for adolescents' development, which is associated with their sense of security, autonomy, and psychological well-being (Olson, 1991, 2000; W. Zhang *et al.*, 2006). A warm and supportive PCR has been associated with higher learning engagement, stronger academic motivation, and better academic performance (Shao & Kang, 2022; W. Wang, 2024).

Empirical evidence also suggests that PCR quality is linked to adolescents' emotional and behavioral adjustment. Bacikova-Sleskova *et al.* (2024) reported that perceived parental control and PCR quality were associated with adolescents' psychological adjustment, with gender differences observed in these associations. Meng *et al.* (2026) identified distinct behavioral and psychological characteristics across different PCR patterns, further highlighting the importance of relationship quality in adolescent development. In the Chinese context, family dynamics and functioning have been shown to differ between one-child and two-child families, suggesting that family structure may be associated with variations in students' family experiences (J. Tong *et al.*, 2023).

These findings indicate that PCRs are embedded within broader family structures and cultural contexts and may operate differently across subgroups. Nevertheless, existing studies have rarely distinguished FCR and MCR when examining students' perceptions of family relationships.

2.6. Demographic differences in parental factors and academic self-efficacy

Beyond the influence of family resources, demographic characteristics may shape students' perceptions of academic competence and family experiences. According to Bronfenbrenner's (1979) ecological systems theory, development results from interactions between individual characteristics and multiple environmental systems, with

family and school contexts playing particularly important roles. Previous studies have reported demographic differences in students' academic beliefs and perceptions of parental factors across gender, grade level, family residence, and only-child status (Gu *et al.*, 2024; Scherrer & Preckel, 2019; J. Tong *et al.*, 2023; Wei *et al.*, 2022). However, few studies have simultaneously examined demographic differences in multiple dimensions of parental factors and ASE within the same sample. Therefore, the following subsections review empirical evidence regarding demographic differences and develop hypotheses concerning gender, grade level, family residence, and only-child status.

2.6.1. Gender differences

Regarding gender, previous studies have identified variations in students' ASE, although the magnitude and direction of these differences vary across educational contexts and subject domains (Affuso *et al.*, 2023, 2025; Brage-del-Río *et al.*, 2025; L. Wang & Yu, 2023). Research has also identified gender differences in perceived PEI and PCR (Bacikova-Sleskova *et al.*, 2024; García-Mendoza *et al.*, 2022). Together, these findings indicate that gender may influence both students' academic self-beliefs and their perceptions of parental factors. Therefore, H1 was formulated as follows:

H1: Students' ASE and perceptions of PPC, PEI, and PCR differ significantly by gender.

2.6.2. Grade level differences

Students' academic development and perceptions of parental factors may change across grade levels. Previous studies have shown that students' ASE may vary as academic demands and educational expectations increase (Scherrer & Preckel, 2019; Yang, 2025). Similarly, PEI and PCR may change as adolescents become increasingly autonomous (Hill & Tyson, 2009; Wei *et al.*, 2022). In addition, parents' confidence and parenting experiences may also evolve during this developmental period (Glatz *et al.*, 2024). Collectively, these findings suggest that students' perceptions of ASE and family-related experiences may vary across grade levels. Based on the above findings, H2 was developed:

H2: Students' ASE and perceptions of PPC, PEI, and PCR differ significantly by grade.

2.6.3. Family residence differences

Family residence represents an important contextual factor associated with students' educational opportunities and family experiences. Previous studies have shown that urban, town, and rural families differ in educational resources,

socioeconomic conditions, and parental educational support, which may contribute to differences in students' academic experiences and parental factors (Chen *et al.*, 2025; Gu *et al.*, 2024; Hung *et al.*, 2025). Collectively, these findings suggest that family residence may be associated with students' academic beliefs and family experiences. Accordingly, H3 was proposed:

H3: Students' ASE and perceptions of PPC, PEI, and PCR differ significantly by family residence.

2.6.4. Only-child status differences

Family structure is another demographic characteristic that may influence students' perceptions of parental factors and development. Previous studies have suggested that family functioning, parent-child interactions, and developmental experiences differ between only-child families and families with multiple children (Persram *et al.*, 2025; J. Tong *et al.*, 2023). These differences may be associated with variations in the parental resources available to students and their educational experiences. Considering the role of family structure, H4 was formulated:

H4: Students' ASE and perceptions of PPC, PEI, and PCR differ significantly by only-child status.

2.7. The present study

Building on the preceding literature and ecological systems theory, the present study examined demographic differences in junior high school students' perceptions of multiple dimensions of family functioning and their ASE. Specifically, differences in FPC, MPC, FEI, MEI, FCR, MCR, and ASE were examined by gender, grade level, family residence, and only-child status among junior high school students in Shanxi, China. By considering these parental and student-related factors simultaneously, the study aimed to provide a more comprehensive account of demographic variations in family educational experiences and to inform more targeted family education guidance and school-family collaboration.

3. Data and methods

3.1. Participants and procedure

This study was approved by the Research Ethics Committee of Universiti Putra Malaysia (Approval No. JKEUPM-2025-025). Before data collection, permission was obtained from the participating schools, written informed consent was obtained from parents or legal guardians, and assent was obtained from all participating students. Participants were informed that participation was entirely voluntary and that they could withdraw from the study at any stage without any negative consequences. To protect participants' privacy and confidentiality, the

questionnaire was completed anonymously, and no personally identifiable information was collected. The paper-based surveys were administered in classrooms under the supervision of trained researchers, with instructions provided to ensure that students completed the questionnaires independently. All collected data were used solely for research purposes and were stored securely with access restricted to the research team.

This study employed a cross-sectional survey design using a three-stage stratified sampling approach. The sampling procedure was designed to ensure representation of junior high school students from different residential contexts in Yuncheng, Shanxi, China. In the first stage, the target population was stratified into three residential categories: urban, town, and rural areas. In the second stage, schools were randomly selected from each residential stratum. In the third stage, classes were randomly selected within each participating school, and all eligible students from the selected classes were invited to participate. The number of participants recruited from each stratum was approximately proportional to the distribution of junior high school students across urban, town, and rural areas to ensure adequate representation of different residential contexts.

The inclusion criteria were: (i) students enrolled in Grades 7–9 in the selected junior high schools; (ii) students who were able to understand and complete the questionnaire independently; and (iii) students who voluntarily agreed to participate, with written informed consent obtained from a parent or legal guardian and assent obtained from the student. Students from divorced, remarried, or long-term parental separation families were excluded because these family contexts involve additional factors beyond the scope of the present study.

A total of 480 questionnaires were distributed, and 472 valid responses were obtained after data screening, resulting in a valid response rate of 98.3%. The final sample consisted of 50.4% male students and 49.6% female students. Students were relatively evenly distributed across Grades 7, 8, and 9, accounting for 33.5%, 33.7%, and 32.8% of the sample, respectively. Regarding family residence, 43.2% of the students were from urban areas, 49.4% from towns, and 7.4% from rural areas. In terms of family structure, 70.8% of students came from multi-child families, whereas 29.2% were only children. These demographic characteristics allowed comparisons across relevant subgroups within the sample.

3.2. Measures

3.2.1. Academic Self-Efficacy Scale

Academic Self-Efficacy Scale was developed by Liang (2000)

at Central China Normal University. The scale measures two dimensions of ASE: (i) ASE in learning ability and (ii) ASE in learning behavior. ASE was calculated as the mean score across all items of the two dimensions; a higher score indicates higher ASE. The scale uses a five-point Likert scale. The scale has been widely used and psychometrically validated among Chinese junior high school students in previous research (Zhou *et al.*, 2023). In this study, the total Cronbach's alpha (α) was 0.937.

3.2.2. Parental Psychological Capital Questionnaire

The Psychological Capital Questionnaire, originally developed by Luthans *et al.* (2007), was designed to measure individuals' positive psychological capacities in the work environment. The adaptation of the scale followed a multi-stage process, including consultations with the research supervisory committee to ensure conceptual alignment, reviews by expert psychologists to assess cultural and linguistic appropriateness, pilot testing to evaluate item clarity and preliminary reliability, and psychometric evaluation using exploratory and confirmatory factor analyses. The questionnaire includes two subscales, namely the FPC questionnaire and MPC questionnaire. Each subscale comprises four dimensions: self-efficacy, hope, resilience, and optimism. The scale is rated on a five-point Likert scale, with higher scores indicating higher levels of PPC as perceived by students. In this study, the overall Cronbach's α was 0.925 for the father version and 0.923 for the mother version.

3.2.3. Parental Educational Involvement Scale

The Parental Educational Involvement Scale was developed by Song (2010). The questionnaire includes two subscales, namely father's educational involvement scale and mother's educational involvement scale, each of which comprises three dimensions: (i) emotional involvement, (ii) intellectual involvement, and (iii) behavioral management involvement. The scale contains 42 items: 21 items in the father's educational involvement subscale and 21 items in the mother's educational involvement subscale. The scale is scored on a five-point Likert scale, and higher scores indicate higher levels of student-perceived PEI. In this study, the overall Cronbach's α was 0.941 for the father version and 0.940 for the mother version.

3.2.4. Parent–Child Relationships Scale

The Parent–Child Relationships Scale was adapted from the Family Adaptability and Cohesion Evaluation Scale (Olson *et al.*, 1991; W. Zhang *et al.*, 2006). The original scale includes two dimensions: cohesion and adaptability. In the present study, the cohesion subscale was selected because it focuses on emotional closeness, support, and

connectedness between parents and children, which directly corresponds to the focus of the present study. The adaptability dimension was not included because it reflects broader family functioning rather than PCR quality specifically. The cohesion subscale has been used in studies involving Chinese adolescents and has demonstrated satisfactory reliability and validity. Separate father–child and mother–child versions were administered, both rated on a five-point Likert scale, with higher scores indicating stronger perceived PCRs. In this study, the Cronbach's α values were 0.907 for the father–child version and 0.914 for the mother–child version, indicating good internal consistency for both scales.

3.2.5. Demographic variables

The background questionnaire was designed to collect detailed demographic information from participants. The data gathered included participants' gender, current grade level, family residence, and only-child status. This information was analyzed to describe the sample characteristics and to examine potential differences in study outcomes across demographic subgroups.

3.2.6. Measurement validity and reliability

Exploratory factor analysis was first conducted using data from a pilot study ($n = 104$) to assess the underlying factor structures of each scale. As shown in Table 1, the Kaiser–Meyer–Olkin (KMO) values ranged from 0.872 to 0.926, and Bartlett's tests of sphericity were significant for all scales ($p < 0.001$), indicating that the data were appropriate for factor analysis. The extracted factor structures were consistent with the theoretical dimensions of each instrument, with cumulative variance explained ranging from 62.26% to 72.49%.

Confirmatory factor analysis was then performed using the main study sample ($n = 472$) to further validate the measurement models. The results indicated that both measurement models demonstrated excellent fit, supporting the proposed factor structures. For the father-related measurement model, the fit indices were $\chi^2/df = 1.396$, incremental fit index (IFI) = 0.961, comparative fit index (CFI) = 0.961, Tucker–Lewis index (TLI) = 0.959, root mean square error of approximation (RMSEA) = 0.029, and standardized root mean square residual (SRMR) = 0.040. For the mother-related measurement model, the fit indices were $\chi^2/df = 1.399$, IFI = 0.958, CFI = 0.958, TLI = 0.956, RMSEA = 0.029, and SRMR = 0.037. All standardized factor loadings were statistically significant ($p < 0.001$) and exceeded the recommended threshold of 0.50, ranging from 0.525 to 0.902 for the father-related model and from 0.526 to 0.906 for the mother-related model, providing further support for the factorial validity of the measurement models.

Reliability was assessed using Cronbach's α and composite reliability (CR), both of which exceeded the recommended thresholds ($\alpha > 0.70$; $CR > 0.70$). As shown in Table 2, Cronbach's α values ranged from 0.907 to 0.941, and CR values ranged from 0.908 to 0.969. Convergent validity was evaluated using average variance extracted (AVE). All constructs demonstrated AVE values above 0.50, ranging from 0.543 to 0.643, indicating adequate convergent validity. Overall, the results provide evidence for the reliability and construct validity of the measurement instruments in the present sample.

Table 1. Results of factor analysis

Construct	Items	Number of factors	KMO	Bartlett's test	Variance explained (%)
ASE	18	2	0.926	***	62.257
FPC	19	4	0.881	***	71.861
MPC	19	4	0.872	***	67.704
FEI	18 ^a	3	0.924	***	72.486
MEI	19 ^b	3	0.917	***	67.919
FCR	6	1	0.888	***	66.790
MCR	6	1	0.887	***	70.409

Note: $n = 104$. During the pilot study, several items were removed based on the exploratory factor analysis results: ^athree items were removed from FEI; ^btwo items were removed from MEI. *** $p < 0.001$.

Abbreviations: ASE: Academic self-efficacy; FCR: Father–child relationship; FEI: Father's educational involvement; FPC: Father's psychological capital; KMO: Kaiser–Meyer–Olkin measure of sampling adequacy; MCR: Mother–child relationship; MEI: Mother's educational involvement; MPC: Mother's psychological capital.

Table 2. Results of reliability and convergent validity

Construct	Cronbach's alpha	CR (>0.70)	AVE (>0.50)
ASE	0.937	0.956	0.543
FPC	0.925	0.969	0.619
MPC	0.923	0.961	0.565
FEI	0.941	0.966	0.614
MEI	0.940	0.966	0.614
FCR	0.907	0.908	0.621
MCR	0.914	0.915	0.643

Note: $N = 472$.

Abbreviations: ASE: Academic self-efficacy; AVE: Average variance extracted; CR: Composite reliability; FCR: Father–child relationship; FEI: Father's educational involvement; FPC: Father's psychological capital; MCR: Mother–child relationship; MEI: Mother's educational involvement; MPC: Mother's psychological capital.

3.3. Data analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 30.0 and IBM SPSS Amos version 24.0 (IBM Corp., United States of America). First, exploratory factor analysis was conducted using SPSS to examine the factor structure of the measurement instruments. Reliability analyses were performed to assess the internal consistency of the scales. Confirmatory factor analysis was subsequently conducted using AMOS to evaluate the construct validity of the measurement models.

Descriptive statistics were calculated to summarize the characteristics of the study variables. Independent-samples *t*-tests were conducted to examine differences between two-group demographic variables, including gender and only-child status. One-way analysis of variance (ANOVA) was conducted to examine differences across multiple-group demographic variables, including grade level and family residence. When significant differences were identified in ANOVA results, least significant difference (LSD) post hoc tests were performed to determine specific group differences among categories.

4. Results

4.1. Differences by gender in academic self-efficacy, parental psychological capital, parental educational involvement, and parent-child relationships

The independent-samples *t*-test results indicated several statistically significant differences between males and females (see Table 3). Female students reported significantly higher scores than male students on ASE (Male: $M = 3.374$, $SD = 0.707$; Female: $M = 3.521$, $SD = 0.663$; $t = -2.340$,

$p = 0.020$, Cohen's $d = -0.215$), MPC (Male: $M = 3.590$, $SD = 0.714$; Female: $M = 3.779$, $SD = 0.708$; $t = -2.889$, $p = 0.004$, Cohen's $d = -0.266$), FEI (Male: $M = 3.473$, $SD = 0.890$; Female: $M = 3.705$, $SD = 0.787$; $t = -2.998$, $p = 0.003$, Cohen's $d = -0.276$), and MEI (Male: $M = 3.473$, $SD = 0.913$; Female: $M = 3.741$, $SD = 0.868$; $t = -3.260$, $p = 0.001$, Cohen's $d = -0.300$). According to Cohen's (1988) criteria, all significant differences represented small effect sizes. Conversely, no significant gender differences were found for FPC ($t = -0.748$, $p = 0.455$, Cohen's $d = -0.069$), FCR ($t = 0.314$, $p = 0.753$, Cohen's $d = 0.029$), or MCR ($t = -1.043$, $p = 0.297$, Cohen's $d = -0.096$).

In summary, female students reported higher levels of ASE, MPC, FEI, and MEI than male students, although all significant differences were associated with small effect sizes. No significant gender differences were observed in FPC, FCR, or MCR. Therefore, H1 was partially supported.

4.2. Differences by grade level in academic self-efficacy, parental psychological capital, parental educational involvement, and parent-child relationships

A series of one-way ANOVAs were conducted to examine cross-sectional differences across grade levels in ASE, PPC, PEI, and PCR among junior high school students ($N = 472$). Significant main effects of grade were found for all measured variables (see Table 4).

Academic self-efficacy differed significantly by grade, $F(2, 469) = 29.494$, $p < 0.001$. LSD post hoc tests indicated that Grade 7 students ($M = 3.762$, $SD = 0.617$) reported significantly higher ASE than both Grade 8 ($M = 3.353$, $SD = 0.666$; $p < 0.01$) and Grade 9 ($M = 3.222$, $SD = 0.667$; $p < 0.01$).

Table 3. Results of independent-samples *t*-tests for ASE, FPC, MPC, FEI, MEI, FCR, and MCR by gender

Variables	Male ($n = 238$)		Female ($n = 234$)		<i>t</i>	<i>p</i>	Cohen's <i>d</i>
	M	SD	M	SD			
ASE	3.374	0.707	3.521	0.663	-2.340	0.020	-0.215
FPC	3.608	0.713	3.657	0.694	-0.748	0.455	-0.069
MPC	3.590	0.714	3.779	0.708	-2.889	0.004	-0.266
FEI	3.473	0.890	3.705	0.787	-2.998	0.003	-0.276
MEI	3.473	0.913	3.741	0.868	-3.260	0.001	-0.300
FCR	3.668	0.996	3.640	0.970	0.314	0.753	0.029
MCR	3.505	1.039	3.604	1.025	-1.043	0.297	-0.096

Notes: $N = 472$. Cohen's *d* values of 0.20, 0.50, and 0.80 represent small, medium, and large effect sizes, respectively (Cohen, 1988).

Abbreviations: ASE: Academic self-efficacy; FCR: Father-child relationship; FEI: Father's educational involvement; FPC: Father's psychological capital; M: Mean; MCR: Mother-child relationship; MEI: Mother's educational involvement; MPC: Mother's psychological capital; SD: Standard deviation.

Parental psychological capital also showed significant grade differences. For FPC, $F(2, 469) = 9.250, p < 0.001$, LSD post hoc tests showed that Grade 7 students ($M = 3.824, SD = 0.627$) scored significantly higher than Grade 8 ($M = 3.554, SD = 0.679; p < 0.01$) and Grade 9 students ($M = 3.517, SD = 0.762; p < 0.01$). Similarly, for MPC, $F(2, 469) = 7.927, p < 0.001$, Grade 7 students ($M = 3.860, SD = 0.706$) scored significantly higher than Grade 8 ($M = 3.635, SD = 0.718; p < 0.05$) and Grade 9 students ($M = 3.554, SD = 0.694; p < 0.01$).

Regarding PEI, significant grade differences were found for FEI, $F(2, 469) = 5.638, p = 0.004$, and MEI, $F(2, 469) = 17.372, p < 0.001$. LSD post hoc tests showed that Grade 7 students scored higher on FEI ($M = 3.771, SD = 0.815$) than Grade 8 ($M = 3.504, SD = 0.841; p < 0.01$) and Grade 9 students ($M = 3.489, SD = 0.862; p < 0.01$). Similarly, Grade 7 students scored higher on MEI ($M = 3.933, SD = 0.813$) than Grade 8 ($M = 3.492, SD = 0.895; p < 0.01$) and Grade 9 students ($M = 3.389, SD = 0.900; p < 0.01$).

Regarding PCR, FCR differed significantly by grade, $F(2, 469) = 13.173, p < 0.001$, with LSD post hoc tests showing that Grade 7 students ($M = 3.967, SD = 0.876$) scored higher than Grade 8 ($M = 3.548, SD = 0.963; p < 0.01$) and Grade 9 students ($M = 3.443, SD = 1.031; p < 0.01$). MCR also showed a significant effect, $F(2, 469) = 3.810, p = 0.023$, with Grade 7 students ($M = 3.736, SD = 0.952$) scoring higher than Grade 8 ($M = 3.482, SD = 1.010; p < 0.05$) and Grade 9 students ($M = 3.442, SD = 1.110; p < 0.05$).

In summary, LSD post hoc analyses consistently showed that Grade 7 students scored significantly higher than

Grade 8 and Grade 9 students on all measured variables. These findings indicate significant differences in ASE, PPC, PEI, and PCR across grade groups in the present sample. Accordingly, H2 was fully supported.

4.3. Differences by family residence in academic self-efficacy, parental psychological capital, parental educational involvement, and parent–child relationships

A series of one-way ANOVAs were conducted to examine differences in ASE, PPC, PEI, and PCR across family residence categories (urban, town, rural) among junior high school students (see Table 5).

Academic self-efficacy differed significantly by family residence, $F(2, 469) = 16.719, p < 0.001$. LSD post hoc tests showed that students from urban areas ($M = 3.633, SD = 0.682$) scored significantly higher on ASE than students from towns ($M = 3.342, SD = 0.655; p < 0.01$) and rural areas ($M = 3.059, SD = 0.689; p < 0.01$). Furthermore, students from towns scored higher on ASE than students from rural areas ($p < 0.05$).

Regarding PPC, significant effects of family residence were observed for both FPC, $F(2, 469) = 4.360, p = 0.013$, and MPC, $F(2, 469) = 10.815, p < 0.001$. For FPC, students from urban areas ($M = 3.741, SD = 0.688$) perceived significantly higher levels than students from towns ($M = 3.554, SD = 0.700; p < 0.01$). For MPC, students from urban areas ($M = 3.846, SD = 0.705$) reported significantly higher levels than those from rural areas ($M = 3.383, SD = 0.636; p < 0.01$).

Table 4. Results of one-way ANOVA examining cross-sectional differences in ASE, FPC, MPC, FEI, MEI, FCR, and MCR by grade

Variables	Grade 7		Grade 8		Grade 9		<i>F</i>	<i>p</i>	LSD
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
ASE	3.762	0.617	3.353	0.666	3.222	0.667	29.494	< 0.001	1 > 2*; 1 > 3**
FPC	3.824	0.627	3.554	0.679	3.517	0.762	9.250	< 0.001	1 > 2*; 1 > 3**
MPC	3.860	0.706	3.635	0.718	3.554	0.694	7.927	< 0.001	1 > 2*; 1 > 3**
FEI	3.771	0.815	3.504	0.841	3.489	0.862	5.638	0.004	1 > 2*; 1 > 3**
MEI	3.933	0.813	3.492	0.895	3.389	0.900	17.372	< 0.001	1 > 2*; 1 > 3**
FCR	3.967	0.876	3.548	0.963	3.443	1.031	13.173	< 0.001	1 > 2*; 1 > 3**
MCR	3.736	0.952	3.482	1.010	3.442	1.110	3.810	0.023	1 > 2*; 1 > 3*

Notes: $N = 472$; * $p < 0.05$, ** $p < 0.01$. 1 = Grade 7; 2 = Grade 8; 3 = Grade 9.

Abbreviations: ASE: Academic self-efficacy; FCR: Father–child relationship; FEI: Father’s educational involvement; FPC: Father’s psychological capital; LSD: Least significant difference; *M*: Mean; MCR: Mother–child relationship; MEI: Mother’s educational involvement; MPC: Mother’s psychological capital; *SD*: Standard deviation.

Table 5. Results of one-way ANOVA for ASE, FPC, MPC, FEI, MEI, FCR, and MCR by family residence

Variables	Urban		Town		Rural		<i>F</i>	<i>p</i>	LSD
	M	SD	M	SD	M	SD			
ASE	3.633	0.682	3.342	0.655	3.059	0.689	16.719	< 0.001	1 > 2**; 1 > 3**; 2 > 3*
FPC	3.741	0.688	3.554	0.700	3.522	0.748	4.360	0.013	1 > 2**
MPC	3.846	0.705	3.588	0.709	3.383	0.636	10.815	< 0.001	1 > 2**; 1 > 3**
FEI	3.719	0.834	3.520	0.837	3.284	0.887	5.542	0.004	1 > 2*; 1 > 3**
MEI	3.753	0.843	3.540	0.931	3.188	0.849	7.323	< 0.001	1 > 2*; 1 > 3**; 2 > 3*
FCR	3.773	0.968	3.559	1.007	3.590	0.848	2.665	0.071	–
MCR	3.666	1.067	3.501	0.976	3.257	1.125	2.983	0.052	–

Notes: *N* = 472. **p* < 0.05, ***p* < 0.01. 1 = Urban; 2 = Town; 3 = Rural.

Abbreviations: ASE: Academic self-efficacy; FCR: Father–child relationship; FEI: Father’s educational involvement; FPC: Father’s psychological capital; LSD: Least significant difference; M: Mean; MCR: Mother–child relationship; MEI: Mother’s educational involvement; MPC: Mother’s psychological capital; SD: Standard deviation.

For PEI, significant residence effects were observed for both FEI, $F(2, 469) = 5.542$, $p = 0.004$, and MEI, $F(2, 469) = 7.323$, $p < 0.001$. LSD post hoc tests showed that urban students reported higher FEI ($M = 3.719$, $SD = 0.834$) than rural students ($M = 3.284$, $SD = 0.887$; $p < 0.01$). For MEI, urban students ($M = 3.753$, $SD = 0.843$) reported higher involvement than rural students ($M = 3.188$, $SD = 0.849$; $p < 0.01$), and town students ($M = 3.540$, $SD = 0.931$) also reported higher involvement than rural students ($p < 0.05$).

Regarding PCR, the main effects of family residence were not statistically significant for either FCR, $F(2, 469) = 2.665$, $p = 0.071$, or MCR, $F(2, 469) = 2.983$, $p = 0.052$.

In summary, significant differences across family residence groups were observed for ASE, PPC, and PEI, with urban students generally reporting higher levels than students from other residence groups. In contrast, perceived PCR did not differ significantly across family residence groups. These findings provided partial support for H3.

4.4. Differences by only-child status in academic self-efficacy, parental psychological capital, parental educational involvement, and parent–child relationships

A series of independent-samples *t*-tests were conducted to compare ASE, PPC, PEI, and PCR between only children and children with siblings. The results showed several significant differences between only children and children with siblings (see Table 6).

Only children reported significantly higher levels of perceived FPC ($M = 3.853$, $SD = 0.690$) and MPC ($M = 3.955$, $SD = 0.617$) compared to children with siblings (FPC: $M = 3.541$, $SD = 0.689$; MPC: $M = 3.572$, $SD = 0.726$). The *t*-tests indicated $t = 4.473$, $p < 0.001$, Cohen’s $d = 0.453$ for FPC, and $t = 5.807$, $p < 0.001$, Cohen’s $d = 0.550$ for MPC. According to Cohen’s (1988) guidelines, these differences ranged from small to medium effect sizes.

Significant differences were also found for PEI. Only children perceived higher FEI ($M = 3.861$, $SD = 0.824$) than children with siblings ($M = 3.476$, $SD = 0.833$), $t = 4.587$, $p < 0.001$, Cohen’s $d = 0.464$, representing a small-to-medium effect size. For MEI, only children also scored higher ($M = 3.777$, $SD = 0.849$) than children with siblings ($M = 3.535$, $SD = 0.912$), $t = 2.664$, $p = 0.008$, Cohen’s $d = 0.270$, representing a small effect size.

However, no statistically significant differences were found for ASE ($t = 1.240$, $p = 0.216$, Cohen’s $d = 0.124$), FCR ($t = 1.316$, $p = 0.189$, Cohen’s $d = 0.133$), or MCR ($t = 0.922$, $p = 0.358$, Cohen’s $d = 0.095$). All corresponding effect sizes were small.

In summary, only children reported higher levels of PPC and PEI than children with siblings. The corresponding effect sizes ranged from small to medium. In contrast, ASE and the quality of PCR did not differ significantly between only children and children with siblings. Thus, H4 received partial support.

Table 6. Results of independent-samples *t*-tests for ASE, FPC, MPC, FEI, MEI, FCR, and MCR by only-child status

Variables	Only children		Children with siblings		<i>t</i>	<i>p</i>	Cohen's <i>d</i>
	M	SD	M	SD			
ASE	3.507	0.673	3.422	0.695	1.240	0.216	0.124
FPC	3.853	0.690	3.541	0.689	4.473	<0.001	0.453
MPC	3.955	0.617	3.572	0.726	5.807	<0.001	0.550
FEI	3.861	0.824	3.476	0.833	4.587	<0.001	0.464
MEI	3.777	0.849	3.535	0.912	2.664	0.008	0.270
FCR	3.746	0.983	3.616	0.983	1.316	0.189	0.133
MCR	3.623	1.060	3.525	1.021	0.922	0.358	0.095

Notes: *N* = 472. Cohen's *d* values of 0.20, 0.50, and 0.80 represent small, medium, and large effect sizes, respectively (Cohen, 1988).

Abbreviations: ASE: Academic self-efficacy; FCR: Father-child relationship; FEI: Father's educational involvement; FPC: Father's psychological capital; M: Mean; MCR: Mother-child relationship; MEI: Mother's educational involvement; MPC: Mother's psychological capital; SD: Standard deviation.

5. Discussion

5.1. Differences by gender

The results partially supported H1 by revealing significant gender differences in junior high school students' perceptions of ASE, PPC, and PEI, whereas no significant differences were observed in perceived PCR. Specifically, female students reported higher levels of ASE, MPC, FEI, and MEI. In contrast, no significant gender differences were found in FPC, FCR, or MCR. Taken together, these findings indicate that gender was associated with differences in students' perceptions of academic competence and parental factors in the present sample, although these associations varied across different domains.

With regard to ASE, the present findings are consistent with previous studies showing higher ASE among female students in early adolescence (Affuso *et al.*, 2023, 2025; Hemade *et al.*, 2025; L. Wang & Yu, 2023). At the same time, other research has reported male advantages in specific domains, particularly in STEM-related areas (Brage-del-Río *et al.*, 2025; Tao *et al.*, 2025), or under certain psychological conditions (R. Zhang *et al.*, 2025). This variability suggests that gender differences in ASE may vary across subject domains, educational contexts, and individual characteristics. From the perspective of Bronfenbrenner's (1979) ecological systems theory, students' ASE develops through ongoing interactions within multiple environmental contexts, particularly the family and school microsystems. The present findings suggest that gender differences in ASE may reflect

differences in students' experiences within these immediate developmental contexts.

In terms of PPC, female students perceived higher levels of their MPC than did male students, whereas no significant gender differences were observed in perceptions of FPC. One possible explanation is that male and female students may differ in how they perceive and interpret parental psychological resources. Female students may be more likely to attend to relational interactions and emotional support within the family, which could contribute to higher perceived levels of MPC. The family provides an important developmental context for students' daily interactions with their parents. Differences in these family interactions may contribute to variations in students' perceptions of PPC.

A similar pattern was observed for PEI, with female students reporting higher perceived levels of both FEI and MEI. This finding is consistent with previous research showing that girls tend to report higher levels of perceived parental learning support (Bacikova-Sleskova *et al.*, 2024; García-Mendoza *et al.*, 2022). One possible explanation is that gender-related differences in communication patterns and help-seeking tendencies may influence how students perceive PEI. Girls may be more likely to discuss academic experiences with their parents, making them more aware of PEI. PEI is an important component of the family microsystem that supports students' academic development. The higher levels of perceived PEI among female students suggest that family educational support may not be experienced in the same way by all students.

In contrast to the gender differences observed in these domains, no significant differences were found between male and female students in their perceptions of FCR and MCR. This suggests that boys and girls reported similar levels of perceived intimacy and support in their relationships with their parents in the current sample. This finding is consistent with previous research reporting weak or non-significant gender differences in PCR (Bacikova-Sleskova *et al.*, 2024). Although previous studies have highlighted possible gender differences in PCR, these differences may depend on cultural contexts, family characteristics, and specific dimensions of parenting. The absence of gender differences in perceived PCR in the current study may indicate that overall emotional closeness and support were similarly experienced by male and female students.

Overall, these findings provide partial support for H1 and suggest that gender differences are evident in some, but not all, aspects of students' perceptions of parental factors and ASE. They also extend previous research by showing that gender differences vary across different parental factors rather than occurring uniformly. From a practical perspective, educational interventions and family guidance may benefit from considering gender-related differences while remaining responsive to individual needs, thereby providing more targeted support for students' ASE and healthy development.

5.2. Differences by grade level

The results fully supported H2 by revealing significant grade-level differences in junior high school students' perceptions of ASE, PPC, PEI, and PCR. These findings suggest that students at different grade levels perceived their academic competence and parental factors differently within the present sample.

Regarding ASE, Grade 7 students reported significantly higher ASE than students in Grades 8 and 9. This finding is consistent with previous research suggesting that adolescents' ASE may decline as students progress through school due to increasing academic demands, developmental transitions, and changing learning experiences (Huang *et al.*, 2023). One possible explanation is that students in higher grades experience greater academic pressure and more demanding learning tasks, which may reduce their confidence in their academic abilities. From the perspective of Bronfenbrenner's (1979) ecological systems theory, students' ASE develops through continuous interactions with their immediate environments, particularly the school and family microsystems. As educational expectations and learning experiences change across grade levels, students may develop different perceptions of their academic competence.

Regarding PPC, students' perceptions of both FPC and MPC were lower in higher grades. Glatz *et al.* (2024) indicated that parents may experience changes in parenting-related confidence and emotional involvement as their children progress through adolescence, which may influence family interactions. As students move through junior high school, changes in parent-child interactions and educational expectations may influence how they perceive their parents' psychological resources. This may help explain the lower levels of perceived PPC reported by students in higher grades.

Regarding PEI, students in higher grades reported lower perceived levels of both FEI and MEI. Previous research has suggested that PEI may gradually shift from direct supervision towards more indirect forms of support as children progress through school (Hill & Tyson, 2009; Yang, 2025). In addition, students' increasing desire for autonomy may influence how they perceive and evaluate PEI (Bacikova-Sleskova *et al.*, 2024; García-Mendoza *et al.*, 2022). As interactions between parents and students change during adolescence, educational involvement may become less visible to students, even though parents continue to provide support. This may explain why students in higher grades perceived lower levels of PEI.

Regarding PCR, Grade 7 students also reported higher perceived relationship quality than students in higher grades. Previous studies have suggested that PCR may become more complex during adolescence as autonomy, communication patterns, and family interaction dynamics change (Bacikova-Sleskova *et al.*, 2024). These changes may influence how students perceive emotional closeness and parental support, which may be associated with differences in perceived PCR across grade groups. Accordingly, the lower perceived PCR reported by students in higher grades may reflect differences in students' perceptions of PCR rather than a decline in relationship quality itself.

Overall, these findings provide support for H2 by showing that junior high school students' perceptions of ASE, PPC, PEI, and PCR differed across grade levels. The observed pattern is broadly consistent with previous research on adolescents' academic experiences and family interactions (Bacikova-Sleskova *et al.*, 2024; Glatz *et al.*, 2024; Yang, 2025). In addition to differences in educational experiences and family interactions, it is also important to consider the possibility of response shift in self-report measures. Response shift refers to changes in individuals' internal standards, values, or conceptualizations when evaluating themselves or their experiences (Schwartz & Sprangers, 1999; Vanier *et al.*, 2021). Recent research has further highlighted that such changes may influence the interpretation of self-reported measures over time

(Sawatzky *et al.*, 2025). As students progress through junior high school, they may adopt different standards when evaluating their academic competence and family support, which may also contribute to the observed differences across grade groups. From a practical perspective, educators and parents should pay particular attention to students in higher grades by providing appropriate academic guidance, emotional support, and constructive parent-child communication to promote their ASE and psychological well-being.

5.3. Differences by family residence

The results partially supported H3 by identifying significant differences in ASE, PPC, and PEI across family residence groups, whereas no significant differences were observed in PCR. These findings indicate that family residence was associated with differences in students' perceptions of ASE, PPC, and PEI within the present sample.

Urban students reported significantly higher ASE than town and rural students, with rural students showing the lowest levels. This finding is consistent with previous research indicating that family socioeconomic status is associated with students' academic adjustment (Chen *et al.*, 2025; Q. Liu *et al.*, 2020). Studies conducted in rural China have also shown that limited family support and educational resources may reduce students' learning confidence and academic performance (Gu *et al.*, 2024). In addition, longitudinal studies further show that the effect of PEI on adolescents' academic adjustment varies across different developmental stages and family backgrounds (Wei *et al.*, 2022). One possible explanation is that urban families generally have greater access to educational resources, more stable educational support, and higher educational expectations, which may contribute to students' ASE (Hung *et al.*, 2025). These differences in family and educational environment may contribute to students' perceptions of their academic competence.

Regarding PPC, urban students perceived FPC as significantly higher than town students and MPC as significantly higher than both town and rural students. Previous reviews have indicated that parental self-efficacy is closely associated with social support and family resources, whereas families experiencing greater stress and fewer resources are more likely to experience psychological challenges (Glatz *et al.*, 2024). Furthermore, parental burnout has been linked to middle school students' academic performance through family interaction processes (Peng *et al.*, 2025). In rural contexts, parents often face multiple challenges such as economic pressure, unstable employment, and limited educational resources; these challenges may reduce parents' positive emotional

expression, sense of hope, and self-confidence, which may subsequently be reflected in students' perceptions of PPC (An *et al.*, 2025). Weaker social support networks in rural areas may provide fewer external resources for parents (Yue *et al.*, 2023).

Regarding PEI, urban students reported significantly higher levels of PEI than rural students. This finding is consistent with previous evidence showing that PEI varies across socioeconomic groups, with higher-resource families generally demonstrating more frequent and effective involvement (Tan *et al.*, 2020). Rural parents may face practical constraints, including limited time, educational resources, and familiarity with school systems, which may restrict opportunities for educational engagement (Chen *et al.*, 2025; Gu *et al.*, 2024; Wei *et al.*, 2022). However, these differences should not be interpreted as indicating that rural parents value education less. Instead, they may reflect differences in available resources and opportunities for involvement (Seginer, 2006).

In terms of PCR, no statistically significant differences were found in students' perceptions of FCR or MCR across different family residences. Although urban students reported slightly higher mean scores, the differences were not statistically significant. This finding differs from previous studies suggesting that family stress and resource conditions are associated with PCR (Bacikova-Sleskova *et al.*, 2024; J. Tong *et al.*, 2023). However, previous research has also indicated that different relationship patterns may have different psychological and behavioral implications (Meng *et al.*, 2026). The current findings may suggest that perceived PCR is influenced more strongly by proximal family interactions, such as emotional warmth, communication, and parenting practices, rather than residential location alone. Thus, emotional connections within families may remain relatively stable across different residential contexts.

Overall, these findings provide partial support for H3 by showing that family residence was associated with differences in students' perceptions of ASE, PPC, and PEI, but not PCR. These findings suggest that family residence is an important demographic characteristic associated with students' perceptions of family resources and educational support. Although the cross-sectional design does not allow conclusions regarding causal mechanisms, the findings highlight the importance of considering contextual factors when examining family influences on students' academic development. From a practical perspective, educational support programs may need to pay greater attention to families in town and rural areas, particularly regarding access to educational resources, parental psychological resources, and opportunities for educational

involvement. Strengthening home–school collaboration and community-based support may help promote more equitable educational support environments.

5.4. Differences by only-child status

The results partially supported H4 by showing that students from only-child families reported significantly higher perceived levels of PPC and PEI than students from multi-child families, whereas no significant differences were found in ASE or PCR.

No significant differences were found in ASE between only-child and multi-child families. Previous studies have shown that ASE is associated with multiple factors, including the school environment, teacher support, peer interaction, and students' prior academic achievement (Affuso *et al.*, 2023, 2025; Honicke & Broadbent, 2016). Consequently, the influence of family structure on ASE may be less apparent during junior high school, when school-related experiences become increasingly important. Previous research has also suggested that the advantages associated with only-child families may be moderated by school and peer contexts (Hemade *et al.*, 2025). The present finding is consistent with studies reporting limited differences in ASE across family structures (R. Zhang *et al.*, 2025), although it differs from research suggesting that only children demonstrate stronger self-perceptions of competence (L. Wang & Yu, 2023). These inconsistent findings suggest that the association between family structure and ASE may depend on broader educational and developmental contexts.

Students from only-child families reported significantly higher perceived levels of both FPC and MPC than students from multi-child families, with the difference in MPC reaching a moderate effect size. Previous studies have suggested that interactions between only children and their parents are often more focused, which may make adolescents more likely to perceive parental optimism, resilience, and emotional support (An *et al.*, 2025; Luthans *et al.*, 2007). By comparison, parents in multi-child families need to distribute their time and attention across multiple children, which may be associated with lower perceived levels of parental psychological resources (Bacikova-Sleskova *et al.*, 2024; Meng *et al.*, 2026). This finding is consistent with previous research reporting higher perceived psychological resources among only-child families (Yue *et al.*, 2023).

Students from only-child families also reported significantly higher perceived levels of PEI than students from multi-child families, with effect sizes ranging from small to moderate. This result is consistent with previous

research showing higher levels of educational involvement in only-child families (Tan *et al.*, 2025; Yang, 2025). Parents in only-child families may have more opportunities to maintain close communication with teachers and provide more focused support for their child's learning activities (Fan & Williams, 2010; Hill & Tyson, 2009; Martinez-Yarza *et al.*, 2024). In contrast, parents in multi-child families need to divide their time and attention among several children, which limits the level of personalized educational involvement (Glatz *et al.*, 2024; Gu *et al.*, 2024; J. Tong *et al.*, 2023).

However, no significant differences were found in PCR between only-child and multi-child families. This finding is consistent with some studies suggesting that family structure has a limited impact on PCR (J. Tong *et al.*, 2023). The quality of PCR depends more on interaction processes and family functioning than on the number of children (Olson, 2000; Shao & Kang, 2022). In addition, in multi-child families, positive sibling relationships may also contribute to a supportive family climate and partially offset differences in parental attention allocation, although this possibility cannot be directly examined in the present study (Holmes *et al.*, 2024; Persram *et al.*, 2025). Meanwhile, although interactions in only-child families are more concentrated, the quality of PCR during the junior high school period may become similar across the two family types (Meng *et al.*, 2026; W. Wang, 2024). Therefore, these findings suggest that the quality of PCR may depend more on the nature of family interactions than on family structure itself.

Overall, these findings provide partial support for H4. Only-child status was associated with students' perceptions of PPC and PEI, but not with ASE or PCR. Thus, family composition may be more closely associated with students' perceptions of parental resources and educational practices than with students' ASE or perceived PCRs. Although the cross-sectional design does not permit causal inferences, the results highlight the importance of considering family context when examining students' perceptions of parental factors. From a practical perspective, educators and school counselors may need to pay greater attention to students from multi-child families who perceive relatively lower levels of parental psychological resources and educational involvement. Within the constraints of available family resources, interventions that encourage high-quality parent–child communication and effective educational support may help strengthen students' perceptions of family support (Gu *et al.*, 2024). Future longitudinal and multi-regional studies are needed to further examine how family structure is associated with students' perceptions of family resources and academic development.

5.5. Limitations and future directions

The findings of the present study should be interpreted in light of several limitations. First, the cross-sectional design limits the ability to draw causal conclusions about the relationships among PPC, PEI, PCR, and ASE. Future longitudinal studies are needed to examine how these associations may change over time and to clarify temporal relationships among parental factors and students' academic development. Second, the demographic comparisons were based on independent-samples *t*-tests and one-way ANOVAs, which provide information about group differences but do not account for potential confounding among demographic variables. Therefore, the reported findings should be interpreted as unadjusted group differences within the current sample rather than evidence of independent effects of specific demographic characteristics. In addition, because students were recruited from a limited number of schools, potential school-level clustering effects were not modeled. Future studies could employ multivariable and multilevel analytical approaches to further examine the contributions of demographic and school-level factors to family-related processes and ASE.

Although the scales demonstrated satisfactory reliability and construct validity in the overall sample, measurement invariance across demographic groups was not examined in the present study. Therefore, it remains unclear whether the constructs were interpreted equivalently across different demographic groups. The observed group differences should consequently be interpreted with caution. Future research should conduct measurement invariance testing before making demographic comparisons to support more valid comparisons across groups. In addition, all variables were measured via students' self-reports, which may introduce common method bias. Although students' perceptions provide important insights into their family experiences, they may not fully represent parents' actual psychological resources or educational behaviors. Future studies should incorporate multiple informants, including parents and teachers, as well as qualitative approaches such as interviews or case studies, to obtain a more comprehensive understanding of family processes.

Finally, the sample was limited to junior high school students in Shanxi, China, which may reduce the generalizability of the findings to other developmental stages and cultural contexts. Future studies should examine diverse populations and educational settings to further evaluate the applicability of the proposed framework. Although stratified sampling was employed, the proportion of rural students in the current sample was relatively small, which may reduce statistical power for detecting differences involving rural groups. Future studies

should recruit larger and more balanced samples across urban, town, and rural areas and examine more diverse populations and educational settings to further evaluate the applicability of the proposed framework.

6. Conclusion

This study examined demographic differences in Chinese junior high school students' perceptions of ASE, PPC, PEI, and PCR. The findings showed that students' perceptions of academic and parental factors differed across gender, grade level, family residence, and only-child status.

Regarding gender, female students reported significantly higher levels of ASE and higher perceived levels of MPC, FEI, and MEI than male students, whereas no significant differences were found in FPC, FCR, or MCR. Regarding grade level, significant differences were found across all variables, with Grade 7 students reporting higher levels of ASE, PPC, PEI, and PCR than students in Grades 8 and 9. Regarding family residence, significant differences were observed in ASE, PPC, and PEI, with urban students generally reporting higher levels than town and rural students, while no significant differences were found in PCR. Regarding only-child status, only-child students reported significantly higher levels of PPC and PEI than children with siblings, whereas no significant differences were found in ASE or PCR.

Overall, this study suggests that demographic characteristics are associated with different patterns of students' perceptions of ASE and parental factors. These findings underscore the importance of considering demographic diversity in understanding adolescents' academic and family experiences. They also provide empirical evidence that may inform the development of targeted family- and school-based interventions aimed at promoting students' ASE and strengthening family support.

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Conflict of interest

The authors declare they have no competing interests.

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Ethics approval and consent to participate

The study received ethical approval from the Office of the Deputy Vice Chancellor (Research and Innovation), Universiti Putra Malaysia, with reference numbers UPM. TNCPI 800-2/1/7 and JKEUPM Ref No. JKEUPM-2025-025. The research was conducted using an anonymous questionnaire, ensuring that no personal data were collected. Written informed consent was obtained from parents or legal guardians, and assent was obtained from participating students.

Consent for publication

The research was conducted using an anonymous questionnaire, ensuring that no personal data were collected. Written informed consent for publication was obtained from parents or legal guardians, and assent was obtained from participating students.

Availability of data

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Further disclosure

This article is based on research conducted as part of the author's ongoing doctoral dissertation. No part of this paper has been previously published, presented at conferences, or deposited in a preprint server.

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