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Association Between Perceived Supportive Educational Environments and Emotion Regulation Among Middle School Students in Shandong China

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Abstract

Emotion regulation is central to adolescent psychological adjustment, but the relative contribution of the educational environments surrounding students remains insufficiently understood in many Chinese contexts. This cross-sectional study examined associations between perceived teacher support, peer support, family support, campus psychological environment, and self-reported emotion regulation among 384 Grade 6–9 students in Shandong Province, China. Students completed a brief 25-item set of researcher-adapted indicators embedded in an online questionnaire. Internal consistency, descriptive statistics, Pearson correlations, and simultaneous multiple regression were examined. Cronbach's alpha values ranged from .735 to .830. All four support variables were positively correlated with self-reported emotion regulation ($r = .642–.828$, all $p < .001$). The regression model explained 80.7% of the observed variance, $F(4, 379) = 396.91$, $p < .001$. Campus psychological environment had the largest adjusted coefficient ($\beta = .514$), followed by peer support ($\beta = .206$), family support ($\beta = .200$), and teacher support ($\beta = .133$). Variance inflation factors ranged from 1.72 to 2.46, indicating no severe multicollinearity. Regression diagnostics indicated approximate residual normality, no clear non-linear pattern, and no single case with extreme influence. The findings suggest that students' emotional functioning is associated with a wider educational ecology, particularly psychologically safe and supportive school-wide conditions.

1 Introduction

Adolescence is a period of rapid social, cognitive, and emotional change. The World Health Organization has identified adolescent mental health as a major global priority [1]. Emotion-regulation theory also describes the capacity to recognise, express, and modify emotional responses as central to adjustment and coping [2]. Recent adolescent research further links social-emotional learning with internalising problems and resilience [3]. Longitudinal European evidence similarly suggests that social-emotional skills and resilience are intertwined with behavioural adjustment [4]. Emotion regulation is not only an individual attribute. It develops through repeated exchanges with the social settings in which young people spend their daily lives, especially families, peer groups, classrooms, and schools [5]. Contemporary applications of ecological theory in education continue to support this multi-context perspective [6].

Ecological systems theory provides a useful account of these linked settings [5]. Family and school constitute major microsystems, while the connections between them form a mesosystem that can reinforce or weaken support [6]. Positive psychology adds a complementary emphasis on strengths, supportive relationships, psychological safety, and opportunities to practise adaptive coping [7]. Recent affect-regulation research has further linked resilience with adaptive emotional functioning [8]. Together, these perspectives suggest that adolescent emotional functioning should be examined across multiple sources of support rather than attributed to one relationship in isolation.

Within schools, teacher support includes respectful communication, emotional care, academic guidance, and constructive feedback [9]. Peer support provides belonging, reassurance, information sharing, and social models for responding to stress [10]. Family support supplies emotional warmth, communication, and continuity across situations [11]. Campus psychological environment refers to broader school-wide conditions, including inclusion, relationship quality, psychological safety, help-seeking norms, and access to mental-health services [12]. Longitudinal evidence also indicates that school climate is associated with adolescent social and emotional health over time [13]. Organisational conditions can shape student outcomes through the practices and relationships they sustain, as shown in research on teacher commitment, effective teaching, and perceived learning outcomes [14]. In a more specialised digital-learning context, gamified classroom design has also been associated with improved engagement and emotion regulation among neurodivergent English learners [15].

Existing evidence nevertheless leaves several gaps. First, studies frequently examine one source of support at a time, making it difficult to compare teacher, peer, family, and school-wide conditions within a single model. Second, findings from Chinese student samples indicate that school climate, engagement, and emotional competence are shaped by collectivist values and contextual expectations [16]. A recent systematic review from India likewise concluded that school climate is associated with adolescents' emotional health and academic functioning across resource-constrained settings [17]. Emerging evidence from Chinese higher education has also shown links among school climate, resilience, and emotion regulation, underscoring the broader importance of contextual support [18]. Third, emotion regulation has been tied to self-efficacy and academic functioning in secondary education [19]. Adolescent interoception research has further highlighted the central role of emotion regulation in social-emotional competence [20]. Meta-analytic evidence confirms robust links between emotion regulation and social affect and cognition [21]. Emotion regulation strategies have also been related to emotional support and engagement in adolescent language learning [22]. Evidence specific to Shandong Province remains limited.

The present study therefore examined the concurrent associations of perceived teacher support, peer support, family support, and campus psychological environment with self-reported emotion regulation among middle school students in Shandong, China. Four directional hypotheses were specified: H1, teacher support is positively associated with self-reported emotion regulation; H2, peer support is positively associated with self-reported emotion regulation; H3, family support is positively associated with self-reported emotion regulation; and H4, campus psychological environment is positively associated with self-reported emotion regulation.

2 Theoretical and conceptual framework

2.1 Ecological systems perspective

Bronfenbrenner's ecological systems theory proposes that development occurs through continuing interactions between individuals and nested environmental systems [5]. For middle school students,

teacher and peer interactions are immediate school-based processes, family support is an immediate home-based process, and campus psychological environment reflects school-wide conditions that organise daily experience. The framework also highlights interdependence: family communication may affect how students use school support, while school norms may influence the quality and visibility of teacher and peer assistance.

2.2 Positive psychology perspective

Positive psychology emphasises strengths, positive relationships, resilience, and environments that enable individuals to function well [7]. Contemporary affect-regulation work further suggests that resilience can be understood through repeated emotion-regulation processes [8]. Applied to education, supportive communication, recognition, belonging, and accessible help can create positive emotional experiences and provide repeated opportunities to practise coping. The perspective complements the ecological account by explaining why supportive settings may be related to better emotional functioning.

Figure 1 presents the study's parsimonious conceptual model. The arrows represent hypothesised positive statistical associations. They do not represent causal pathways because all constructs were measured at one time point.

Source. Developed by author based on ecological systems theory [5], positive psychology [7], and the study hypotheses.

Interpretation. The model compares four perceived support domains with one self-reported emotional outcome. The arrows represent hypothesised positive statistical associations and do not imply causality.

3 Methods

3.1 Design and reporting approach

The study used a quantitative cross-sectional correlational design. The design was appropriate for estimating concurrent patterns among naturally occurring perceptions without manipulating school conditions. Reporting was organised with reference to the STROBE principles for cross-sectional studies [23].

3.2 Setting, participants, and recruitment

The target population comprised Grade 6–9 students attending participating public and private middle schools in Shandong Province. author designed and coordinated a four-stage, school- and class-based recruitment procedure intended to include urban and rural settings, public and private schools, and all four grades. Schools and intact classes were selected within the accessible strata, after which students in participating classes were invited to complete the questionnaire. The sampling procedure was designed to obtain a heterogeneous school-based sample rather than to estimate province-wide prevalence; therefore, the findings are not presented as probability-based provincial estimates.

The planned sample of 384 was informed by the Krejcie and Morgan table for large populations at a 95% confidence level and approximately 5% margin of error [24]. A total of 420 questionnaires were submitted, of which 384 met the screening criteria, giving a valid-response rate of 91.4%. Analyses used the 384 cases with complete scale scores.

3.3 Measures

30-item online questionnaire. Demographic questions recorded sex, grade, school location, school type, and parental education. The present analysis reports sex, grade, and school location because these variables were complete and directly relevant to the descriptive profile. Twenty-five substantive items represented five project-specific indicators—teacher support, peer support, family support, perceived campus psychological environment, and self-reported emotion regulation—with five items per indicator. Responses ranged from 1 (strongly disagree) to 5 (strongly agree). The teacher-support item domain was informed by contemporary research on student social-emotional support [9]; the peer-support domain drew on perceived social-support research [10]; the family-support domain reflected parental emotional-warmth research [11]; the campus-environment domain was informed by school-climate and socio-emotional-skills research [12, 13]; and the emotion-regulation domain was informed by adolescent emotion-regulation competence research [20].

Three educational psychology academics and two middle-school mental-health teachers reviewed item wording, content relevance, comprehensibility, and age appropriateness before administration. This expert review provides content- and face-validity evidence, while Cronbach's alpha provides internal-consistency evidence. KMO and Bartlett statistics were used only to assess factorability and are not presented as proof of the proposed five-factor structure. Because a confirmatory factor analysis was not conducted in the present analysis, the five brief measures are treated as project-specific indicators. Tables 1 and 2 summarise the measurement domains, internal consistency, and the boundaries of the available measurement evidence.

Table 1
Measurement domains and internal consistency

Construct	Operational focus	Items	α
Teacher support	Academic guidance, emotional care, respectful feedback	5	.735
Peer support	Emotional reassurance, information sharing, behavioural assistance	5	.769
Family support	Emotional warmth, communication, educational guidance	5	.830
Campus psychological environment	Inclusion, relationship quality, psychological safety, mental-health services	5	.816
Self-reported emotion regulation	Emotion recognition, expression, strategy use, perceived stability	5	.820

Note. The coefficients describe internal consistency in this sample. The indicators are project-specific and are not presented as fully validated stand-alone scales.

Source. Questionnaire indicators developed by author with reference to sources [9–13, 20]; reliability coefficients calculated from the 2026 survey data.

Interpretation. All alpha coefficients exceeded .70, supporting exploratory group-level consistency. The evidence supports reliability but does not by itself prove structural or discriminant validity.

Table 2
Measurement-quality evidence and interpretive boundaries

Evidence domain	Procedure or result	Interpretation and boundary
Content relevance and comprehensibility	Review by three educational psychology academics and two middle-school mental-health teachers	Supports content and face validity; does not confirm factor structure
Internal consistency	Cronbach's α = .735–.830	Acceptable for exploratory group-level analysis; alpha is not structural validity
Factorability	KMO = .859; Bartlett $\chi^2(300) = 6715.76$, $p < .001$	The item matrix is suitable for factor analysis; the five-factor model is not confirmed
Scale-score distinctiveness	Inter-scale r = .535–.828; VIF = 1.72–2.46	No complete redundancy or severe regression collinearity; r = .828 indicates close constructs
Structural and discriminant validity	CFA, CR, AVE, and HTMT were not conducted	Not established; the measures are treated as project-specific indicators

Source. The author expert-review records and statistical analysis of the 2026 survey data.

Interpretation. The available evidence supports content relevance, factorability, and internal consistency, but full structural and discriminant validity were not established. The measures are therefore interpreted as project-specific indicators.

3.4 Data collection and ethical procedures

Data were collected online during January–February 2026 under the coordination of author and with logistical assistance from designated school staff. Before participation, students and their parents or legal guardians received written information explaining the study purpose, voluntary nature of participation, confidentiality, intended academic use of the data, and an estimated completion time of 10–15 minutes. Teachers assisted only with scheduling and distribution and did not have access to individual responses. Duplicate submissions were restricted through device- and account-based controls. Questionnaires were excluded when completion time was below five minutes, more than three items were missing, or a clear repetitive response pattern was evident.

The study protocol and school-based questionnaire administration were reviewed and authorised through the participating school's research-approval process before recruitment. The school administration approved the protocol and questionnaire distribution, and participating class teachers approved the timing and classroom arrangements. Written informed consent was obtained from parents or legal guardians, and age-appropriate written assent was obtained from participating students before data collection. Students were informed that participation was voluntary, that they could decline or withdraw without penalty, and that teachers would not see individual responses. Names, student numbers, and directly identifying information were not included in the analytic dataset. The anonymised data were stored in encrypted form on a dedicated research computer controlled by author and were used only for academic analysis.

3.5 Statistical analysis

Data were screened and analysed in IBM SPSS Statistics 26. Frequencies and percentages described the sample, while means, standard deviations, minima, and maxima summarised the focal variables. Cronbach's alpha was used as an index of internal consistency [25], interpreted with reference to standard psychometric guidance [26]. The Kaiser–Meyer–Olkin (KMO) statistic and Bartlett's test of sphericity were used only to assess whether the 25-item correlation matrix was factorable; they were not interpreted as confirmation of the intended five-factor measurement model. At the scale-score level, correlations below .85 and VIF values below conventional concern thresholds were treated as preliminary evidence against complete redundancy, but not as substitutes for confirmatory factor analysis, composite reliability, average variance extracted, or HTMT assessment.

Pearson correlations estimated bivariate relationships. A simultaneous multiple linear regression entered teacher support, peer support, family support, and perceived campus psychological environment as predictors of self-reported emotion regulation. Statistical significance was evaluated at $p < .05$. Ninety-five per cent confidence intervals for unstandardised coefficients were calculated as $B \pm 1.96SE$. Tolerance and variance inflation factors (VIFs) were used to assess multicollinearity. Residual-versus-

fitted, normal Q–Q, residual-histogram, and Cook's-distance plots were inspected. These diagnostics indicated approximate residual normality and no single case with extreme influence, although mild narrowing of residual dispersion at higher fitted values was possible. The regression results are therefore interpreted as exploratory sample-level associations rather than causal or out-of-sample predictions.

3.6 Visual summary of the study workflow

Figure 2 summarises the theoretical framing, sampling, measurement, analysis, and reported outputs.

Source. Developed by author from the research protocol and analytic plan.

Interpretation. The workflow shows the logical sequence from theory and sampling to measurement, analysis, and interpretation, thereby linking the research questions with the reported evidence.

4 Results

4.1 Participant characteristics

The analytic sample included 211 boys (54.9%) and 173 girls (45.1%). Students were distributed across Grades 6–9, with the largest proportion in Grade 9. Three quarters attended rural schools. The distribution indicates that the findings primarily reflect a rural and upper-grade school sample rather than a balanced provincial profile.

Table 3
Participant characteristics (N = 384)

Characteristic	Category	n	%
Sex	Boy	211	54.9
	Girl	173	45.1
Grade	Grade 6	59	15.4
	Grade 7	120	31.3
	Grade 8	69	18.0
	Grade 9	136	35.4
School location	Urban	96	25.0
	Rural	288	75.0

Source. The author 2026 Shandong middle-school survey dataset.

Interpretation. The sample included all four grades but was predominantly rural (75.0%) and included a comparatively large Grade 9 subgroup (35.4%); generalisation should reflect this composition.

4.2 Preliminary measurement evidence and descriptive statistics

Cronbach's alpha values ranged from .735 to .830, supporting acceptable internal consistency for exploratory group-level analysis. The overall KMO value was .859, and Bartlett's test was significant, $\chi^2(300) = 6715.76$, $p < .001$, indicating that the 25-item correlation matrix was factorable. These statistics do not establish structural validity. At the scale-score level, all correlations were below .85, although the association between perceived campus psychological environment and self-reported emotion regulation was close to this threshold ($r = .828$), indicating substantial conceptual proximity that requires cautious interpretation. Mean scores were above the scale midpoint for all indicators (Table 4). Family support had the highest mean, whereas teacher support had the lowest. Self-reported emotion regulation also had a relatively high mean.

Table 4
Descriptive statistics and reliability

Variable	M	SD	Minimum	Maximum	α
Teacher support	3.84	0.61	1.80	5.00	.735
Peer support	4.05	0.62	1.20	5.00	.769
Family support	4.39	0.63	1.60	5.00	.830
Campus psychological environment	4.27	0.66	1.40	5.00	.816
Self-reported emotion regulation	4.25	0.67	1.40	5.00	.820

Note. Scores ranged from 1 to 5. M = mean; SD = standard deviation; α = Cronbach's alpha.

Source. The author descriptive and reliability analysis of the 2026 survey data.

Interpretation. All mean scores were above the scale midpoint. Family support had the highest mean, while teacher support had the lowest; the high outcome mean indicates possible upper-end concentration.

4.3 Bivariate correlations

All four support variables were positively correlated with self-reported emotion regulation (Table 5). The largest bivariate correlation was observed for campus psychological environment ($r = .828$), followed by family support ($r = .747$), peer support ($r = .714$), and teacher support ($r = .642$). Correlations among the four predictors ranged from .535 to .706, indicating substantial overlap but no perfect redundancy. Figure 3 presents the same correlation structure as a heatmap to facilitate visual comparison across constructs.

Table 5
Pearson correlations among study variables

Variable	1	2	3	4	5
1. Teacher support	—				
2. Peer support	.580***	—			
3. Family support	.571***	.706***	—		
4. Campus psychological environment	.535***	.564***	.635***	—	
5. Self-reported emotion regulation	.642***	.714***	.747***	.828***	—
Note. ***p < .001, two-tailed.					

Source. The author Pearson-correlation analysis of the 2026 survey data.

Interpretation. All associations were positive and statistically significant. The r = .828 association between perceived campus psychological environment and emotion regulation warrants substantive attention and additional construct-distinctiveness testing.

4.4 Multiple regression and diagnostic statistics

The simultaneous regression model was statistically significant, $F(4, 379) = 396.91$, $p < .001$. The multiple correlation was $R = .898$, with $R^2 = .807$ and adjusted $R^2 = .805$. Thus, the four perceived support indicators jointly accounted for 80.7% of the variance in self-reported emotion regulation within this sample. This value is not interpreted as evidence of causal prediction or generalisable out-of-sample accuracy. It is considered alongside the broad scope of the campus-environment indicator, the strong campus-environment–emotion-regulation correlation, the common self-report response format, and possible conceptual overlap.

Table 6 presents unstandardised coefficients, confidence intervals, standardised coefficients, and significance tests. Table 7 reports the associated collinearity diagnostics. Each predictor had a positive adjusted coefficient. Perceived campus psychological environment showed the largest standardised coefficient ($\beta = .514$), followed by peer support ($\beta = .206$), family support ($\beta = .200$), and teacher support ($\beta = .133$). The coefficients compare adjusted association magnitude; they do not establish that one factor has a stronger causal effect than another.

Table 6
Multiple linear regression predicting self-reported emotion regulation

Predictor	B	SE	95% CI for B	β	t	p
Constant	-0.374	0.120	[-0.609, -0.139]	—	-3.118	.002
Teacher support	0.147	0.033	[0.082, 0.212]	.133	4.495	< .001
Peer support	0.223	0.037	[0.150, 0.296]	.206	6.099	< .001
Family support	0.214	0.038	[0.140, 0.288]	.200	5.652	< .001
Campus psych. env.	0.521	0.031	[0.460, 0.582]	.514	16.774	< .001

Note. N = 384. R = .898; R^2 = .807; adjusted R^2 = .805; F(4, 379) = 396.91, p < .001. CI = confidence interval.

Source. The author multiple-regression analysis of the 2026 Shandong middle-school survey data.

Interpretation. Each predictor retained a positive unique association with self-reported emotion regulation. The coefficient for perceived campus psychological environment was substantially larger than those for the three interpersonal-support indicators.

Table 7
Collinearity diagnostics for the regression predictors

Predictor	Tolerance	VIF
Teacher support	.581	1.72
Peer support	.446	2.24
Family support	.406	2.46
Campus psych. env.	.542	1.85

Note. VIF = variance inflation factor.

Source. The author collinearity analysis of the 2026 Shandong middle-school survey data.

Interpretation. Tolerance values exceeded .40 and VIF values were below 2.50, indicating substantial shared variance but no severe predictor multicollinearity under conventional screening rules.

Figure 4 displays the regression diagnostic plots used to evaluate linearity, residual normality, residual dispersion, and influential cases.

4.5 Interpretation of the high model R^2

The high R^2 was examined by decomposing the scale-score relationships. Perceived campus psychological environment alone had a bivariate r of .828 with self-reported emotion regulation, corresponding to r^2 = .686. Teacher, peer, and family support together accounted for approximately

66.4% of the sample variance, while adding perceived campus psychological environment increased R^2 to .807, an increment of approximately .143. Thus, the model fit was driven primarily by strong shared variance across positive self-perceptions and by the broad school-wide environment indicator rather than by severe numerical multicollinearity.

These values strengthen the comparative finding that school-wide psychological conditions were closely associated with students' emotional functioning, but they do not eliminate common-method or construct-overlap concerns. The R^2 is therefore reported transparently, interpreted as sample-specific, and not presented as evidence of causal prediction or instrument validity.

4.6 Visual comparison of adjusted coefficients

Figure 5 displays the adjusted regression coefficients in a coefficient-plot format. The figure combines the unstandardised B estimates, their 95% confidence intervals, and the standardised beta annotations. Campus psychological environment shows the largest adjusted association, whereas teacher support shows the smallest adjusted coefficient.

4.7 Hypothesis summary

The pattern of coefficients was consistent with all four prespecified directional hypotheses. Table 10 summarises the results. The decisions refer to statistical associations within this cross-sectional sample and not to causal effects.

Table 8
Summary of hypothesis tests

Hypothesis	Proposed association	β	p	Interpretation
H1	Teacher support → emotion regulation	.133	< .001	Consistent with H1
H2	Peer support → emotion regulation	.206	< .001	Consistent with H2
H3	Family support → emotion regulation	.200	< .001	Consistent with H3
H4	Campus environment → emotion regulation	.514	< .001	Consistent with H4

Note. β values are standardised coefficients from the simultaneous regression model.

Source. The author simultaneous multiple-regression analysis of the 2026 survey data.

Interpretation. The observed coefficient pattern was consistent with all four directional hypotheses within the cross-sectional sample; the decisions concern associations and not causal effects.

5 Discussion

This study compared four sources of perceived educational support within a single model. Teacher support, peer support, family support, and campus psychological environment were each positively

associated with self-reported emotion regulation, and all retained positive coefficients when entered simultaneously. The overall pattern supports an ecological interpretation in which students' emotional functioning is connected to a network of relationships and institutional conditions rather than to one isolated source of assistance.

5.1 Campus psychological environment

Campus psychological environment showed the strongest bivariate and adjusted association. The construct is broader than a single interpersonal relationship because it includes inclusion, psychological safety, relationship quality, help-seeking norms, and access to mental-health support. It may therefore function as an umbrella condition that shapes whether teacher and peer support can be accessed consistently. This interpretation is compatible with cross-national evidence linking cooperative school climate with socio-emotional skills [12]. It is also consistent with longitudinal research showing that school climate is related to adolescents' social and emotional health over time [13]. The finding additionally accords with evidence that organisational conditions influence student outcomes through the teaching practices and relationships they sustain [14].

5.2 Peer, family, and teacher support

Peer and family support had similar standardised coefficients after the other indicators were controlled. Peer support is especially salient during adolescence, when acceptance and belonging become central to daily emotional experience [10]. Family support offers continuity through emotional warmth, communication, and guidance [11]. The family-support mean was the highest of all predictors, but its adjusted coefficient was not the largest. A high average level does not necessarily imply the greatest unique statistical association once overlapping supports are considered.

Teacher support had the smallest adjusted coefficient, although its bivariate relationship was substantial. One explanation is that students' experiences of teacher support partly contribute to their perception of the wider campus psychological environment. Another is that a five-item indicator may not capture the full range of emotional support, autonomy support, classroom management, and instructional responsiveness. The result should not be read as evidence that teachers are unimportant. Rather, teacher support may operate through, and be strengthened or constrained by, the climate in which teachers interact with students.

5.3 Educational design and student well-being

The findings also contribute to evidence that emotion regulation is sensitive to the design of learning environments. Jiang et al. [15] reported improved engagement and emotion regulation in a gamified digital-learning intervention for neurodivergent English learners. Although that study and the present survey differ in population, design, and exposure, both highlight the potential value of structured, responsive, and inclusive educational settings. Future research should test whether face-to-face and digital supports reinforce one another and whether associations vary across learning and developmental needs.

5.4 Theoretical and practical implications

The study extends the ecological perspective by estimating the concurrent contribution of family, peer, teacher, and school-wide conditions in one regional sample. The dominant coefficient for campus psychological environment suggests that a school microsystem should not be reduced to separate dyadic relationships. School-wide norms and services may organise the quality, consistency, and visibility of interpersonal support. Positive psychology provides a complementary account because psychologically safe and affirming environments may provide positive emotional experiences [7]. This interpretation is also compatible with current resilience-oriented affect-regulation theory [8].

The results do not establish a mechanism, because no mediator, moderator, temporal sequence, or cross-level process was tested. The theoretical contribution is therefore comparative and contextual. It identifies which perceived support indicators were most strongly associated with self-reported emotion regulation in the sample and provides a basis for longitudinal, multilevel, and intervention research.

For practice, schools should develop coherent support systems rather than isolated activities. School-wide priorities include clear anti-bullying and help-seeking procedures, visible counselling pathways, inclusive norms, psychologically safe classrooms, and routine monitoring of emotional needs. Teacher development can include emotional attunement, constructive feedback, calm conflict management, and referral skills. Peer-support structures—such as cooperative learning, mentoring, and supervised support groups—can strengthen belonging. Family–school communication should extend beyond academic performance to practical guidance on listening, emotional validation, and early support.

Resource allocation is also relevant because 75% of the sample attended rural schools. Psychological services and teacher development should not be concentrated only in urban settings. Feasible options may include shared school psychologists across school clusters, tele-counselling referral networks, structured teacher toolkits, and partnerships with community health services. These actions connect adolescent mental health and psychological well-being with education quality, educational environment, and school safety, thereby aligning the study with Sustainable Development Goals 3 and 4 [27].

6 Limitations and future research

Several limitations constrain interpretation. First, all variables were measured at one time point, so temporal order and causal direction cannot be established. Students with stronger emotion regulation may perceive their environments more positively, and unmeasured factors may influence both perceptions and outcomes. Second, all focal variables were collected through one self-report questionnaire, increasing the possibility of common-method variance, social desirability, and acquiescent responding. The high R^2 and strong correlation between campus psychological environment and self-reported emotion regulation should therefore be interpreted cautiously.

Third, each construct was represented by five adapted items. Internal consistency was acceptable, and the KMO and Bartlett statistics showed that the item matrix was factorable, but these results do not

establish a five-factor measurement structure. The high scale-score correlation between perceived campus psychological environment and self-reported emotion regulation (r = .828) indicates that the constructs may be conceptually close. A future validation study should report the complete item set, conduct confirmatory factor analysis using an estimator appropriate for ordinal items, compare the proposed five-factor model with plausible alternative models, and report standardised loadings, model-fit indices, composite reliability, average variance extracted, HTMT ratios, and measurement invariance where sample size permits.

Fourth, students were recruited through intact classes and schools, but class- and school-level identifiers were not included in the de-identified analytic dataset used for the present regression. The analysis therefore treated observations as independent and may have underestimated standard errors. Future studies should retain non-identifying cluster codes, calculate intraclass correlations, and use multilevel models or cluster-robust standard errors. Fifth, the sample came from one province and was predominantly rural; generalisation beyond the participating schools should therefore be cautious.

Longitudinal and quasi-experimental designs are needed to determine whether changes in school climate precede changes in emotion regulation. Multi-informant data from students, parents, teachers, and counsellors could reduce same-source bias. Future studies should test mechanisms such as psychological safety, belonging, resilience, and help-seeking, as well as interactions between family and school support. Such designs would move the field from identifying concurrent associations towards explaining how supportive educational environments contribute to sustained emotional development.

7 Conclusion

Among 384 middle school students in Shandong Province, perceived teacher support, peer support, family support, and campus psychological environment were positively associated with self-reported emotion regulation. Campus psychological environment showed the largest adjusted association when the four support indicators were considered together. The findings underscore that adolescent emotional functioning is embedded in a wider educational ecology. Schools seeking to support student mental health should combine supportive relationships with inclusive norms, psychological safety, accessible services, and meaningful family–school collaboration. Because the evidence is cross-sectional and based on brief self-report indicators, the results should guide hypothesis development and programme design rather than be treated as proof of causal effects.

Declarations

Ethics approval: The study protocol and school-based questionnaire administration were reviewed and authorised through the participating school's research-approval process before recruitment. The school administration approved the protocol and questionnaire distribution, and participating class teachers approved the timing and classroom arrangements. The study protocol was formally reviewed and approved by the Institutional Review Board of the Shandong University, China (Approval No.

LL20240308). The study was conducted in accordance with the ethical standards of the Institutional Review Board of Shandong University and the Declaration of Helsinki. Written informed consent was obtained from parents or legal guardians, and age-appropriate written assent was obtained from participating students. Participation was voluntary, and students could decline or withdraw without adverse consequences.

Consent to participate: Written informed consent was obtained from parents or legal guardians, and age-appropriate written assent was obtained from participating students before data collection. Participation was voluntary, and students could withdraw without adverse consequences.

Consent to Publish: Not applicable. The authors declare that this manuscript is an original work and has not been published previously nor is it under consideration for publication elsewhere. This manuscript contains no identifiable personal data, images, or videos of participants; therefore, consent to publish from participants is not applicable. All authors have read and approved the final version of the manuscript and consent to its publication in the journal if accepted.

Data availability: The anonymised dataset is not publicly available because it contains data collected from minors and is subject to school confidentiality and parental-consent conditions. De-identified data, the item codebook, and supporting analysis records may be available from author on reasonable request, subject to permission from the participating school and applicable ethical requirements.

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Author contributions declaration:

G.T. and K.A. conceptualized the study and designed the methodology; A.B. and A.T. performed the data collection and managed the survey administration across participating schools in Shandong Province; R.S.A. and H.H. conducted the statistical analysis and interpreted the results; R.B. contributed to the theoretical framework, literature review, and manuscript editing; G.T. drafted the original manuscript; K.A. supervised the research process and provided critical revisions; all authors reviewed, approved, and take responsibility for the final version of the manuscript.

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References

1. World Health Organization. World mental health report: transforming mental health for all. Geneva: World Health Organization; 2022.
2. Gross JJ. Emotion regulation: current status and future prospects. Psychol Inq. 2015;26(1):1–26. https://doi.org/10.1080/1047840X.2014.940781.

3. Colomeischi AA, Ursu A, Bogdan I, Ionescu-Corbu A, Bondor R, Conte E. Social and emotional learning and internalizing problems among adolescents: the mediating role of resilience. Children. 2022;9(9):1326. https://doi.org/10.3390/children9091326.
4. Martinsone B, Stokenberga I, Damberga I, et al. Adolescent social emotional skills, resilience and behavioral problems during the COVID-19 pandemic: a longitudinal study in three European countries. Front Psychiatry. 2022;13:942692. https://doi.org/10.3389/fpsyt.2022.942692.
5. Bronfenbrenner U. The ecology of human development: experiments by nature and design. Cambridge, MA: Harvard University Press; 1979.
6. Tong P, An IS. Review of studies applying Bronfenbrenner's bioecological theory in international and intercultural education research. Front Psychol. 2024;15:1233925. https://doi.org/10.3389/fpsyg.2023.1233925.
7. Seligman MEP. Authentic happiness: using the new positive psychology to realize your potential for lasting fulfillment. New York: Free; 2002.
8. Troy AS, Hasroth EC, Shallcross AJ, Giuliani NR, Gross JJ, Mauss IB. Psychological resilience: an affect-regulation framework. Annu Rev Psychol. 2023;74:547–76. https://doi.org/10.1146/annurev-psych-020122-041854.
9. Kim EK, Allen JP, Jimerson SR. Supporting student social emotional learning and development. Sch Psychol Rev. 2024;53(3):201–7. https://doi.org/10.1080/2372966X.2024.2346443.
10. Luo Y, Ma T, Deng Y. School climate and adolescents' prosocial behavior: the mediating role of perceived social support and resilience. Front Psychol. 2023;14:1095566. https://doi.org/10.3389/fpsyg.2023.1095566.
11. Wan Z, Huang S. The relationship between parental emotional warmth and school bullying: the chain mediation role of social support and emotional regulation. PLoS ONE. 2025;20(5):e0323261. https://doi.org/10.1371/journal.pone.0323261.
12. Wang FM, King RB, Zeng LM. Cooperative school climates are positively linked with socio-emotional skills: a cross-national study. Br J Educ Psychol. 2024;94(2):622–41. https://doi.org/10.1111/bjep.12670.
13. Wong MD, Dosanjh KK, Jackson NJ, Runger D, Dudovitz RN. The longitudinal relationship of school climate with adolescent social and emotional health. BMC Public Health. 2021;21:207. https://doi.org/10.1186/s12889-021-10245-6.
14. Ali N, Wu Y, Abiola AO, Ahmed K, Krishnasamy HN, Niqab M, Babu SM. Teachers' perceptions of the relationship between teachers' organizational commitment, effective teaching practices, and students' learning outcomes in the secondary schools of Bunir. Pakistan Soc. 2026;16(7):206. https://doi.org/10.3390/soc16070206.
15. Jiang M, Akhter S, Hashemifardnia A. Neurodivergent English learners in digital classrooms: investigating the impact of gamified learning on engagement and emotional regulation. Psychol Sch. 2026;63(2):530–43. https://doi.org/10.1002/pits.70108.

16. Chan RCH, Lam MS. The relationship between perceived school climate, academic engagement, and emotional competence among Chinese students: the moderating role of collectivism. Learn Individ Differ. 2023;106:102337. https://doi.org/10.1016/j.lindif.2023.102337.
17. Podiya JK, Navaneetham J, Bhola P. Influences of school climate on emotional health and academic achievement of school-going adolescents in India: a systematic review. BMC Public Health. 2025;25:14. https://doi.org/10.1186/s12889-024-21268-0.
18. Fang Z, Fu YK, Liu DR, Chen CR. The impact of school climate on college students' socio-emotional competence: the mediating role of psychological resilience and emotion regulation. BMC Psychol. 2025;13:682. https://doi.org/10.1186/s40359-025-03019-x.
19. Usán Supervía P, Quílez Robres A. Emotional regulation and academic performance in the academic context: the mediating role of self-efficacy in secondary education students. Int J Environ Res Public Health. 2021;18(11):5715. https://doi.org/10.3390/ijerph18115715.
20. Chen LL, Bai SL, Zhang L, Zhou YM, Liu PB. Interoception and social-emotional competence among adolescents: the role of emotion regulation. Curr Psychol. 2024. https://doi.org/10.1007/s12144-024-06307-8.
21. Salazar Kaempf M, Adam L, Rohr MK, Exner C, Wieck C. A meta-analysis of the relationship between emotion regulation and social affect and cognition. Clin Psychol Sci. 2023;11(6):1159–89. https://doi.org/10.1177/21677026221149953.
22. Zhang YC, Hu YB, Yu M. Exploring emotional support and engagement in adolescent EFL learning: the mediating role of emotion regulation strategies. Lang Teach Res. 2024. https://doi.org/10.1177/13621688241266184.
23. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. Lancet. 2007;370(9596):1453–7. https://doi.org/10.1016/S0140-6736(07)61602-X.
24. Krejcie RV, Morgan DW. Determining sample size for research activities. Educ Psychol Meas. 1970;30(3):607–10. https://doi.org/10.1177/001316447003000308.
25. Cronbach LJ. Coefficient alpha and the internal structure of tests. Psychometrika. 1951;16:297–334. https://doi.org/10.1007/BF02310555.
26. Nunnally JC, Bernstein IH. Psychometric theory. 3rd ed. New York: McGraw-Hill; 1994.
27. United Nations General Assembly. Transforming our world: the 2030 Agenda for Sustainable Development. New York: United Nations; 2015.

Figures

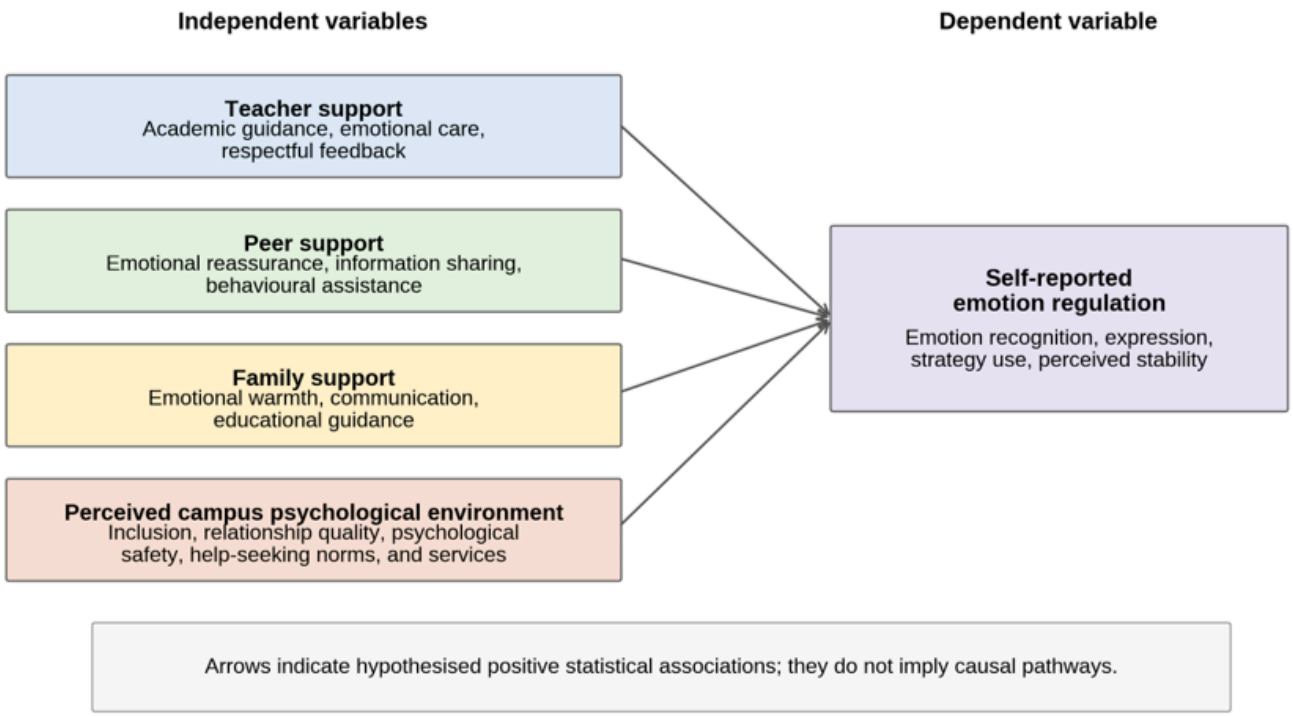


Figure 1

Conceptual model of the study

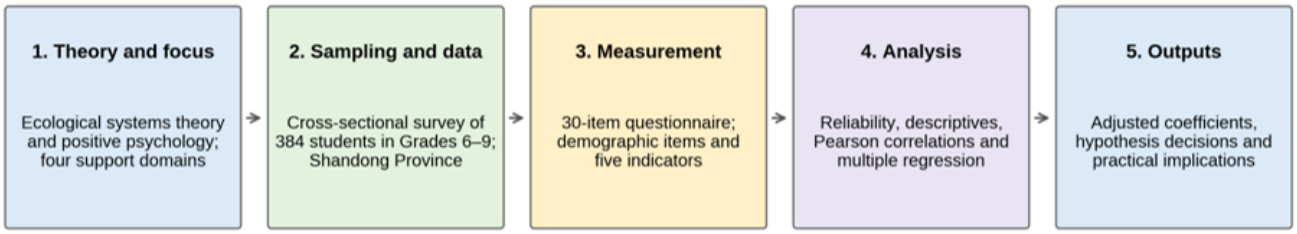


Figure 2

Study workflow and analytic pipeline

Source. Developed by author from the research protocol and analytic plan.

Interpretation. The workflow shows the logical sequence from theory and sampling to measurement, analysis, and interpretation, thereby linking the research questions with the reported evidence.

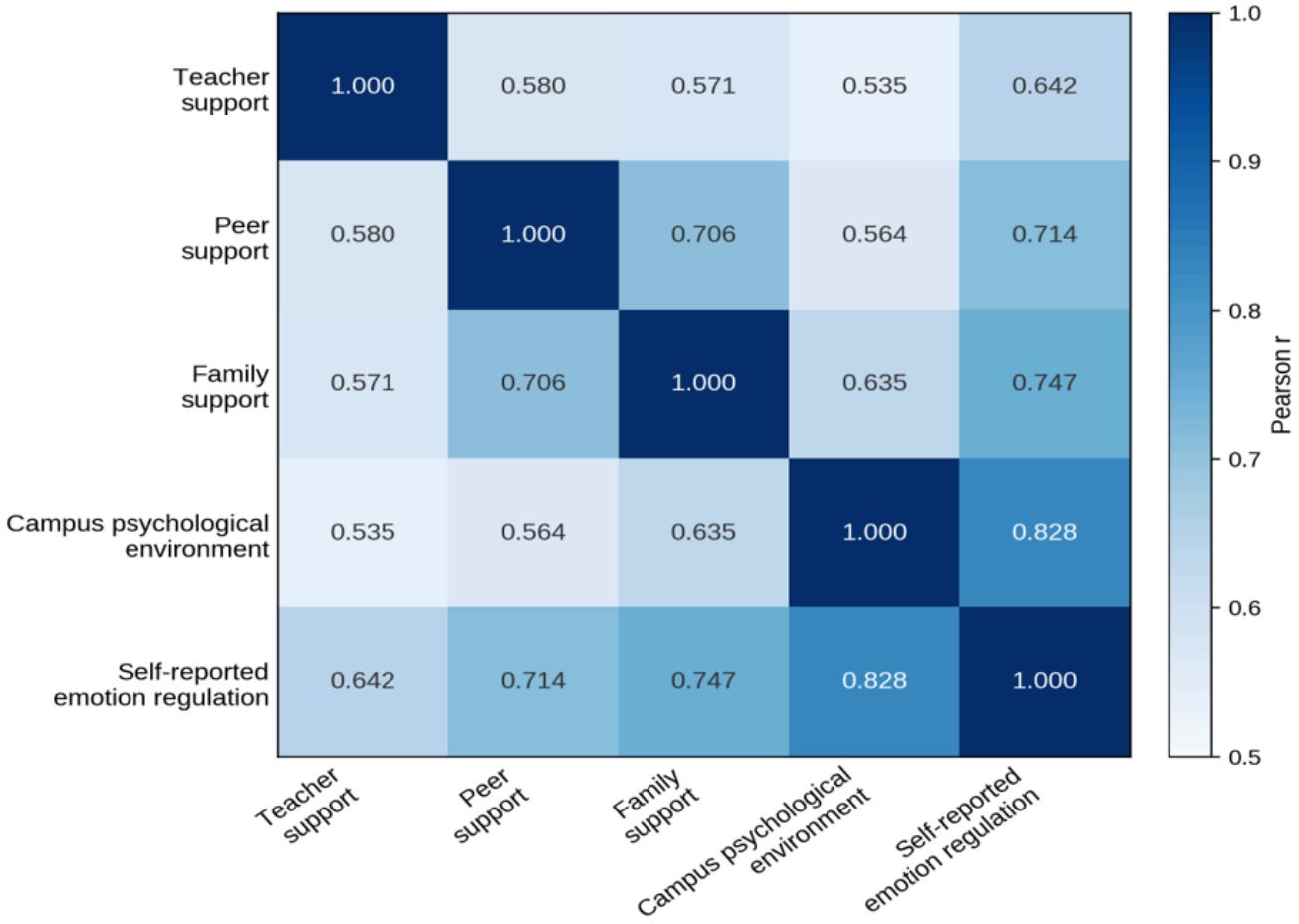


Figure 3

Correlation matrix of the study variables

Source. The author analysis of the 2026 Shandong middle-school survey data (N = 384).

Interpretation. All four perceived support indicators were positively related to self-reported emotion regulation. The strongest association was with perceived campus psychological environment (r = .828), indicating both substantive importance and a need to examine construct distinctiveness.

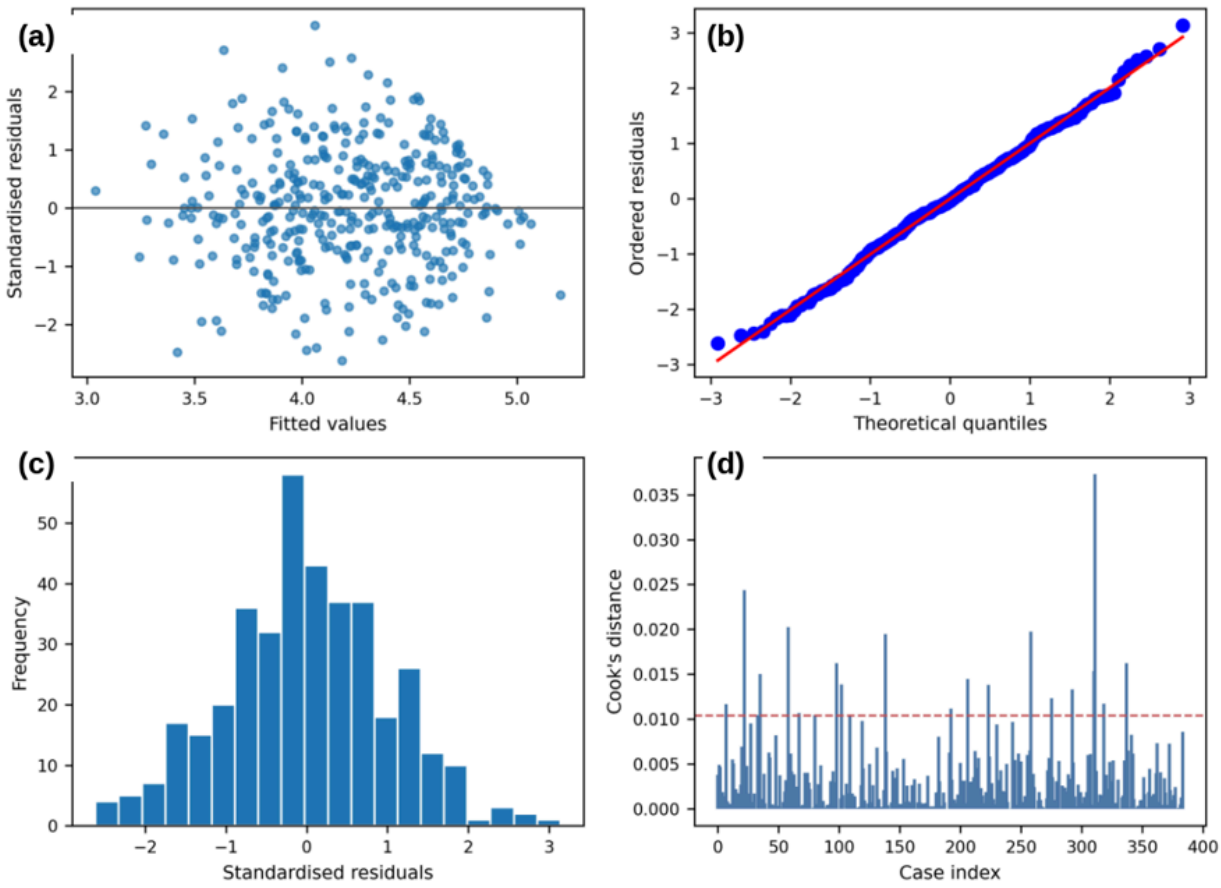


Figure 4

Regression diagnostic plots: (a) standardised residuals versus fitted values; (b) normal Q–Q plot; (c) histogram of standardised residuals; (d) Cook's distance by case index

Source. The author regression-diagnostic analysis of the 384 valid survey responses.

Interpretation. Residuals were approximately normally distributed and no clear non-linear pattern was evident. Residual dispersion narrowed slightly at higher fitted values, suggesting possible mild heteroscedasticity or an upper-scale ceiling effect. Several cases exceeded the heuristic Cook's-distance threshold of 4/N = .0104, but none approached 1.

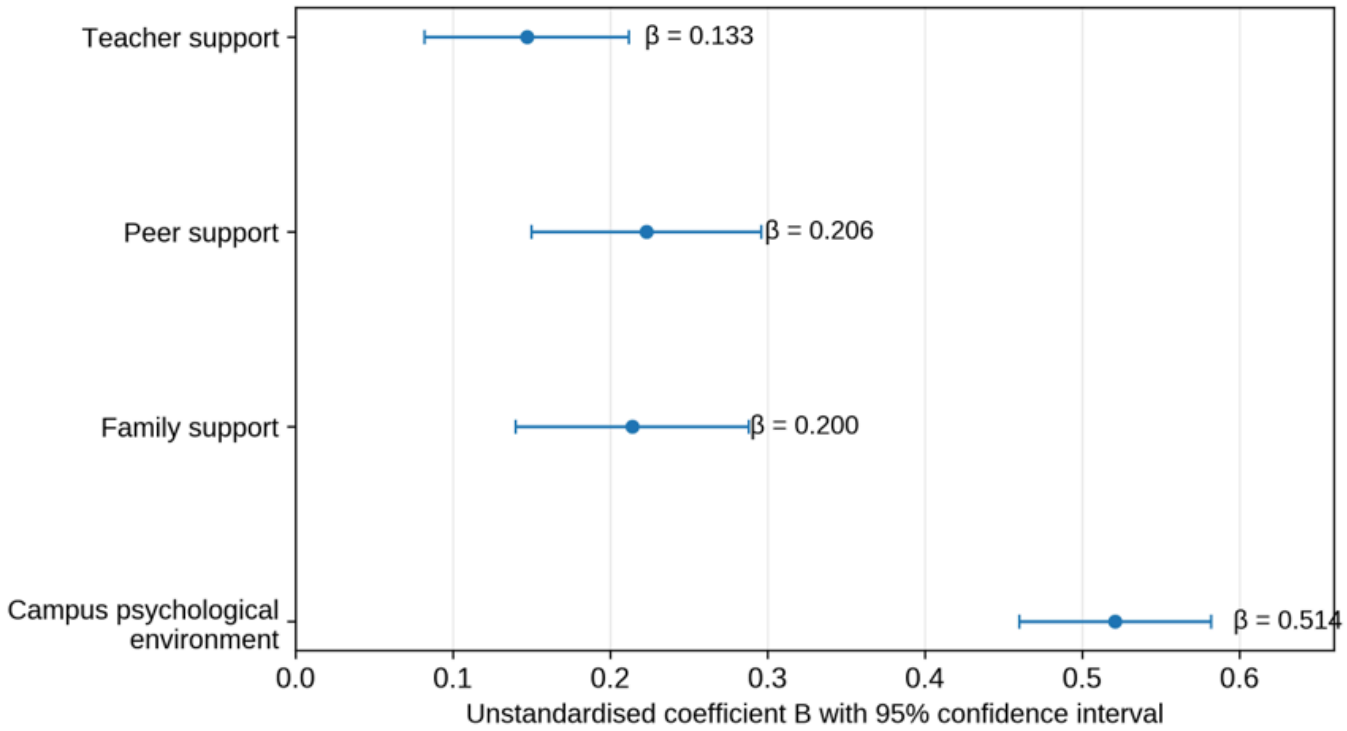


Figure 5

Adjusted regression coefficients for self-reported emotion regulation

Source. The author multiple-regression analysis of the 2026 Shandong middle-school survey data (N = 384).

Interpretation. All adjusted coefficients were positive and their 95% confidence intervals excluded zero. Perceived campus psychological environment showed the largest adjusted association, while teacher support showed the smallest unique coefficient after overlap among predictors was controlled.