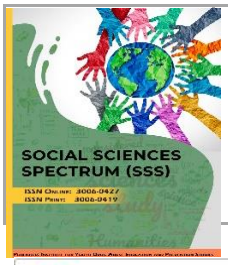

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Beyond Academic Performance: The Psychological Benefits of Positive School Culture in Mathematics Education in Quetta, Pakistan

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Abstract

Mathematics education does not improve only academic achievement by it fosters students' confidence, motivation, and resilience to overcome the academic challenges. A positive school culture has been recognized as an important contextual factor that may impact these psychological outcomes. The present study examined the influence of positive school culture on the psychological development of secondary school mathematics students in Quetta, Pakistan. Specifically, it investigated the effects of five dimensions of positive school culture peer relations, teacher student relations, learning practices, diversity and inclusion, and extracurricular activities on academic resilience, mathematics self-efficacy, and academic motivation. A cross-sectional quantitative research design was employed, and the data were collected from 400 secondary school students using a structured questionnaire. The reliability and validity of the instrument were established through Cronbach's alpha and Confirmatory Factor Analysis (CFA**)** using Smart PLS 4, while the descriptive statistics, Pearson correlation, and the multiple regression analyses were conducted using IBM SPSS Statistics 26. The findings revealed that peer relations significantly predicted academic resilience, whereas teacher, student relationships significantly predicted academic motivation. However, there was no statistical significant relationships were found between positive school culture and mathematics self-efficacy. Overall, the influence of positive school culture on students' psychological development was limited, suggesting that specific interpersonal relationships within schools are more influential than the overall school environment. This study highlights the significance of supportive peer interactions and positive teacher and student relationships to improve students' resilience and develop motivation in mathematics education.

Keywords: School Culture, Academic Resilience, Mathematics Self-Efficacy, Motivation, Mathematics Education.

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Introduction

The subject mathematics has been widely accepted as an important subject which cultivates logical reasoning, critical thinking, and problem-solving skills in students. It is essential for both academic success and our everyday life. Mathematics is a foundation of different subjects' science, technology, engineering, and mathematics (STEM) education which plays a crucial role in the field of economic and technological development. However, the students' success in mathematics has always been measured through examination scores, standardized test results, and with grade point averages. These indicators always provide valuable information about students' academic achievement, but do not fully explain that how students learn or respond to their academic challenges. The students who obtain high grades in mathematics but he still lacks his confidence, motivation. For this resilience is required to cope up with mathematical challenges. Many researchers believe that academic performance should not only be measured through students' academic performance but the psychological factors like, confidence, motivation and resilience should also be considered that enable students to learn effectively and sustain their learning over time (Ryan & Deci, 2020; Schukajlow et al., 2023).

Mathematics is also one of the major subject in which many students feel anxiety, fear of failure, and low self-confidence. However, these emotional challenges mostly discourage students from actively participation in classroom activities and reduce their willingness to engage with difficult mathematics challenges. As a result, the students' success in mathematics will not only depends on students' cognitive abilities, but also on students' psychological factors which includes self-efficacy, motivation, and academic resilience. The confident students who have confidence in mathematics abilities are likely to face academic difficulties, remain persistent while having difficulties, and use effective learning strategies (Bandura, 1997). Moreover, the motivated students show greater engagement in mathematics learning, while academically resilient students perform better from academic failures and they remain continue with working toward their academic goals while having challenges (Ungar, 2013; Xenofontos & Mouroutsou, 2023). Recent studies have been shown that the students having higher mathematics self-efficacy and motivation mostly perform better in mathematics activities, whereas mathematics anxiety and fear have negative influence on learner's achievement (Živković et al., 2023).

The educational research has now accepted the significance of the psychological variables, and academic achievement of students alone does not reflect to their success. Moreover, the Researchers aim to understand what would be helpful for students to stay motivated, confident, and resilient when they experience difficulties in mathematics learning. Rather focusing only on students' achievement in examination scores, researchers are interested in understanding the factors which provide help to students to stay motivated, confident, and resilient when they face academic challenges. Out of these factors, the academic resilience, self-efficacy, and motivation are considered the important psychological resources. These factors help the students to remain continued in learning despite challenges, recover from setbacks, and maintain their positive attitudes toward mathematics learning. The students having these qualities are more willing to engage actively in classroom activities. Moreover, the students put greater effort in learning mathematics skills, and remain committed to achieving their academic goals. These psychological factors not only improve students' learning experiences but also improve academic performance, and that support them in their long-term academic development, personal growth, and overall well-being. (Ryan & Deci, 2020; Schukajlow et al., 2023).

Positive school culture plays a vital role that influences students' psychological development. Moreover, the positive school culture is shaped by the shared values, relationships, and everyday practices that shape students' experiences within a school. It includes supportive school leadership, positive teacher and student relationships, cooperation among peers, and an inclusive environment where every student feels respected, valued, protected and safe. However, a positive school culture also helps students to develop confidence, stay motivated, and become more resilient when dealing with academic challenges. Students who percieve supported by their teachers and peers enjoy learning, remain engaged in mathematics lessons, and continue trying even when they face difficulties in mathematical learning. Studies have shown that a positive school culture strengthens students' academic resilience, self-efficacy, motivation, and classroom engagement. Therefore, creating a supportive and collaborative school environment is essential for the improvement of students' learning experiences and success in mathematics. (Thapa et al., 2013; Wang & Degol, 2016; Xenofontos & Mouroutsou, 2023).

Existing studies consistently shows that a positive school culture has a crucial role in supporting students for development of psychological factors. The schools that promote supportive teacher, student relationships, develop collaboration among peers, give mutual respect to everyone, and a sense of belonging create positive learning environments where students are more inclined to feel motivated, confident, and more engaged in academic learning. In mathematics classrooms, teachers' emotional support and encouragement help in increasing students' interest in mathematics and foster meaningful learning experiences. (Hettinger et al., 2023). Likewise, supportive school environments help students in developing greater self-efficacy and academic resilience that enable the students to cope up more effectively with academic challenges and remain persistence when learning becomes difficult (Xenofontos & Mouroutsou, 2023). These findings indicate that a supportive school culture is not serves as a feature of effective schools but also an important factor that helps students in developing confidence, motivation, and resilience which are needed for successful mathematics learning (Schukajlow et al., 2023).

The current study is drawn upon Social Ecological Resilience Theory (Ungar, 2017) and the Transformative Social and Emotional Learning (T-SEL) framework (CASEL, 2020). collectively these theories offer a holistic explanation of positive school culture that how it influences students' psychological development. Social-Ecological Resilience Theory explains that development of resilience is a dynamic process through supportive relationships, access to resources, and positive environmental conditions rather than through individual characteristics alone (Ungar, 2017).

Although previous research has established the importance of positive school environments for students' learning and well-being. However, several important gaps remain in the literature. Firstly, primarily focuses on academic achievement and school effectiveness, while limited attention has been given to psychological benefits of a positive school environment, especially in mathematics education. (Wang & Degol, 2016; Schukajlow et al., 2023). Secondly, although academic resilience, self-efficacy, and motivation are widely investigated, but they are often examined separately. Moreover, less attention has been given that how these psychological factors are influenced together by a positive school culture. (Živković et al., 2023; Xenofontos & Mouroutsou, 2023). Third, mostly previous studies have been conducted in Western countries. Therefore, their findings cannot be fully applying to developing countries like Pakistan, where school resources, educational practices, and socio cultural conditions are different. (Ali et al., 2017). Finally, despite the growing interest in school climate and student outcomes, empirical evidence focusing

specifically on secondary school mathematics students in Quetta, which remains limited. However, addressing these gaps can provide a more comprehensive understanding into how positive school culture contributes to students' psychological development beyond academic performance and offer evidence which is relevant to Pakistani educational context.

To fill these response, the present study examines the psychological benefits of positive school culture among secondary school mathematics students in Quetta. The study specifically, investigates the relationship between positive school culture and three important psychological factors which are academic resilience, mathematics self-efficacy, and academic motivation. Guided by Social-Ecological Resilience Theory (Ungar, 2017) and the Transformative Social and Emotional Learning (T-SEL) framework (CASEL, 2020). The study adopts a quantitative research design to explore how a supportive school environment contributes to students' psychological development, to increase their academic performance. By focusing on the mathematics learning context, this study extends the existing literature on school culture and offers context specific evidence from Quetta. The findings are expected will contribute in mathematics education research and provide practical implications for school stakeholders seeking to create positive school environments that support students' psychological well-being and promote meaningful learning experiences.

Literature Review

Positive School Culture

A supportive school culture has a fundamental factor of research because it influences not only the students' academic achievement but also they experience psychological and social development. Moreover, the school culture is characterized by shared values, their beliefs, norms and everyday life purposes that shape by teaching, learning, and developing relationships in the context of school (Deal & Peterson, 2016). A positive school culture includes supportive leadership, respectful teacher, student relationships, collaboration among peers, shared learning goals, and an inclusive environment where students feel safe, respected, valued, and encouraged to participate (Thapa et al., 2013; Wang & Degol, 2016).

Recent research shows that a positive school culture does more than maintain discipline or improve academic performance in mathematics learning. It fosters a supportive learning environment that encourages students to build their self-confidence, stay motivated, participate actively, and maintain their emotional well-being. When students feel respected, valued, and supported at school, they are likely to exhibit positive attitudes toward learning, take part in classroom activities, and ask for help when they face academic difficulties (Schukajlow et al., 2023). Moreover, positive teacher and student relationships and cooperative classroom environments help increase students' engagement, strengthen student self-efficacy, and encourage students to keep trying when learning mathematics. (Živković et al., 2023).

Through the lens of Social Ecological Resilience Theory, positive school culture represents an important environmental resource that helps students cope with academic challenges by providing supportive relationships and opportunities for meaningful participation (Ungar, 2017). Likewise, the Transformative Social and Emotional Learning (T-SEL) framework (2020) emphasizes that inclusive and equitable school environments emhance students' social, emotional, and academic development by strengthening their sense of belonging, agency, and positive relationships (CASEL, 2020). Together these perspectives suggest that a positive school culture helps students

develop the psychological resources they need to succeed in mathematics, not only with regards to academic performance but also in confidence, motivation, and resilience.

Academic Resilience

The academic resilience is an ability of students' ability to maintain their learning, stay motivated, and remain academic engage in their mathematics learning despite experiencing challenges, setbacks, or adverse circumstances. According to Social Ecological Resilience Theory, resilience is not a fixed personal trait but a process that develops through supportive relationships and access to social opportunities o environment and instructional resources (Ungar, 2017). This theory suggests that schools play an important role in building students' resilience by providing a safe, supportive, and encouraging learning culture that helps students that overcome academic challenges.

In mathematics education, academic resilience has become an important area of research because many students experience mathematics anxiety, repeated failure, and low confidence when learning the subject. Students with higher academic resilience tend to persist then they show engagement to continue working on difficult mathematical challenges, learn through their mistakes, and maintain a positive attitude even when students face challenges. A recent review by Xenofontos and Mouroutsou (2023) concluded that mathematical resilience is shaped not only by students' personal characteristics but also by supportive classroom environments, positive teacher student relationships, and meaningful learning experiences. Similarly, other studies have shown that resilient students are more persistent, confident, and actively engaged in learning, which helps improve their mathematics achievement and overall academic development (Schukajlow et al., 2023).

Mathematics Self-Efficacy

Mathematics self-efficacy describes students' belief in their capability to accomplish mathematics related tasks and solve mathematical challenges (Bandura, 1997). This confidence affects how students approach learning, how much effort they put into their academic tasks, and whether they continue trying when they face challenging tasks. Students with high mathematics self-efficacy are more likely to view difficult tasks as opportunities to learn, whereas those with low self-efficacy often avoid challenging situations and are more likely to stop trying when they face difficulties.

Several studies have shown that mathematics self-efficacy is one of the significant psychological predictors of students' engagement and achievement in mathematics. Students who are confident in their mathematical skills tend to participate more actively in their classroom activities. Students apply effective learning strategies, and demonstrate greater persistence when solving complex challenges (Živković et al., 2023). Likewise, recent studies have found that mathematics self-efficacy is positively associated with academic motivation, problem-solving skills, and mathematics performance, while low self-efficacy is often linked with mathematics anxiety, fear and show lower engagement in learning (Schukajlow et al., 2023; Zakariya, 2022).

The development of mathematics self-efficacy is influenced not only by students' individual experiences but also by the learning environments in which the students participate. Supportive teachers, constructive feedback, collaborative classroom interactions, and positive school experiences always help students to build confidence in their mathematical abilities. According to

the Transformative Social and Emotional Learning (T-SEL) framework, learning environments that provide supportive relationships, promote inclusion, and encourage student participation into their learning tasks help students to develop greater confidence, emotional well-being, and active involvement in mathematics learning (CASEL, 2020). These findings suggest that positive school culture plays an important role to strengthen students' mathematics self-efficacy, which supports both their psychological development and learning outcomes.

Recent studies suggest that academic resilience can be strengthened through supportive school environments that encourage students, promote collaboration, and create a sense of belonging. When students feel that their school is caring, inclusive, and supportive, they are more likely to develop the confidence and determination. They are also more likely to stay motivated, continue learning, and work toward achieving their academic goals despite having challenges. These findings show that academic resilience is not only an individual quality but also develops through positive school experiences. Therefore, a positive school culture plays an important role in supporting students' psychological development and helping them succeed in their learning. (Ungar, 2017; Xenofontos & Mouroutsou, 2023).

Academic Motivation

Academic motivation refers to the factors that encourage students to begin leaning, stay engaged, and work toward their educational goals. According to Self-Determination Theory, motivation can be two types either intrinsic or extrinsic. Intrinsic motivation comes from students' own interest and willingness in learning, whereas extrinsic motivation is influenced by external rewards, expectations, or recognition (Ryan & Deci, 2020). In mathematics education, motivation is especially very important because students often face difficult concepts, challenging activities and problem-solving tasks that require effort, persistence, and active participation. Students who are motivated are more likely to take part in classroom activities, put more effort in solving mathematical problems, and continue learning while facing academic challenges.

Recent research has consistently highlighted the importance of academic motivation in mathematics learning. Students with higher levels of motivation demonstrate greater classroom engagement, stronger persistence, and more positive attitudes toward mathematics, which ultimately support their academic success (Schukajlow et al., 2023). Similarly, Živković et al. (2023) reported that motivational factors, together with mathematics self-efficacy, contribute significantly to students' mathematics performance by encouraging confidence and sustained effort during learning. These findings suggest that motivation is not only associated with academic achievement but also helps students remain engaged and resilient when they encounter academic challenges.

Academic motivation is shaped not only by students' personal goals but also by the educational environments in which they learn. Schools that provide supportive teacher–student relationships, meaningful learning experiences, constructive feedback, and opportunities for active participation encourage students to develop stronger motivation toward learning. Consistent with the Transformative Social and Emotional Learning (T-SEL) framework, learning environments characterized by inclusion, belonging, and supportive relationships help students develop a sense of purpose, confidence, and engagement in their learning (CASEL, 2020). Therefore, positive school culture can play an important role in strengthening students' academic motivation, enabling them to participate more actively and persist when learning mathematics becomes challenging.

Positive School Culture and Students' Psychological Development

Several studies suggest that positive school culture provides is an important foundation for students' psychological development. Rather than influencing academic achievement alone, supportive school environments contribute to the development of psychological resources that enable students to cope up with academic challenges, remain engaged in learning, and develop confidence in their abilities. the schools which have supportive leadership, supportive teacher and student relationships, collaborative learning, combined respect, and inclusive practices help the students to experience a sense of belonging, emotional security, and active participation in classroom mathematics activities (Thapa et al., 2013; Wang & Degol, 2016). These experiences strengthen students' resilience, self-efficacy, confidence and motivation, which are essential to sustained mathematics learning.

Many studies have found a supportive relationship between school culture and students' psychological development. Therefore, a supportive learning environments encourage students to help in academic challenges as opportunities for growth, strengthen their confidence in solving mathematical problems, and motivate them to remain persist in mathematical challenges (Schukajlow et al., 2023). Moreover, research has shown that positive teacher-student relationships and inclusive classroom practices increase students' mathematics self-efficacy, lower fear and anxiety, and promote greater learning in engagement (Živković et al., 2023). Xenofontos and Mouroutsou (2023) further stated that academic resilience in mathematics develops through the interaction between individual characteristics and supportive educational environments, highlighting the important role of schools which fostering students' psychological development.

The relationship between positive school culture and students' psychological development is further supported by the theories namely, Social Ecological Resilience Theory (Ungar, 2017) and the Transformative Social and Emotional Learning (T-SEL) framework (CASEL, 2020). The perspectives of both theories emphasized that students develop resilience, confidence, and motivation when they learn in that environments which provide supportive relationships, equitable opportunities, meaningful participation, and emotional support to the students. Moreover, the existing literature indicates that positive school culture extends beyond improving academic performance by strengthening the psychological resources that help students succeed in mathematics. These findings provide a strong theoretical and empirical basis for examining the influence of positive school culture on academic resilience, mathematics self-efficacy, and academic motivation among secondary school students.

Hypotheses Development

The literature reviewed in the preceding sections demonstrates that positive school culture promotes students' psychological development by fostering supportive relationships, inclusive learning environments, and meaningful participation. Guided by Social-Ecological Resilience Theory (Ungar, 2017) and the Transformative Social and Emotional Learning (T-SEL) framework (CASEL, 2020), the present study proposes that positive school culture positively influences secondary school students' academic resilience, mathematics self-efficacy, and academic motivation. According to the following the hypotheses were formulated:

H0: Positive school culture has a significant positive influence on students' academic resilience.

H1: Positive school culture has a non-significant positive influence on students' academic resilience.

H0: Positive school culture has a significant positive influence on students' mathematics self-efficacy.

H2: Positive school culture has a non-significant positive influence on students' mathematics self-efficacy.

H0: Positive school culture has a significant positive influence on students' academic motivation.

H3: Positive school culture has a non-significant positive influence on students' academic motivation.

Research Methodology

Research Design

The present research adopted a quantitative cross-sectional research design to analyze the influence of positive school culture on secondary school students' psychological development in mathematics education. A quantitative approach was deemed appropriate because it facilitates the objective measurement of variables and the statistical analysis of relationships among them. The study focused on three psychological outcomes academic resilience, mathematics self-efficacy, and academic motivation to understand how students' perceptions of positive school culture relate to their psychological development. The data were collected during a single period of time using a structured questionnaire administered to secondary school mathematics students in Quetta, Pakistan.

Population and Sample

The target population comprised secondary school mathematics students enrolled in public, private, semi-government, and NGO-managed schools in Quetta. A sample of 400 student's participants' were selected for this study. However, the participants were selected by using stratified random sampling in order to adequate representation from different school categories. This sampling technique improved the representativeness of the sample by giving students from different school categories with an equal opportunity to participate in the present study.

Research Instrument

The data for this study were gathered by using a structured self-administered questionnaire which consisting of two sections. However, the first section consists on demographic information, which includes students' gender, grade level, and school type. Whereas, the second section developed to measure the study variables.

Positive school culture was measured by using five dimensions which includes peer relations, teacher-student relationships, students learning practices, diversity and inclusion, and extracurricular activities. Whereas, students' psychological development factors were measured by using three constructs namely academic resilience, mathematics self-efficacy, and academic motivation. The responses from the participants were measured on a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree)

Before the collection of data, the questionnaire was thoroughly reviewed by experts of educational department to ensure content validity. Internal consistency was assessed by using Cronbach's alpha, with all constructs demonstrating acceptable reliability values above the recommended threshold of 0.70 (Nunnally & Bernstein, 1994).

Validity and Reliability of the Instrument

The existing instruments and previously validated scales reported in the literature were carefully reviewed and adapted from School Culture Survey (SCS) developed by Gruenert and Valentine (1998), the Child and Youth Resilience Measure (CYRM-28) developed by Ungar and Liebenberg (2011, and the Mathematics Self-Efficacy Scale (MSES) developed by Betz and Hackett (1983), which best suited the objectives of the present study and the educational context of Quetta. To ensure content validity, the instrument was reviewed by experts in educational and mathematics education departments. The experts' feedback was used to improve the clarity, relevance, and appropriateness of the questionnaire items. After that the measurement properties of the questionnaire were evaluated by using Smart PLS 4. The Confirmatory Factor Analysis (CFA) was conducted to assess the construct validity. The Convergent validity was assessed using factor loadings and Average Variance Extracted (AVE), while discriminant validity was evaluated by using the Fornell–Larcker criterion. The reliability of the constructs was examined using Cronbach's alpha and Composite Reliability (CR). However, the findings showed that all constructs met the recommended criteria for reliability and validity, indicating that the questionnaire was appropriate for data collection and further statistical analysis for the present study.

Data Analysis

The collected data were analyzed by using SPSS (Version 26) and with the help of Smart PLS 4. The collected data were first screened to check for completeness, missing values, and normality by examining descriptive statistics, including the mean, standard deviation, skewness, and kurtosis. Then the reliability of the measurement scales was evaluated by using Cronbach's alpha. Then the Confirmatory Factor Analysis (CFA) was conducted through Smart PLS 4 to assess the measurement of the model. Convergent validity was evaluated by using factor loadings, while discriminant validity was assessed using the Fornell-Larcker criterion. The overall fitness of the measurement model was examined using several model fit indices, including the Standardized Root Mean Square Residual (SRMR), Normed Fit Index (NFI), d_ULS, d_G, Chi-square (χ^2), and χ^2/df. After confirming the reliability and validity of the measurement model, SPSS was used to perform descriptive statistics, Pearson correlation, and multiple regression analyses. These analyses were conducted to examine the relationship between positive school culture and students' academic resilience, mathematics self-efficacy, and academic motivation. However, the significance level of 0.05 was used for all statistical tests.

Results

Table 1: *Descriptive Statistics for Study Variables*

Variables	Min	Max	Mean	SD	Skewness	Kurtosis
Overall School Culture (SC)	128	212	181.20	12.12	−0.35	0.28
Academic Resilience (ARES)	12	38	29.31	4.88	−0.18	−0.24
Mathematics Self-Efficacy (MSE)	15	40	29.71	4.47	−0.08	−0.38
Academic Motivation (AMOT)	8	40	34.41	4.29	−0.89	1.42
Combined Psychological Outcomes	48	116	93.42	8.21	−0.15	−0.08

Table 1 presents the descriptive statistics of the study variables. Overall the mean score of school culture was recorded as a high mean score (M = 181.20, SD = 12.12), which indicate that students generally perceived their school environment as positive and supportive. Moreover, among the psychological outcomes, the academic motivation had the highest mean (M = 34.41, SD = 4.29), followed by mathematics self-efficacy (M = 29.71, SD = 4.47) and academic resilience (M = 29.31, SD = 4.88), which generally suggest positive psychological characteristics among the participants. The combined psychological outcomes also showed a relatively high mean (M = 93.42, SD = 8.21). Furthermore, the skewness (−0.89 to −0.08) and kurtosis (−0.38 to 1.42) values were within the acceptable range (±2), indicating that the data were approximately normally distributed and suitable for parametric analyses (George & Mallery, 2020).

Table 2: *Cronbach's Alpha Reliability Coefficients*

Scale/Dimension	No. of Items	Cronbach's α
Peer Relations (PR)	10	0.847
Teacher-Student Relations (TSR)	10	0.892
Learning Practices (LP)	10	0.876
Diversity & Inclusion (DNI)	8	0.812
Extracurricular Activities (ECSA)	8	0.834
Academic Resilience (ARES)	8	0.856
Mathematics Self-Efficacy (MSE)	8	0.823
Academic Motivation (AMOT)	8	0.798

Table 2 presents the internal consistency of the study instruments using Cronbach's alpha. The reliability coefficients ranged from 0.798 to 0.892, indicating acceptable to excellent internal consistency. Among the school culture dimensions, Teacher–Student Relationships demonstrated the highest reliability (α = 0.892), followed by Learning Practices (α = 0.876), Peer Relations (α = 0.847), Extracurricular Activities (α = 0.834), and Diversity and Inclusion (α = 0.812). The psychological outcome measures also showed satisfactory reliability, with Academic Resilience (α = 0.856), Mathematics Self-Efficacy (α = 0.823), and Academic Motivation (α = 0.798). Overall, all scales exceeded the recommended threshold of 0.70 (Nunnally & Bernstein, 1994), indicating that the instruments were reliable for subsequent analyses.

Table 3: *Heterotrait-Monotrait (HTMT) Ratio Matrix*

	PR	TSR	LP	DNI	ECSA	ARES	MSE	AMOT
PR	—							
TSR	0.312	—						
LP	0.456	0.298	—					
DNI	0.287	0.412	0.356	—				
ECSA	0.324	0.278	0.389	0.267	—			
ARES	0.189	0.245	0.156	0.198	0.134	—		
MSE	0.167	0.234	0.145	0.176	0.124	0.456	—	
AMOT	0.198	0.267	0.189	0.234	0.156	0.423	0.398	—

Table 3 presents the Pearson correlation coefficients among the study variables. All dimensions of positive school culture showed positive correlations with academic resilience, mathematics self-efficacy, and academic motivation, indicating that more positive school experiences were generally associated with better psychological outcomes. Among the school culture dimensions, Teacher–Student Relationships demonstrated relatively stronger associations with the psychological variables. In addition, academic resilience, mathematics self-efficacy, and academic motivation were positively correlated with one another, suggesting that these psychological outcomes are closely related among secondary school mathematics students.

Table 4: *Fornell-Larcker Criterion*

	PR	TSR	LP	DNI	ECSA	ARES	MSE	AMOT
PR	0.724							
TSR	0.298	0.783						
LP	0.456	0.312	0.754					
DNI	0.287	0.412	0.356	0.708				
ECSA	0.324	0.278	0.389	0.267	0.734			
ARES	0.189	0.245	0.156	0.198	0.134	0.746		
MSE	0.167	0.234	0.145	0.176	0.124	0.456	0.715	
AMOT	0.198	0.267	0.189	0.234	0.156	0.423	0.398	0.699

Table 4 presents the Fornell–Larcker criterion for assessing discriminant validity. The square root of the Average Variance Extracted (AVE) for each construct (diagonal values) exceeded its correlations with the other constructs, indicating satisfactory discriminant validity (Fornell & Larcker, 1981). These results confirm that each construct is empirically distinct and measures a unique concept.

Table 5: *Smart-PLS CFA Model Fit Indices*

Fit Index	Value	Recommended Threshold	Assessment
SRMR (Standardized Root Mean Square Residual)	0.058	< 0.08 (Hu & Bentler, 1999)	Good fit
d_ULS (Unweighted Least Squares Discrepancy)	0.892	< 95% bootstrap CI	Acceptable
d_G (Geodesic Distance)	0.756	< 95% bootstrap CI	Acceptable
NFI (Normed Fit Index)	0.912	> 0.90 (Bentler & Bonett, 1980)	Good fit
Chi-Square (χ^2)	487.34	$p > 0.05$	Significant (expected with large N)
χ^2 / df	2.14	< 3.0 (Kline, 2011)	Acceptable

The table 5 presents the model fit indices for the measurement model. However, the results show that the model achieved an acceptable fit with the observed data. The SRMR value (0.058) was below the recommended threshold of 0.08, and the NFI value (0.912) was higher than the recommended value of 0.90, which indicate a good model fit (Hu & Bentler, 1999; Bentler & Bonett, 1980). Similarly, the χ^2/df ratio of 2.14 was also below the recommended threshold of 3.0, further supporting the adequacy of the model (Kline, 2011). The d_ULS and d_G values was also fell within the acceptable ranges. Overall, the results confirm that the measurement model provided a good fit to the observed data and was suitable for further analysis.

Table 6: *Pearson Correlation Matrix*

Variable	1	2	3	4	5	6	7	8
Peer Relations (PR)	-							
Teacher-Student Relations (TSR)	−0.150**	-						
Learning Practices (LP)	0.069	−0.067	-					
Diversity & Inclusion (DNI)	0.066	−0.136**	0.125*	-				
Extracurricular Activities	0.088	0.022	0.057	−0.069	-			

(ECSA)								
School Culture (SC)	0.460**	0.386**	0.589**	0.406**	0.360**	-		
Academic Resilience (ARES)	0.126*	−0.040	−0.017	0.091	0.025	0.071	-	
Mathematics Self-Efficacy (MSE)	0.039	0.044	0.014	−0.009	−0.047	0.031	0.134**	-
Academic Motivation (AMOT)	−0.076	0.138**	−0.104*	0.000	−0.052	−0.031	−0.038	0.025

Note: ** p < .05, ** p < .01 (two-tailed)*

Table 6 represents the Pearson correlation coefficients among the study variables. The results show that all dimensions of positive school culture were significantly and positively related to the all school culture construct (r = 0.360–0.589, p < .01), which indicate that these dimensions consistently measured the same construct. Overall, that showed school culture had a weak positive relationship with academic resilience (r = 0.071) and mathematics self-efficacy (r = 0.031), while its relationship with academic motivation was weak and negative (r = −0.031). Among the psychological outcomes, academic resilience showed a small but significant positive relationship with mathematics self-efficacy (r = 0.134, p < .01). The remaining correlations were weak and not statistically meaningful. Overall, the findings indicate that the relationships between school culture and the psychological outcomes were generally weak, which highlight the need for further analysis through multiple regression.

Table 7: *Regression Results for Academic Resilience (H_1)*

Predictor	**B**	**SE**	**β**	**t**	**p**
(Constant)	22.680	3.862	—	5.872	< 0.001
Peer Relations	0.105	0.045	0.118	2.334	0.020*
Teacher-Student Relations	−0.010	0.038	−0.014	−0.270	0.787
Learning Practices	−0.029	0.039	−0.038	−0.753	0.452
Diversity & Inclusion	0.087	0.050	0.088	1.726	0.085
Extracurricular Activities	0.031	0.066	0.023	0.464	0.643

Table 7 presents the Pearson correlation coefficients among the study variables. The dimensions of positive school culture were positively and significantly correlated with the overall school culture construct (r = 0.360–0.589, p < .01). Overall school culture demonstrated weak positive correlations with academic resilience (r = 0.071) and mathematics self-efficacy (r = 0.031),

whereas its correlation with academic motivation was weak and negative (r = −0.031). Among the psychological outcomes, academic resilience was positively associated with mathematics self-efficacy (r = 0.134, p < .01), while the remaining correlations were weak. Overall, these findings indicate limited relationships between positive school culture and the psychological outcomes, highlighting the need for further analysis through regression.

Table 8: *Regression Results for Mathematics Self-Efficacy (H_2)*

Predictor	B	SE	β	t	p
(Constant)	28.916	3.573	—	8.093	< 0.001
Peer Relations	0.042	0.042	0.052	1.013	0.312
Teacher-Student Relations	0.036	0.035	0.053	1.036	0.301
Learning Practices	0.013	0.036	0.018	0.358	0.720
Diversity & Inclusion	−0.010	0.047	−0.011	−0.221	0.825
Extracurricular Activities	−0.066	0.061	−0.055	−1.086	0.278

Table 8 represents the results of the multiple regression analysis examining the influence of the dimensions of positive school culture on academic resilience. The findings indicate that none of the school culture dimensions significantly predicted academic resilience (p > .05). Although peer relations (β = 0.052) and teacher–student relations (β = 0.053) showed weak positive associations with academic resilience, these relationships were not statistically significant. Similarly, learning practices, diversity and inclusion, and extracurricular activities did not demonstrate significant predictive effects. Overall, the results suggest that the dimensions of positive school culture did not significantly explain variations in students' academic resilience in the present study.

Table 9: *Regression Results for Academic Motivation (H_3)*

Predictor	B	SE	β	t	p
(Constant)	35.990	3.378	-	10.653	< 0.001
Peer Relations	−0.038	0.040	−0.049	−0.962	0.337
Teacher-Student Relations	0.085	0.033	0.129	2.557	0.011*
Learning Practices	−0.063	0.034	−0.093	−1.857	0.064
Diversity & Inclusion	0.026	0.044	0.030	0.591	0.555
Extracurricular Activities	−0.049	0.058	−0.043	−0.857	0.392

Table 9 presents the results of the multiple regression analysis examining the influence of the dimensions of positive school culture on academic motivation. The findings indicate that teacher–student relationships were the only significant predictor of academic motivation (β = 0.129, t = 2.557, p = .011), suggesting that more positive teacher–student relationships were associated with higher levels of students' academic motivation. Although peer relations, learning practices, diversity and inclusion, and extracurricular activities showed positive or negative associations with academic motivation, none of these relationships reached statistical significance (p > .05). Overall,

the results highlight the importance of supportive teacher–student relationships in fostering students' motivation toward mathematics learning.

Table 10: *Summary of Hypothesis Testing Results*

Hypothesis	Statement	Result	Key Finding
H_1	Positive school culture → Academic Resilience	Partially supported	PR significant ($\beta = 0.118$, $p = 0.020$); overall model marginally no significant
H_2	Positive school culture → Mathematics Self-Efficacy	Not supported	No significant predictors; $R^2 = 0.007$
H_3	Positive school culture → Academic Motivation	Partially supported	TSR significant ($\beta = 0.129$, $p = 0.011$); LP marginally negative

Table 10 summarizes the results of the hypothesis testing. H_1 was partially supported, as peer relations showed a significant positive influence on academic resilience, although the overall regression model was only marginally significant. H_2 was not supported, and also indicating that positive school culture did not significantly predict mathematics self-efficacy. Moreover, H_3 was partially supported, with teacher-student relationships emerging as a significant positive predictor of academic motivation, while the remaining dimensions of school culture did not show any significant effects.

Discussion

The present study investigated the influence of positive school culture of secondary school students on psychological development in mathematics learning, with particular foucus on academic resilience, mathematics self-efficacy, and the academic motivation. Overall, the findings suggested that positive school culture demonstrated limited direct effects on students' psychological development. While peer relations had a significant positive effect on academic resilience, further the teacher student relationships significantly influenced academic motivation. However, the other dimensions of school culture did not show any significant effects. In addition, positive school culture was not found to be a significant predictor of mathematics self-efficacy. These findings suggest that certain aspects of school culture may have a greater influence on students' psychological development.

The findings suggest that peer relations positively influenced by academic resilience that highlights the importance of supportive interactions among students which help them in cope with academic challenges. The positive peer relationships can provide encouragement, emotional support, and opportunities for collaborative learning, which enable the students to recover from setbacks and remain persist in mathematics learning. Moreover, this finding is consistent with Ungar's (2017) Social Ecological Resilience Theory, which emphasizes that resilience develops through supportive social environments as compare to alone individual characteristics. The result also supports that previous studies which identified peer support as an important contributor to students' resilience and persistence in mathematics (Xenofontos & Mouroutsou, 2023).

The study also stated that teacher student relationships were significantly predicted with academic motivation, and also indicate that students who experience supportive, respectful, and encouraging

relationships with their teachers are more likely to remain motivated in mathematics learning skills. The teachers who provide constructive feedback, encouragement, and emotional support to their students can able to foster students' interest and willingness to engage with mathematical challenging tasks. This finding is also consistent with the Transformative Social and Emotional Learning (T-SEL) framework (CASEL, 2020), which emphasizes that the caring relationships and emotionally supportive learning environments promote students' motivation and engagement. Similarly, the findings as have been reported by Ryan and Deci (2020), who argued that supportive educational environments strengthen students' intrinsic motivation by fulfilling their psychological needs for competence, autonomy, and relatedness.

In contrast, positive school culture did not have a significant effect on mathematics self-efficacy. However, this suggests that students' confidence in learning mathematics may depend on factors which are beyond the general school environment. For instance, the confidence in mathematics learning often develops through successful learning experiences, previous academic achievement, teachers' feedback and encouragement, and students' own learning experiences (Bandura, 1997; Živković et al., 2023). Similarly, learning practices, diversity and inclusion, and extracurricular activities did have a significant influence on students' psychological outcomes in this study. One possible explanation is that differences in school resources, classroom teaching practices, and students' individual experiences may have limited the influence of these aspects of school culture.

Overall, the findings suggest that a positive school culture plays an important role in students' psychological development but not all aspects of school culture that have the same level of influence. Supportive peer relationships and positive teacher student relationships were the most important factors in promoting academic resilience and motivation among secondary school mathematics students. These findings highlight the importance of creating a school environment where students feel supported, respected, and encouraged. At the same time, they suggest that students' confidence in learning mathematics is influenced not only by the school environment but also by other personal and contextual factors.

Conclusion

This study examined the influence of positive school culture on the psychological development of secondary school mathematics students in Quetta, focusing on academic resilience, mathematics self-efficacy, and academic motivation. The findings revealed that positive school culture had a limited overall influence on the psychological factors. Moreover, among the dimensions of school culture, peer relations significantly contributed to students' academic resilience, while teacher and student relationships emerged as a significant predictor of academic motivation. However, positive school culture did not have a significant effect on mathematics self-efficacy. These findings suggest that although a supportive school environment plays an important role, students' interactions with their peers and teachers have a greater influence on their psychological development than the overall school culture. Further the study adds into the existing literature by highlighting the importance of psychological factors in mathematics education, rather than focusing only on academic performance. It also provides useful implications for school leaders and teachers the need to strengthen supportive peer relationships and positive teacher and student relationships to improve students' resilience and motivation. Future studies should consider using longitudinal or mixed-method research designs for better understanding about how the school culture influences students' psychological development over time.

Practical Implications

The findings of this study have several important practical implications for mathematics education. Although positive school culture did not have a strong overall effect on all psychological outcomes, the significant influence of peer relationships and teacher and student relationships shows the importance of creating a supportive school environment. School leaders should encourage a positive and inclusive culture by promoting cooperation, mutual respect, and meaningful interactions among students. Mathematics teachers should build positive and trusting relationships with their students by providing encouragement, constructive feedback, and a supportive classroom environment. These practices can help to improve students' academic motivation. The schools can also introduce mentoring programs, peer learning activities, and professional development programs to help the teachers for better support system of students' psychological well-being as well as their academic learning. Moreover, strengthening these aspects of school culture can help in creating a learning environment where students feel supported, stay motivated, become more resilient, and participate actively participate in mathematics learning, contributing to their overall educational development.

Conflict of Interest

The author(s) declare that there are no conflicts of interest regarding the publication of this study.

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