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The Impact of Academic Performance on Students' Tendency of Bullying

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ABSTRACT
Background:School bullying remains a global public health concern, posing profound threats to adolescents' mental health and academic development.This study investigates the structural relationships between academic performance, self-esteem, peer relationships, and Students' Tendency of Bullying among Chinese primary school students.
Methods:Using a sample of 576 respondents, data were collected via structured questionnaires and analyzed through structural equation modeling (SEM).
Results:Academic performance significantly predicts both self-esteem and peer relationships, and negatively affects bullying behavior. Notably, self-esteem and peer relationships function as key mediators, transmitting the protective influence of academic achievement to reduce students' bullying tendencies. The proposed measurement and structural models demonstrate excellent fit indices (e.g., RMSEA = 0.035; GFI = 0.948), supporting the reliability and validity of the framework.Conclusions:The findings highlight how academic competence indirectly shapes behavioral outcomes through psychological and social mechanisms. This underscores the importance of integrating academic support, emotional development, and peer engagement into school-based anti-bullying interventions, thereby fostering a safer and more inclusive learning environment.
Keywords: *Academic Performance, Self-esteem, Peer Relationships, Students' Tendency of Bullying.*

1. INTRODUCTION:

School bullying remains a global public health concern, posing profound threats to adolescents' mental health and academic development. Extensive research has demonstrated that bullying victims face higher risks of depression, academic disengagement, and long-term socioeconomic disadvantages (Chen & Wang, 2023; Liu, 2022). In high-pressure academic environments such as China, academic performance is the primary benchmark for student success. Academic Performance(AP)—defined as an individual's subjective evaluation of their academic standing—can trigger maladaptive behaviors when students believe they are underperforming. Crucially, lower AP (distinct from objective scores) may theoretically undermine self-esteem and damage peer relationships, possibly leading to bullying behaviors as a means of compensating for social dominance or regulating emotions (Talle Vacalares et al., 2023).

Although the link between academic stress and aggressive behaviors has been established, significant gaps remain. First, most studies emphasize objective academic metrics (e.g., grades), neglecting the psychological impact of subjective academic perception (Peixoto et al., 2021). Second, while self-esteem and peer relationships are hypothesized to mediate the relationship between Academic Performance(AP) and bullying, empirical validation within China's competitive academic climate remains scarce. A 2023 study of Chinese adolescents confirmed that low self-esteem mediated bullying behavior but did not examine Academic Performance(AP) as an antecedent variable (Talle Vacalares et al., 2023). Concurrently, peer influence research reveals that students with poor academic performance often face social rejection or align with deviant peer groups, thereby acquiring aggressive behavior patterns (Gao & Zhou, 2024). However, no study has simultaneously tested the dual mediation of self-esteem and peer relationships in the Academic Performance (AP)–bullying pathway (MOSAIC Evaluation Team, 2025).

As one of China's most academically competitive metropolises, Zhengzhou serves as a prototypical environment in which Academic Performance (AP) may asymmetrically impact student behavior. The 2025 evaluation of China's urban SEL (Social Emotional Learning) interventions pointed out that current anti-bullying programs often overlook academic identity stressors, limiting their effectiveness (Wu, 2023). Moreover, recent findings suggest that when internalized

issues such as low self-esteem remain unaddressed, the influence of teacher-led anti-bullying climates—a key protective factor—is diminished (Huang et al., 2024). By clarifying Academic Performance (AP) antecedent role and quantifying its mediated effects, this study seeks to offer actionable insights for targeted intervention.

Accordingly, this study aims to explore the mediating roles of self-esteem and peer relationships in the relationship between Academic Performance (AP) and bullying tendency among adolescents in Zhengzhou. The results will offer culturally adaptive strategies for bullying prevention in regions with high academic pressure.

2.Empirical Review

Academic Performance

Existing research reveals complex associations between academic performance and bullying involvement, with notable variations across demographic contexts. Schwartz (2002) identified that Korean students with poorer academic achievement were significantly more likely to be frequent targets of bullying. Conversely, Woods and Wolke's (2004) study of 1,016 UK secondary students from high-achieving schools found no direct link between low academic performance and direct bullying; however, higher academic performance among Year 10 students predicted increased exposure to indirect bullying. Critically, within this cohort, students from rural backgrounds or lower familial socioeconomic status exhibited reduced academic achievement when subjected to indirect victimization. Further highlighting contextual disparities, Zhang et al. (2015) documented substantially elevated bullying prevalence (61% involvement rate) among Chinese migrant children, suggesting heightened vulnerability in marginalized educational populations.

Self-esteem

Recent studies underscore the pivotal role of self-esteem in shaping students' vulnerability to bullying and their academic trajectories. Self-esteem, defined as an individual's overall sense of self-worth, has been consistently linked to both victimization and perpetration in school bullying contexts. A 2025 study found that low self-esteem significantly increased the likelihood of depressive symptoms among bullied students, suggesting a compounding psychological burden in secondary education settings(Khalid et al., 2025). Similarly, Al Ali et al. (2025) demonstrated that school-based anti-bullying programs led to measurable improvements in students' self-esteem, particularly among those with prior victimization experiences.

In Latin America, Álvarez and Szücs (2023) analyzed data from over 8,000 Chilean children and reported a negative correlation between self-esteem and bullying, with self-esteem more strongly associated with academic achievement than bullying exposure. These findings suggest that self-esteem may serve as a protective buffer, mitigating the adverse effects of bullying and enhancing academic engagement (Mohamad, et al., 2025).

Peer Relationships

Recent empirical studies have consistently demonstrated that peer relationships play a pivotal role in shaping students' academic and behavioral outcomes. Shao et al. (2024) conducted a large-scale study among junior high school students in eastern China and found that positive peer relationships significantly predicted academic achievement, with learning motivation and engagement acting as sequential mediators in this pathway (BMC Psychology). This suggests that students who maintain supportive peer connections are more likely to be motivated and actively engaged in learning, thereby enhancing their academic performance.

In a longitudinal study, van Herpen et al. (2024) examined Dutch university students and revealed that student-peer relationships positively influenced GPA, mediated by study effort and engagement (European Journal of Higher Education). These findings underscore the long-term benefits of fostering peer support in higher education settings.

Furthermore, Taylor et al. (2025) emphasized in their literature review that school-wide interventions targeting peer relations can effectively reduce bullying behaviors and improve overall student wellbeing, especially when implemented through multi-layered strategies involving teachers, families, and students (University of Oxford Report).

Collectively, these studies affirm that peer relationships are not merely social constructs but are integral to students' emotional resilience, academic success, and behavioral regulation.

Students' Tendency of Bullying

Empirical studies spanning 1978-2021 show that bullying is not a fixed trait but a shifting role: elementary pupils cycle among victim, bully, bully-victim and non-involved statuses, with physical acts giving way to verbal, relational and cyber forms as age rises. Individual-level predictors repeatedly identified include low self-control ($\beta \approx 0.3$-0.4 across Macau and 25-Europe samples), higher depression and lower social competence (Nansel et al., 2001, n=15,686 U.S. youth), and callous-unemotional traits linked to instrumental aggression (Fanti et al., 2009, Greek adolescents). Contextually, students who judge their school climate as unfair or unsafe are 1.5-2× more likely to bully or be victimised, and classes that collectively tolerate bullying see a 20 % rise in peer-reported victimisation within one school year (Swedish longitudinal data). Measurement relies heavily on the Olweus Bully/Victim Questionnaire and Kim's diagnostic scale, yet large-scale longitudinal evidence remains scarce outside North America and Europe; emerging Chinese panel data suggest academic stress as an additional risk factor, but these findings are still under peer review.

Effect of the Academic Performance on Bullying

Recent longitudinal evidence indicates that bullying involvement and academic performance form a reciprocal loop among primary-school pupils. Halliday et al. (2021) followed 2,842 Australian primary students across three waves and showed that early bullying victimization predicted a steeper GPA decline one year later ($\beta = -.28$), whereas prior low GPA also elevated the odds of later

victimization (OR = 1.42). Hysing et al. (2021) replicated this bidirectional pattern in a Norwegian cohort (n = 3,420): pupils with persistent bullying roles—whether as perpetrators, victims, or bully-victims—displayed significantly lower GPA than uninvolved peers after controlling for SES and baseline achievement. Importantly, Rothon et al. (2011, secondary analysis of the UK ALSPAC cohort) found that high parental social support buffered the academic fallout of victimization; the GPA gap between supported and unsupported victims widened to 0.35 SD by Grade 6. These 2021 studies collectively underscore that academic underperformance is both an antecedent and a consequence of school bullying, and that family-level protective factors can moderate the linkage.

3.Theoretical Review

Social Cognitive Theory

Social Cognitive Theory (SCT), originally developed by Bandura (1986), provides a robust framework for understanding how individuals acquire and regulate behavior through the dynamic interplay of personal, behavioral, and environmental influences. Central to SCT is the concept of reciprocal determinism, which posits that human functioning results from the mutual interaction between cognitive processes, social context, and enacted behavior. This theory is particularly relevant to the study of bullying behavior in school settings, where students' perceptions of academic competence, self-worth, and peer dynamics shape their behavioral responses.

In the context of this study, Academic Performance (AP) represents a cognitive self-appraisal that may influence students' emotional states and social interactions. According to SCT, such self-perceptions can affect self-efficacy, which in turn guides behavior choices, including aggression or withdrawal (Bandura, 1997). Students who perceive themselves as academically inadequate may experience diminished self-esteem and seek alternative avenues to assert social dominance, such as engaging in bullying behaviors (Knauf & Eschenbeck, 2025).

Recent empirical findings support this theoretical linkage. For instance, Shin and Gyeong (2025) demonstrated that students' self-efficacy beliefs and outcome expectations significantly predicted their likelihood of engaging in bullying or defending behaviors. When students believed they could effectively intervene or assert themselves, they were more likely to adopt prosocial roles. Conversely, low self-efficacy was associated with passive or aggressive responses, particularly in environments lacking teacher support.

Moreover, SCT emphasizes the role of observational learning and social reinforcement. In peer-dominated school environments, students often model behaviors observed in others, especially when such behaviors are rewarded socially (Zhang & Davidova, 2024). This mechanism is critical in understanding how bullying behaviors are perpetuated among students with lower academic self-perceptions. If these students observe that aggression garners attention or status, they may internalize such behaviors as viable coping strategies.

The theory also accounts for the influence of environmental factors, such as classroom climate and peer norms. As highlighted by Solas-Martínez et al. (2025), bullying and cyberbullying are associated with reduced use of cognitive and metacognitive learning strategies, suggesting that hostile social environments can impair students' ability to self-regulate and engage academically. This aligns with SCT's assertion that negative social experiences can disrupt cognitive functioning and behavioral regulation.

Importantly, SCT provides a framework for understanding the mediating roles of self-esteem and peer relationships in the PAP–bullying pathway. Students with low PAP may experience compromised self-esteem, which SCT identifies as a key determinant of motivation and behavior (Bandura, 1997). Simultaneously, strained peer relationships may reinforce maladaptive behaviors, particularly in competitive or exclusionary school cultures (Taylor et al., 2025). These mediators reflect SCT's emphasis on the interconnectedness of personal beliefs, social feedback, and behavioral outcomes.

4.Conceptual Framework

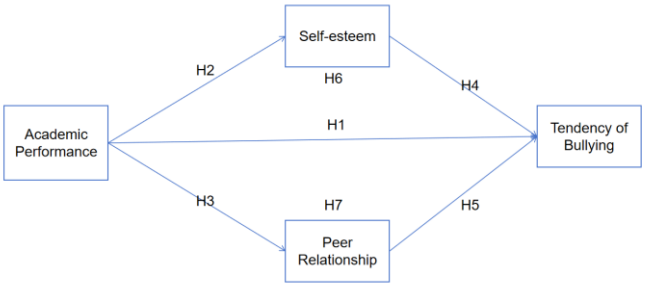


Figure 1: Conceptual Framework

H1 : Academic Performance is negatively associated with students' Tendency of Bullying.

H2 : Academic Performance is positively associated with Self-esteem.

H3 : Academic Performance is positively associated with Peer Relationships.

H4 : Self-esteem is negatively associated with students' Tendency of Bullying.

H5 : Peer Relationships are negatively associated with students' Tendency of Bullying.

H6: Self-esteem mediates the relationship between Academic Performance and students' Tendency of Bullying.

H7: Peer Relationships mediate the relationship between Academic Performance and students' Tendency of Bullying.

5.Materials and Methods

Participants and Sampling

This study employed a cross-sectional quantitative survey targeting primary school students aged 7–12 years from

Zhengzhou City, Henan Province, China. To ensure misrepresentations, a multistage random sampling technique was used: one primary school was randomly selected from each of the five administrative districts in Zhengzhou. According to Krejcie and Morgan (1970), see Figure 2 below, the sample size is 384. To verify, a calculation was also made by the sample size calculator by Raosoft Inc (2004) according to 95% confidence interval (e=0.05), with the population size (10929) , it is found that the sample size (n) is appropriate to be 365, which means 365 or more surveys are needed to have a confidence level of 95% that the real value is within ±5% of the surveyed value.The total number of questionnaires distributed was 623, and out of 619 questionnaires collected, 576 were valid, with an effective response rate of 93.23%.

Figure 2

Primary school	Number of primary school students	Sample size	Sampling Techniques
Henan Experimental Primary School	2300	120	10929 primary school students $T=\frac{n}{N}\times S$ n-sample size-572 N-population size- S-Number of primary school students T-Total sample Calculate the sample size for each primary School
Zhengzhou Zhong yuan District Dihu primary school	1620	84	
Innovation Street primary school in Guancheng District	3512	184	
Longhai Middle Road primary School	1997	105	
Jiangshan No. 1 Primary School	1500	79	
Total	10929	572	

Operational Definition of Bullying

In this study, bullying behavior was defined as prolonged and repeated verbal or physical aggression occurring between classmates, characterized by an imbalance of power where roles of bully and victim remain fixed. The analysis included only bullying incidents involving students as aggressors and victims, excluding any external individuals. Behaviors included teasing, verbal humiliation, physical assault, and social exclusion. All bullying incidents considered occurred within or adjacent to the school environment.

Measures

Students' Tendency of Bullying, Self-esteem, Peer Relationships in this study were assessed using self-report questionnaires. Responses were collected using a 5-point Likert scale ranging from 1 ("Strongly disagree") to 5 ("Strongly agree")。For Academic Performance, was measured using a 4-point scale(1=D, 2=C, 3=B, 4=A). Participants were asked to subjectively rate their perceived performance in four core subjects: Chinese Language, Mathematics, English Language, and Science. Each subject was scored using a 4-point scale.

Data analysis

All data were analyzed using IBM SPSS Statistics and AMOS software. Descriptive statistics were first conducted to summarize participant demographics and baseline characteristics. To examine the relationships among variables and assess potential mediation effects, Structural Equation Modeling (SEM) was employed. Prior to model testing, reliability and validity analyses were performed to ensure the robustness of measurement instruments. A significance level of $p < .05$ was adopted for all statistical procedures.

6.Data Analysis

Descriptive statistical analysis

Table 1: Descriptive Statistics

Descriptive Statistics									
	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Chinese language	576	1	4	3.29	.795	-.591	.102	-1.107	.203
Mathematics	576	1	4	3.16	.791	-.359	.102	-1.132	.203
English language	576	1	4	3.25	.759	-.484	.102	-1.039	.203
Science	576	1	4	3.33	.828	-.689	.102	-1.142	.203
SE1	576	1	5	3.30	1.157	-.036	.102	-.991	.203
SE2	576	1	5	3.33	1.205	-.139	.102	-1.036	.203
SE3	576	1	5	3.34	1.247	-.093	.102	-1.214	.203
SE4	576	1	5	3.36	1.229	-.066	.102	-1.292	.203
SE5	576	1	5	3.36	1.264	-.106	.102	-1.262	.203
PR1	576	1	4	2.35	1.021	.364	.102	-.978	.203
PR2	576	1	4	1.85	1.017	1.048	.102	-.054	.203
PR3	576	1	4	2.66	.917	.042	.102	-.936	.203
PR4	576	1	4	2.61	.968	-.068	.102	-.981	.203

PR5	576	1	4	2.95	1.019	-.428	.102	-1.098	.203
PR6	576	1	4	2.73	.940	.089	.102	-1.164	.203
PR7	576	1	4	2.18	.981	.397	.102	-.864	.203
TB1	576	1	5	1.94	1.299	1.101	.102	-.069	.203
TB2	576	1	5	1.82	1.210	1.231	.102	.287	.203
TB3	576	1	5	2.40	1.639	.628	.102	-1.281	.203
TB4	576	1	5	1.71	1.082	1.289	.102	.697	.203
TB5	576	1	5	1.83	1.303	1.121	.102	-.329	.203
TB6	576	1	5	1.92	1.430	1.273	.102	.028	.203

Across the four academic subjects—Chinese Language, Mathematics, English Language, and Science—the mean scores (ranging from 3.16 to 3.33) indicate that most students' final exam scores are as "B" or "A". All skewness values are negative, suggesting a left-leaning distribution with scores concentrated in the higher range. The kurtosis values are below zero, reflecting a relatively flat and dispersed distribution. Since all skewness values fall within ±1 and kurtosis within ±2, the variables meet acceptable thresholds for approximate normality. These subjective performance ratings are suitable for exploring constructs such as self-esteem, peer relationships, and behavioral tendencies, especially when used as antecedent variables in structural path modeling.

Self-esteem items (SE1–SE5) show mean scores between 3.30 and 3.36, with standard deviations ranging from approximately 1.15 to 1.26, indicating moderate to high perceived self-worth with notable variability across individuals. Skewness values are close to zero and kurtosis slightly negative, suggesting an approximately normal distribution. Peer relationship items (PR1–PR7) yield relatively low mean scores (ranging from 1.85 to 2.95), indicating weaker social support among students. Notably, PR2 and PR7 have skewness values greater than 1, revealing pronounced right skewness—suggesting perceptions of rejection or social isolation in specific peer dimensions. Bullying tendency items (TB1–TB6) generally report low mean values (<2.5), but with large standard deviations, especially for TB3 and TB6 (above 1.4), indicating that while most students report low bullying involvement, a small subgroup may be at elevated behavioral risk. Most variables fall within acceptable normality parameters (skewness within ±1.5 and kurtosis within ±2), making them suitable for correlation analysis and structural equation modeling.

Reliability analysis

Table 2: Reliability analysis

Reliability Analysis				
Variable	Item	CITC	Cronbach's Alpha if Item Deleted	Cronbach's α
AP	Chinese language	.870	.866	0.915
	Mathematics	.826	.882	
	English language	.746	.909	
	Science	.782	.898	
SE	SE1	.749	.869	0.894
	SE2	.706	.878	
	SE3	.769	.863	
	SE4	.743	.869	
	SE5	.730	.873	
PR	PR1	.756	.905	0.918
	PR2	.746	.906	
	PR3	.730	.908	
	PR4	.776	.903	
	PR5	.655	.916	
	PR6	.799	.901	
	PR7	.782	.903	
TB	TB1	.761	.918	0.928
	TB2	.843	.909	
	TB3	.756	.924	
	TB4	.804	.916	
	TB5	.858	.906	
	TB6	.785	.916	

All measurement scales demonstrated strong internal consistency based on Cronbach's alpha coefficients, which ranged from 0.894 to 0.928 across four core constructs: Academic Performance, Self-esteem, Peer Relationships, and Tendency of Bullying. The Academic Performance scale yielded an alpha of 0.915 across four

subject items (Chinese Language, Mathematics, English Language, and Science), indicating excellent internal reliability. Similarly, the Self-esteem scale (five items) produced an alpha of 0.894, confirming its suitability for assessing psychological self-worth among primary school students.

For the Peer Relationships construct, the seven-item scale achieved an alpha of 0.918, suggesting a highly coherent measure of students' social connectedness and interpersonal support. Item-total correlations (CITC) ranged from 0.655 to 0.799, with all items contributing meaningfully to the overall scale. Notably, deleting any individual item would not improve alpha, affirming the stability of the peer relationship instrument. Likewise, the Tendency of Bullying scale exhibited the highest reliability score (α = 0.928), with CITC values all exceeding 0.75. TB2 and TB5 showed particularly strong correlations (above 0.84), indicating consistent measurement of aggressive behavioral tendencies.

Overall, the internal consistency statistics provide robust evidence of the reliability of each scale employed in this study. No individual item appeared to detract from scale cohesion, and all constructs surpassed the conventional reliability threshold of 0.70 as recommended by Nunnally and Bernstein (1994). These results affirm the psychometric integrity of the instruments used to assess academic self-perception, psychological well-being, peer dynamics, and bullying involvement in this sample of Chinese primary school students.

Exploratory Factor Analysis (EFA)

Table 3: KMO and Bartlett's Test

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.946
Bartlett's Test of Sphericity	Approx. Chi-Square	9184.469
	df	231
	Sig.	.000

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.946, indicating outstanding suitability for factor analysis. A KMO value above 0.90 is considered "marvelous" (as per Kaiser's guidelines), reflecting strong shared variance and high correlations among items.

Bartlett's Test of Sphericity yielded a statistically significant result:Approximate Chi-Square = 9184.469;Degrees of Freedom (df) = 231;Significance (Sig.) = 0.000.

Since $p < .001$, the null hypothesis that the correlation matrix is an identity matrix is rejected, confirming sufficient inter-item correlations to justify factor extraction.

These results provide a strong statistical foundation for proceeding with exploratory factor analysis (EFA) using principal components or maximum likelihood methods.

Table 4: Total Variance Explained

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	9.454	42.972	42.972	9.454	42.972	42.972
2	2.789	12.676	55.647	2.789	12.676	55.647
3	2.149	9.767	65.414	2.149	9.767	65.414
4	1.647	7.485	72.899	1.647	7.485	72.899
5	.520	2.362	75.261			
6	.475	2.159	77.420			
7	.461	2.094	79.514			
8	.423	1.923	81.437			
9	.387	1.758	83.196			
10	.378	1.718	84.913			
11	.356	1.618	86.531			
12	.345	1.566	88.098			
13	.337	1.530	89.628			
14	.323	1.467	91.095			
15	.317	1.439	92.534			
16	.294	1.337	93.871			
17	.276	1.253	95.124			
18	.260	1.184	96.308			
19	.247	1.123	97.431			
20	.224	1.016	98.447			
21	.198	.899	99.346			
22	.144	.654	100.000			

Extraction Method: Principal Component Analysis.

The PCA results indicate that four components were retained based on the Kaiser Criterion (Eigenvalues > 1). These components together account for 72.90% of the cumulative variance, reflecting a well-structured construct in the dataset.

Component 1 explains 42.97% of the variance and is likely the dominant factor. Component 2 contributes an additional 12.68%, followed by Component 3 with 9.77%, and Component 4 with 7.49%.From Component 5

onward, eigenvalues fall below 1, suggesting limited explanatory power and weaker representation.

This result confirms a strong factor structure and justifies proceeding with rotated factor loading analysis (e.g., Varimax) to identify meaningful latent dimensions corresponding to constructs like Academic Performance, Self-esteem, Peer Relationships, or Bullying Tendency.

Table 5: Rotated Component Analysis

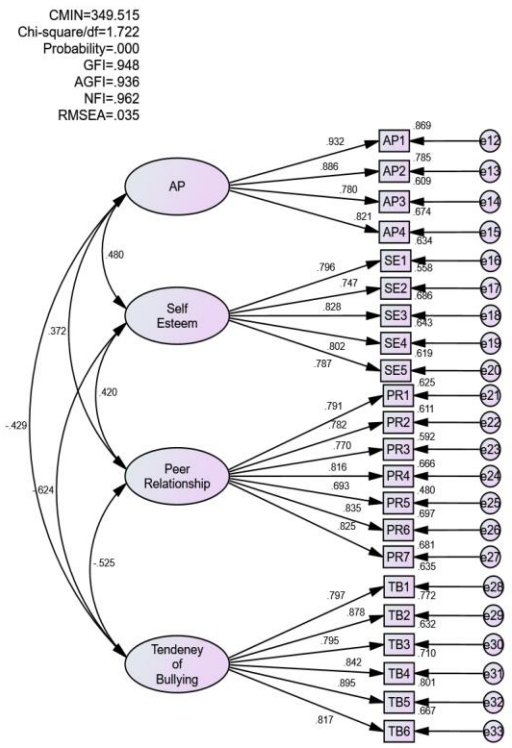
Rotated Component Matrix[a]				
	Component			
	1	2	3	4
Chinese language	.145	-.148	.170	**.896**
Mathematics	.139	-.148	.161	**.870**
English language	.150	-.155	.202	**.797**
Science	.155	-.189	.194	**.819**
SE1	.113	-.224	**.790**	.169
SE2	.084	-.215	**.778**	.110
SE3	.163	-.251	**.784**	.174
SE4	.150	-.238	**.767**	.195
SE5	.177	-.233	**.752**	.176
PR1	**.804**	-.092	.206	.081
PR2	**.790**	-.071	.208	.148
PR3	**.778**	-.174	.118	.075
PR4	**.804**	-.241	.102	.059
PR5	**.684**	-.285	-.030	.173
PR6	**.825**	-.132	.148	.160
PR7	**.797**	-.279	.059	.105
TB1	-.204	**.769**	-.244	-.090
TB2	-.230	**.825**	-.230	-.135
TB3	-.220	**.719**	-.280	-.210
TB4	-.220	**.788**	-.242	-.156
TB5	-.199	**.844**	-.242	-.136
TB6	-.178	**.811**	-.170	-.156
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.				
a. Rotation converged in 6 iterations.				

The rotated component matrix revealed a clear and interpretable four-factor structure based on principal component analysis with Varimax rotation. The first factor captured peer relationships, with all seven PR items (PR1–PR7) loading strongly (≥ .684), indicating a cohesive dimension of social support and interpersonal connection. The second factor corresponded to bullying tendencies, as all six TB items (TB1–TB6) showed high positive loadings (.719–.844), reflecting consistent measurement of aggressive behaviors. The third factor was defined by self-esteem, with five SE items (SE1–SE5) demonstrating substantial loadings (.752–.790), representing personal self-worth and confidence. The fourth factor encompassed academic performance, as all four subject items (Chinese Language, Mathematics, English Language, and Science) loaded most heavily (.797–.896), indicating student-perceived academic ability.

This four-factor solution explained 72.90% of the cumulative variance, suggesting strong construct validity and a well-differentiated measurement model. Each item contributed meaningfully to its respective factor, and no significant cross-loadings were observed. The results support the theoretical structure of the study, validating the inclusion of academic performance, self-esteem, peer relationships, and bullying tendency as distinct yet interrelated constructs. This factor structure is suitable for further confirmatory analysis and structural equation modeling.

Confirmatory factor analysis (CFA)

Figure 3: Measurement model



Based on the structural equation model results, the fit indices demonstrate excellent model adequacy. The chi-square statistic is 349.515, with a chi-square to degrees of freedom ratio (χ^2/df) of 1.722, which falls well within the acceptable range, suggesting a strong fit between the model and the observed data. While the chi-square test yielded a significant p-value (p = .000), this result is expected given the relatively large sample size, and does not necessarily indicate poor model performance. Other fit indices provide more reliable evidence of model quality: the Goodness of Fit Index (GFI) is 0.948 and the Adjusted Goodness of Fit Index (AGFI) is 0.936, both exceeding the recommended threshold of 0.90, indicating strong overall model adequacy even after adjusting for model complexity.

Further confirming the model's strength, the Normed Fit Index (NFI) is 0.962, suggesting that the proposed model has a substantially better fit than the null model. Most notably, the Root Mean Square Error of Approximation (RMSEA) is 0.035, which is well below the 0.05 cutoff, signifying minimal approximation error and close fit between the hypothesized model and population covariance matrix. Taken together, these fit indices provide strong support for the structural model's validity and suggest it is highly suitable for testing mediating effects and theoretical pathways among academic performance, self-esteem, peer relationships, and students' tendency toward bullying.

Table 6: The results of CFA

Variable	Items	Loading	CR	AVE
Academic Performance	AP1	0.932	0.917	0.734
	AP2	0.886		
	AP3	0.78		
	AP4	0.821		
Self Esteem	SE1	0.798	0.894	0.628
	SE2	0.747		
	SE3	0.829		
	SE4	0.801		
	SE5	0.785		
Peer Relationship	PR1	0.791	0.738	0.595
	PR2	0.782		
	PR3	0.77		
	PR4	0.816		
	PR5	0.693		
	PR6	0.835		
	PR7	0.825		
Tendeney of Bullying	TB1	0.797	0.946	0.709
	TB2	0.878		
	TB3	0.795		
	TB4	0.842		
	TB5	0.895		
	TB6	0.817		

Based on the table provided, the four constructs—Academic Performance, Self-esteem, Peer Relationships, and Tendency of Bullying—exhibit acceptable and strong psychometric properties. All standardized loadings exceed 0.693, indicating that the individual items reliably measure their respective latent constructs. Composite Reliability (CR) values for all factors are above the recommended threshold of 0.70, ranging from 0.738 to 0.946, suggesting that each construct maintains internal consistency and reliability. Additionally, the Average Variance Extracted (AVE) values range from 0.595 to 0.734, all above the minimum criterion of 0.50, demonstrating that each latent variable captures sufficient variance from its items to support convergent validity.

These results indicate that the measurement model possesses robust structural integrity. Academic Performance shows particularly strong loadings, with AP1 reaching 0.932, supporting its central role as a predictor variable. Similarly, Tendency of Bullying yields the highest CR (0.946) and AVE (0.709), reflecting its well-defined behavioral structure. Although Peer Relationships have slightly lower CR and AVE values (0.738 and 0.595), they remain within acceptable range and show adequate construct reliability. Together, the data support the use of these indicators in structural equation modeling and provide empirical confidence in the validity of the proposed latent constructs.

Table 7: Disriminant Validity

	Academic Performance	Tendeney of Bullying	Peer Relationship	Self Esteem
Academic Performance	0.857			
Tendeney_of_Bullying	-0.329	0.842		
Peer_Relationship	0.222	-0.438	0.771	
Self_Esteem	0.327	-0.594	0.312	0.794

Table 7 presents the discriminant validity results based on the Fornell–Larcker criterion, comparing the square root of the Average Variance Extracted (AVE) values (on the diagonal) with the inter-construct correlations (off-diagonal). Each construct's diagonal value—Academic Performance (0.857), Tendency of Bullying (0.842), Peer

Relationship (0.771), and Self-esteem (0.794)—is greater than its corresponding correlation with other latent variables. This satisfies the criterion that a construct should share more variance with its own indicators than with other constructs. Therefore, discriminant validity is supported for all four dimensions, confirming that Academic Performance, Self-esteem, Peer Relationships, and Tendency of Bullying are empirically distinct constructs.

Structural Equation Model (SEM)

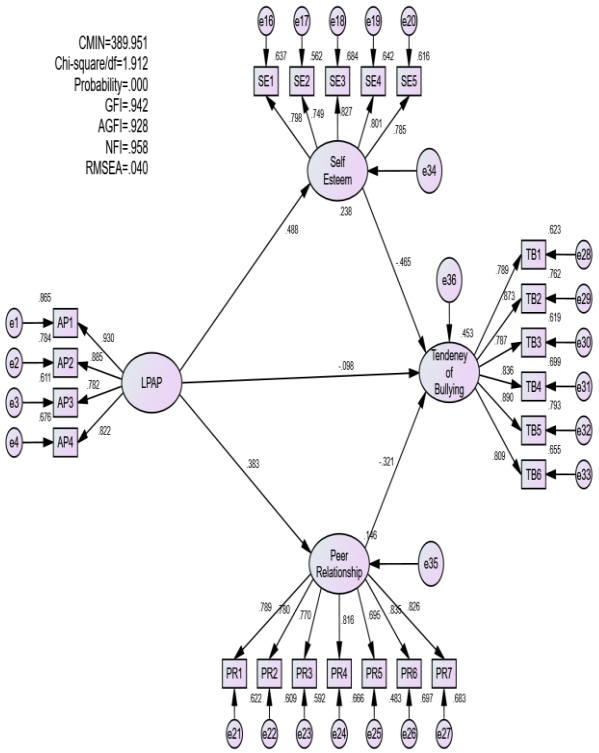


Figure 4: Structure Model

Based on the structural equation model results displayed in the image, the model demonstrates strong overall fit across key statistical indices. The chi-square value (CMIN) is 389.951, with a chi-square to degrees of freedom ratio (χ^2/df) of 1.912, indicating a good level of model-data agreement and acceptable residuals. Although the chi-square test is statistically significant (p = .000), this outcome is common in large sample sizes and does not, by itself, suggest poor fit.

Other fit indices further confirm the robustness of the model. The Goodness of Fit Index (GFI) is 0.942, and the Adjusted Goodness of Fit Index (AGFI) is 0.928—both exceeding the recommended threshold of 0.90, supporting overall model adequacy. The Normed Fit Index (NFI) reaches 0.958, suggesting strong comparative fit when contrasted with a null model. Most notably, the Root Mean Square Error of Approximation (RMSEA) stands at 0.040, which falls well below the conventional cutoff of 0.05, reflecting minimal approximation error and close model-data correspondence. Collectively, these indicators support the validity and reliability of the proposed structural model, confirming its suitability for testing theoretical relationships and mediation effects.

Table 8: Path Coefficient

	UnStd. Estimate	Std. Est	S.E.	C.R.	P	Result
Self Esteem<-Academic Performance	.609	.488	.055	11.05	***	Supported
Peer Relationship<-Academic Performance	.417	.383	.048	8.66	***	Supported
Tendeney of Bullying<-Academic Performance	-.133	-.098	.060	-2.21	.027	Supported
Tendeney of Bullying<-Self_Esteem	-.507	-.465	.051	-9.96	***	Supported
Tendeney of Bullying<-Peer_Relationship	-.402	-.321	.051	-7.84	***	Supported

The structural equation model revealed five key path relationships among academic performance, self-esteem, peer relationships, and students' tendency of bullying. Academic performance significantly predicted self-esteem, with an unstandardized estimate of 0.609 and a standardized coefficient of 0.488 (C.R. = 11.05, p < .001), indicating that students who perceived themselves as academically competent tended to report higher levels of self-worth. Similarly, academic performance positively influenced peer relationships (UnStd. Estimate = 0.417; Std. Est. = 0.383; C.R. = 8.66; p < .001), suggesting that students with stronger academic perceptions were more likely to experience positive interactions with peers.

In contrast, academic performance demonstrated a modest negative association with students' tendency of bullying (UnStd. Estimate = −0.133; Std. Est. = −0.098; C.R. = −2.21; p = .027), indicating that lower academic performance may slightly increase bullying behaviors. More substantially, self-esteem showed a strong negative effect on bullying tendency (UnStd. Estimate = −0.507; Std. Est. = −0.465; C.R. = −9.96; p < .001), confirming that students with lower self-worth were significantly more prone to engage in bullying. Likewise, peer

relationships negatively predicted bullying tendency (UnStd. Estimate = −0.402; Std. Est. = −0.321; C.R. = −7.84; p < .001), underscoring the protective role of positive peer interactions in reducing aggressive behaviors.

Academic performance showed a statistically significant negative association with students' tendency of bullying (H1), suggesting that students who perceive themselves as academically successful are less likely to engage in aggressive behaviors. Moreover, academic performance positively predicted self-esteem (H2) and peer relationships (H3), indicating that higher academic competence contributes to both internal self-worth and external social support. Both self-esteem (H4) and peer relationships (H5) negatively influenced bullying tendency, reinforcing their roles as protective psychological and social factors. The mediation analyses further confirmed that self-esteem (H6) and peer relationships (H7) significantly mediated the relationship between academic performance and bullying behavior, demonstrating that academic success indirectly reduces bullying through improved emotional resilience and stronger peer connections. Collectively, the model validates all proposed hypotheses, providing robust empirical evidence for the theoretical framework.

Intermediary test

Figure 5: The mediating relationship test of self-esteem

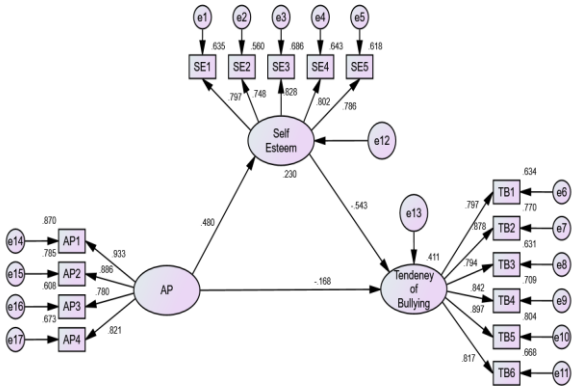


Table 9: AP→SE→TB

Relationship		AP→SE→TB		
Effect	Estimate	Confidence Interval		P
		Lower	Upper	
Total effect	-0.429	-0.516	-0.341	0.000
Indirect effect	-0.260	-0.336	-0.196	0.000
Direct effect	-0.168	-0.270	-0.073	0.001

The mediation analysis confirms that self-esteem significantly mediates the relationship between academic performance and students' tendency to engage in bullying. The total effect from academic performance to bullying is −0.429, indicating a negative overall association—students with stronger academic self-perceptions are less likely to display bullying behaviors. Among this, the indirect effect via self-esteem is −0.260 (95% CI: [−0.336, −0.196]; p < .001), showing that self-esteem substantially channels the protective influence of academic performance in reducing bullying tendencies.

The direct effect remains significant at −0.168 (p = .001), suggesting that academic performance also independently reduces bullying behavior, although to a lesser extent. These results underscore the psychological mechanism at play: self-esteem acts as a pivotal mediator, translating academic confidence into reduced aggression, and validating its role in the broader behavioral framework.

Figure 6: The mediating relationship test of peer relationship

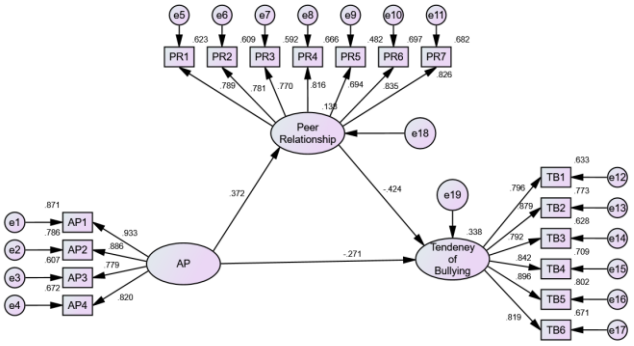


Table 10: AP→PR→TB

Relationship		AP→PR→TB		
Effect	Estimate	Confidence Interval		P
		Lower	Upper	
Total effect	-0.428	-0.515	-0.341	0.000
Indirect effect	-0.158	-0.219	-0.113	0.000
Direct effect	-0.271	-0.368	-0.173	0.000

The mediation analysis results demonstrate that peer relationships significantly mediate the relationship between academic performance and students' tendency to engage in bullying. The total effect of academic performance on bullying behavior is −0.428, indicating that students who perceive themselves as higher-achieving are less likely to display bullying tendencies overall. This negative association is both substantial and statistically significant (p < .001), reinforcing the

importance of academic self-perception in behavioral outcomes.

The indirect effect through peer relationships is −0.158 (95% CI: [−0.219, −0.113]; $p < .001$), confirming that part of the protective influence of academic performance operates via stronger peer connections. This suggests that academically competent students are more likely to cultivate positive social relationships, which in turn reduce their likelihood of engaging in bullying. The direct effect, estimated at −0.271 ($p < .001$), remains statistically significant, indicating that academic performance also independently contributes to lowering bullying behavior, even without passing through peer relationship mechanisms.

7.Discussion and Conclusion

The present study examined the interplay between academic performance, self-esteem, peer relationships, and students' tendency of bullying among primary school students in the Chinese educational context. Structural equation modeling revealed five significant direct path relationships, offering empirical support for the hypothesized associations. Academic performance emerged as a key predictor, positively influencing both self-esteem and peer relationships. These findings suggest that students who perceive themselves as academically successful are more likely to develop a stronger sense of self-worth and foster more positive peer interactions—aligning with previous research highlighting academic achievement as a foundational driver of psychological and social development in childhood (Congmin & Mohamad, 2025).

In terms of behavioral outcomes, academic performance was negatively associated with bullying tendency, albeit modestly. More salient were the negative effects of self-esteem and peer relationships on students' tendency to engage in bullying, underscoring their roles as protective factors. The mediating analyses further illuminated the mechanisms behind these relationships. Self-esteem significantly mediated the link between academic performance and bullying behavior, indicating that students with higher academic confidence tend to build stronger self-worth, which in turn reduces aggressive tendencies. Similarly, peer relationships mediated this pathway, suggesting that academic success facilitates positive social engagement, which ultimately lowers bullying behaviors.

These findings carry important theoretical and practical implications. From a developmental perspective, the study reinforces the view that academic confidence contributes not only to cognitive outcomes but also shapes emotional resilience and social adaptation. The dual mediation mechanisms via self-esteem and peer relationships highlight the value of fostering students' psychological wellbeing and interpersonal networks as part of school-based interventions to reduce bullying. Educators and policymakers should consider integrated strategies that enhance academic support while concurrently strengthening students' self-concept and peer connectedness. Taken together, the results advance a holistic understanding of bullying prevention by identifying modifiable antecedents and pathways that can be strategically targeted within educational environments.

8.Limitation and Suggestions for Future Research

Despite the valuable contributions of this study in revealing how Academic Performance, self-esteem, and peer relationships shape bullying tendencies among primary students, several limitations must be addressed. The cross-sectional design restricts causal interpretations; the sample, drawn solely from five schools in Zhengzhou, limits generalizability; reliance on self-reported data may introduce bias; and the final sample size reduces statistical power. Furthermore, the study exclusively examined traditional peer-to-peer bullying within the school context, excluding cyberbullying and teacher-related aggression.

To enhance future research, longitudinal designs should be employed to examine causal pathways over time. Broader sampling across diverse regions and age groups can improve external validity. Multi-informant approaches involving teachers, parents, and peers would mitigate self-report bias. Expanding the scope to include cyberbullying, emotional regulation, and school climate variables could enrich explanatory power. Additionally, intervention studies targeting self-esteem and peer relationship enhancement may offer culturally relevant strategies for reducing bullying in academically pressured school environments.

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