

PAPER

School Environment and Mental Health among High School Students: Evidence on Association and Regression-Based Explanatory Value from a Study in Da Nang

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ABSTRACT

This study examined emotional and behavioral difficulties among high school students and their perceptions of a mental health-friendly school environment, as well as the association and predictive role of the school environment. A cross-sectional survey was conducted with 400 students in Da Nang, Viet Nam, using the SDQ-25 and a five-dimension school environment scale. The scale showed acceptable reliability and a clear five-factor structure. Students reported relatively positive perceptions of the school environment ($M = 3.77$) and moderate levels of difficulties ($M = 1.06$). The school environment was significantly and negatively associated with emotional and behavioral difficulties ($r = -0.42$, $p < 0.001$) and remained a significant predictor in regression analysis ($\beta = -0.38$, $p < 0.001$). The model explained 21% of the variance. These findings underscore the importance of supportive, non-stigmatizing school environments in promoting student mental health.

KEYWORDS

school environment, student mental health, SDQ-25, emotional and behavioral difficulties, high school students

1 INTRODUCTION

1.1 The importance of adolescent mental health in educational contexts

Adolescent mental health has increasingly been recognized as a critical component of educational quality and overall human development. According to the World Health Organization, mental health is not merely the absence of mental disorders, but also encompasses the capacity to cope with daily stress, learn effectively,

Nhung, H. B. C., Hue, B. T. K., Le, L. T. (2026). School Environment and Mental Health among High School Students: Evidence on Association and Regression-Based Explanatory Value from a Study in Da Nang. *IETI Transactions on Data Analysis and Forecasting (iTDAF)*, 4(2), pp. 48–64. <https://doi.org/10.3991/itdaf.v4i2.61657>

Article submitted 2026-03-23. Revision uploaded 2026-04-28. Final acceptance 2026-04-28.

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and actively participate in society (World Health Organization, 2020) [1]. For high school students, emotional and behavioral difficulties can substantially affect academic performance, peer relationships, school engagement, and long-term psychosocial development. If left unaddressed, these difficulties may persist into adulthood and increase the risk of more severe mental health conditions [2].

1.2 Adolescent mental health in Viet Nam: prevalence and service gaps

In Viet Nam, adolescent mental health has become an issue of growing concern in recent years. Findings from the Viet Nam Adolescent Mental Health Survey (V-NAMHS, 2023) indicate that approximately 21.7% of adolescents experienced at least one mental health problem within a 12-month period, yet only a small proportion (8.4%) accessed professional support services [3]. Similarly, reports from UNICEF Viet Nam highlight a substantial gap between the demand for mental health care and the availability and accessibility of services for children and adolescents [4].

This mismatch reflects structural limitations in school-based mental health systems, including insufficient trained personnel, limited integration of mental health into educational practice, and persistent stigma associated with psychological difficulties. As a result, many students remain underserved despite clear and increasing needs.

1.3 The role of the school environment in student mental health

A growing body of international research emphasizes schools as a key setting for mental health promotion, prevention, and early intervention [5]. Whole-school approaches and social-emotional learning frameworks have been widely recommended as effective strategies for embedding mental health support into daily educational practices [6], [7]. From this perspective, the school environment extends beyond physical infrastructure to include a constellation of psychological, social, and organizational dimensions.

Specifically, a mental health-friendly school environment may include: (1) a sense of safety; (2) norms of respect and non-stigmatization; (3) supportive relationships with teachers and school staff; (4) opportunities for positive development and student participation; and (5) awareness of and positive attitudes toward mental health. These dimensions are increasingly recognized as protective factors that can buffer against emotional and behavioral difficulties and foster resilience among students [7], [8].

1.4 Research gaps in the Vietnamese context

Despite the growing recognition of school-based mental health, empirical research in Viet Nam remains limited in several important respects. First, existing studies have primarily focused on describing the prevalence of mental health problems or examining individual-level factors, such as stress, anxiety, or academic pressure [9], [10]. Second, there is a lack of studies that conceptualize and measure the school environment as a multidimensional construct using validated instruments. Third, few studies have systematically examined both the association between school environment and students' emotional and behavioral outcomes and the statistical contribution of school environment in multivariable regression models.

These limitations are also evident in Da Nang City, where research on student mental health has not yet fully captured the interaction between environmental and individual factors. Consequently, there is insufficient evidence to inform school-level interventions and local education policies aimed at improving student mental health.

1.5 Conceptual framework

This study adopts an integrated conceptual framework drawing on ecological and school-based mental health perspectives. The school environment is conceptualized as a multidimensional construct comprising five domains: safety, respect and non-stigmatization, teacher and school support, opportunities for positive development, and mental health awareness and attitudes. Within this framework, the study examines whether students’ perceptions of a more positive school environment are associated with lower levels of emotional and behavioral difficulties. The framework also guides the regression analysis, in which school environment is treated as the main explanatory variable, SDQ-25 score as the outcome variable, and gender, grade level, and school as control variables. This approach supports the preliminary validation of a context-specific school environment scale and the examination of both association and regression-based predictive value in the Vietnamese high school context.

The analytical framework of this study integrates conceptual and methodological components to examine both the association between school environment and students’ mental health outcomes and the regression-based predictive value of school environment. In this framework, school environment is operationalized as a multidimensional construct measured through five domains and preliminarily validated through exploratory factor analysis (EFA) and reliability testing, while emotional and behavioral difficulties serve as the outcome variable. The analysis includes descriptive statistics, group comparisons, correlation analysis, and multi-variable regression. In the regression model, school environment is treated as the main explanatory variable, while gender, grade level, and school are included as control variables. This framework allows for a comprehensive examination of both the strength of associations and the statistical contribution of school environment to students’ emotional and behavioral difficulties. (see Figure 1).

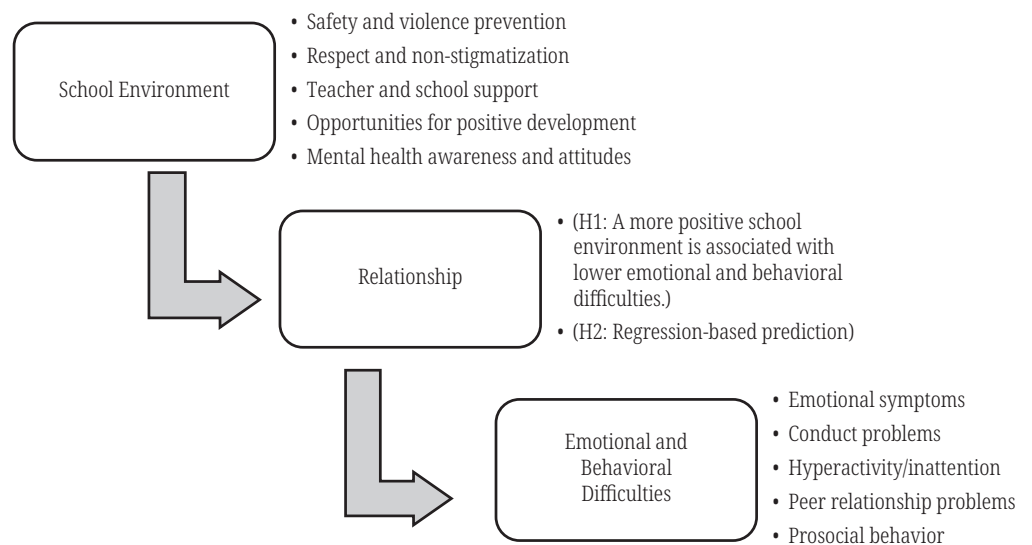


Fig. 1. Conceptual framework illustrating the association between school environment and emotional and behavioral difficulties, and the regression-based predictive value of school environment in the study model

1.6 Research objectives and questions

In response to these gaps, the present study aims to:

- Describe high school students' perceptions of a mental health-friendly school environment;
- Assess the level of emotional and behavioral difficulties;
- Examine the association between the school environment and students' emotional and behavioral difficulties;
- Analyze the statistical contribution of the school environment in explaining students' mental health outcomes in a multivariable regression model.

Based on these objectives, the study addresses the following research questions:

- How do high school students perceive the mental health-related characteristics of their school environment?
- What is the level of emotional and behavioral difficulties among students?
- Is there a significant relationship between the school environment and students' mental health?
- To what extent does the school environment remain statistically significant in explaining emotional and behavioral difficulties when controlling for relevant factors?

1.7 Study contribution

This study contributes to the literature in three main ways. First, it develops and preliminarily validates a context-specific, multidimensional scale of a mental health-friendly school environment for high school students in Da Nang, Viet Nam. The scale captures five key domains, including safety, respect and non-stigmatization, teacher and school support, opportunities for positive development, and mental health awareness and attitudes, and demonstrates acceptable reliability and exploratory structural validity. Second, the study simultaneously examines both the association between school environment and emotional and behavioral difficulties and the statistical predictive value of school environment in a multivariable regression model controlling for relevant background factors. Third, the study provides empirical evidence from a low- and middle-income country context, where school-based mental health research remains relatively limited, thereby contributing contextually grounded findings to the international literature on adolescent mental health and school environment.

2 METHODOLOGY

2.1 Data collection

This study employed a cross-sectional descriptive design to examine the current status and the relationship between the school environment and the emotional and behavioral difficulties of high school students.

The study participants were 400 students enrolled in three high schools in Da Nang City. The schools were selected to reflect the diversity of educational contexts in the locality. To ensure research ethics and data confidentiality, the names of the participating schools are not disclosed in this paper. Students were selected using cluster sampling by class, ensuring a relatively representative distribution across Grades 10, 11, and 12 (see Table 1).

Before participating in the survey, all students were provided with information about the purpose of the study, their right to participate voluntarily, their right to refuse or withdraw at any time, and the assurance of anonymity and data confidentiality.

Table 1. Characteristics of the participants

Characteristic	Frequency (n)	Percentage (%)
Gender		
Male	160	40.0%
Female	240	60.0%
Grade Level		
Grade 10	110	27.5%
Grade 11	191	47.8%
Grade 12	99	24.8%
School		
School 1	105	26.3%
School 2	151	37.8%
School 3	144	36.0%
Total	400	100.0%

The study sample was drawn from three high schools in Da Nang City, Viet Nam. The distribution of participants across the schools was relatively balanced, which contributed to the comparability of groups in the analysis. Female students accounted for a higher proportion than male students, Grade 11 students represented the largest subgroup, and the three participating schools were represented in relatively similar proportions. This distribution helped support comparative analyses across groups while also reflecting, to some extent, the diversity of high school students in the context of Da Nang City.

2.2 Measurements

The study employed a cross-sectional descriptive and analytical design. Data were collected through a self-administered online questionnaire consisting of two main parts: (1) the Mental Health-Friendly School Environment Scale and (2) the 25-item Strengths and Difficulties Questionnaire (SDQ-25).

Mental health-friendly school environment scale. The school environment scale was developed based on the whole-school approach and the guidance on safe, friendly, and gender-responsive schools issued by Plan International Viet Nam

(Plan International Viet Nam, 2022) [11]. This approach is also aligned with regional frameworks such as the Happy Schools model developed by UNESCO [7], [8]. The version used in this study reflects five components: (i) safety and violence prevention; (ii) respect, equality, and interpersonal conduct, together with support from teachers and the school; (iii) the learning environment and positive development; (iv) awareness of mental health; and (v) attitudes toward mental health. The items were rated on a 5-point Likert scale, with higher scores indicating more positive perceptions of the school environment. In the present study, this scale was subjected to preliminary psychometric evaluation through internal consistency analysis and EFA in order to examine its suitability for use in the Vietnamese high school context.

The 25-item strengths and difficulties questionnaire (SDQ-25). The SDQ-25, developed by Goodman (Goodman, 1997), is a widely used screening instrument for child and adolescent mental health [12]. The scale consists of 25 items divided into five subscales: emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems, and prosocial behavior. In this study, the SDQ-25 was used as an indicator of students' emotional and behavioral difficulties.

The SDQ has demonstrated reliability and validity across diverse cultural contexts, including Vietnam (Nguyen and Tran, 2021; Xu, 2020) [13], [14]. One important reason for choosing the SDQ-25 is its effectiveness in measuring adolescents' psychological issues, while also having the ability to detect early signs of mental health problems, thus providing the necessary information for early intervention (Xu, 2020) [14].

2.3 Data analysis

Scale validation. As the Mental Health-Friendly School Environment Scale was newly developed for this study, a preliminary validation procedure was conducted using SPSS. This procedure included assessment of internal consistency using Cronbach's alpha and EFA to examine the underlying factor structure of the scale. These analyses were intended to provide initial evidence regarding the reliability and exploratory structural validity of the instrument before its use in subsequent analyses.

Table 2. Reliability and factor structure of the mental health-friendly school environment scale

Factor Group	Initial Number of Items	Item Status	Final Number of Items	Cronbach's Alpha
APB	5	Retained	5	0.789
TBU	5	Retained	5	0.721
HGN	7	1 item removed	6	0.913
MHP	5	1 item removed	4	0.841
NTS	5	Retained	5	0.825

Notes: APB = Safety and violence prevention; TBU = Respect, equality, and interpersonal conduct; HGN = Support from teachers and the school; MHP = Learning environment and positive development; NTS = Mental health awareness and attitudes.

The findings on reliability testing indicated that the Mental Health-Friendly School Environment Scale demonstrated good psychometric quality and was suitable for use in the study. Specifically, the Cronbach’s alpha coefficients for all factor groups reached acceptable thresholds for research in the social sciences and education, ranging from 0.721 to 0.913. Among them, the HGN factor showed the highest reliability ($\alpha = 0.913$), followed by MHP ($\alpha = 0.841$), NTS ($\alpha = 0.825$), APB ($\alpha = 0.789$), and TBU ($\alpha = 0.721$). These results indicate that the reliability of the factor groups was not entirely uniform; however, overall, all groups demonstrated the internal consistency required for further analysis. With regard to the factor structure, the results of EFA showed that the KMO value was 0.924, and Bartlett’s test was statistically significant (Sig. < 0.001). Five factors were extracted, accounting for a total explained variance of 65.001%. Thus, the Mental Health-Friendly School Environment Scale demonstrated acceptable internal consistency and preliminary evidence of exploratory structural validity for use in the present study (see Table 2).

Table 3. EFA indices for the overall scale

Index	Value
KMO	0.924
Bartlett’s Test (Approx. Chi-Square)	5142.730
df	276
<i>p</i>	< 0.001
Number of factors extracted	5
Cumulative explained variance	65.001%

The exploratory factor analysis provided preliminary support for the proposed factor structure of the scale. The KMO value of 0.924 indicated that the data were highly suitable for factor analysis, while Bartlett’s test was statistically significant ($p < 0.001$), demonstrating that the observed variables were sufficiently correlated to form underlying factors. The five-factor model explained 65.001% of the cumulative variance, suggesting that the proposed conceptual structure was able to reflect students’ perceptions of the school environment relatively well (refer to Table 3).

This finding is important because it provides preliminary empirical support for the use of the scale in subsequent analyses but also suggests the potential applicability of this instrument in future research or in local monitoring and evaluation activities related to the school environment.

Descriptive statistics and group comparisons. Descriptive statistics were used to identify the characteristics of the sample and the mean levels of the variables. Independent-samples t-tests were conducted to examine differences by gender, and one-way analysis of variance (ANOVA) was used to compare differences across grade levels and schools. The threshold for statistical significance was set at $p < 0.05$.

Correlation analysis. To clarify the relationship between the school environment and students’ emotional and behavioral difficulties, Pearson correlation analysis was conducted to assess the strength and direction of the associations between variables.

Correlation coefficients were interpreted according to the following levels: weak ($|r| < 0.3$), moderate ($0.3 \leq |r| < 0.5$), and strong ($|r| \geq 0.5$).

Multivariable regression analysis. Multivariable linear regression analysis was conducted to examine the statistical contribution of the school environment to emotional and behavioral difficulties, as measured by the SDQ-25. In the regression model, the SDQ-25 score was used as the dependent variable, while the independent variables included the total score of the school environment scale, gender (coded as male = 1, female = 0), and school (entered as dummy variables). The assumptions of the regression model, including linearity, normal distribution of residuals, and multicollinearity, were examined before interpreting the results.

3 RESULTS

3.1 Students' perceptions of the school environment and their emotional and behavioral difficulties

Table 4. Mean scores for perceived school environment by sample characteristics

Variable	Comparison Group	School Environment Score (M ± SD)	p
Overall Sample		3.7729 ± 0.59279	
Gender	Male	3.7490 ± 0.61854	0.547
	Female	3.7888 ± 0.57587	
Grade Level	Grade 10	3.6992 ± 0.60378	0.091
	Grade 11	3.8287 ± 0.57698	
	Grade 12	3.7438 ± 0.60583	
School	School 1	3.8185 ± 0.60733	0.351
	School 2	3.7228 ± 0.57868	
	School 3	3.7856 ± 0.59371	

The survey findings showed that students generally held fairly positive perceptions of a mental health-friendly school environment. The overall mean score of the school environment scale was 3.7729 ± 0.59279 , indicating that most students perceived their schools as relatively safe, supportive, and conducive to positive development. When examined across individual and school-related characteristics, the mean school environment scores varied to some extent by gender, grade level, and school; however, these differences did not reach statistical significance. Specifically, female students tended to rate the school environment more positively than male students, although the difference was small. Across grade levels, Grade 11 students had a higher mean score than the other two grades. Across schools, the mean scores differed somewhat among the three participating schools, but the differences were not sufficient to indicate statistically significant variation. These findings suggest that students' perceptions of the school environment in this study were relatively consistent across groups, while also indicating that, at a general level, the schools appeared to have established an environment that students generally perceived positively (refer to Table 4).

3.2 Emotional and behavioral difficulties among students

Table 5. Mean SDQ-25 scores by sample characteristics

Variable	Comparison Group	SDQ-25 (M ± SD)	p
Overall Sample		1.0591 ± 0.30552	
Gender	Male	1.1008 ± 0.33897	0.032
	Female	1.0313 ± 0.29424	
Grade Level	Grade 10	1.0731 ± 0.31414	0.771
	Grade 11	1.0523 ± 0.30066	
	Grade 12	1.0586 ± 0.30722	
School	School 1	0.9851 ± 0.26708	0.014
	School 2	1.0906 ± 0.31335	
	School 3	1.0800 ± 0.31634	

Note: p < 0.05.

The survey findings indicated that students in the study sample exhibited emotional and behavioral difficulties to a certain extent. The overall mean score on the SDQ-25 was 1.0591 ± 0.30552 , suggesting that, in school life, students still reported difficulties related to emotions, behavior, concentration, and peer relationships. Although this mean score does not indicate a prominent level of disturbance on a broad scale, it nevertheless suggests that students’ mental health is an issue that warrants attention in the school context. When analyzed by group characteristics, the results showed that SDQ-25 scores differed to some extent by gender and across schools, while varying less across grade levels. Specifically, male students had a higher mean SDQ-25 score than female students, and differences in mean scores were also observed across schools. In contrast, students in Grades 10, 11, and 12 showed relatively similar score levels (see Table 5).

Overall, these findings suggest that students’ emotional and behavioral difficulties were not distributed entirely evenly but tended to be more pronounced among male students and in certain school contexts.

3.3 Comparison of emotional and behavioral difficulties across student groups

Based on Table 5, the comparative analysis confirmed that differences in emotional and behavioral difficulties across student groups were not only descriptive but also statistically significant. Specifically, male students had higher SDQ-25 scores than female students, and this difference reached statistical significance ($p = 0.032$). In addition, SDQ-25 scores differed significantly across schools ($p = 0.014$), whereas no significant differences were found across grade levels. Although the mean differences between groups were not large, they were statistically significant, indicating that emotional and behavioral difficulties were not distributed evenly across all student groups in the study sample.

3.4 Students' needs for mental health support in schools

Table 6. Students' needs for school-based mental health support activities

No.	Response Category	Frequency (n)	Percentage (%)
1	Strongly disagree	20	5.0%
2	Disagree	15	3.8%
3	Undecided	83	20.8%
4	Agree	194	48.5%
5	Strongly agree	88	22.0%
Total		400	100.0%

The survey results on the need for mental health care indicated that students showed a fairly clear need for support activities within the school setting (Table 6). Specifically, 70.5% of students selected either Agree or Strongly agree in response to whether the school should increase mental health care activities, whereas only 8.8% reported no such need. These findings indicate that most students recognized the importance of mental health support and expressed a need for greater school-based attention to this issue.

3.5 Students' suggestions for supportive interventions

Table 7. Students' suggestions for supportive interventions

No.	Suggested Intervention	Frequency (n)	Percentage (%)
1	Reduce homework and test pressure	271	67.9%
2	Increase extracurricular activities to help relieve stress	259	64.9%
3	Upgrade/expand the school counseling room	122	30.6%
4	Organize thematic sessions on emotion regulation and stress coping	126	31.6%
5	Train teachers to better understand student psychology	175	43.9%
6	Establish clear procedures to support students in crisis	141	35.3%
7	Create a relaxation corner at school	205	51.4%
8	Develop an anonymous online counseling channel	129	32.3%
9	Other	9	2.3%

The survey findings on supportive interventions showed that students' priorities were concentrated in three main areas. First, there was a clear need to reduce academic pressure, with the most frequently selected intervention being the reduction of homework and tests (67.9%). This was the highest proportion among the proposed options, reflecting that academic pressure was one of the major concerns reported by students. Second, students expressed a need for greater opportunities for psychological recovery, as reflected in their preference for extracurricular activities (64.9%) and relaxation spaces at school (51.4%). Third, students indicated a need to strengthen the school-based support system, including training teachers to better understand student psychology (43.9%), establishing clear crisis-support procedures (35.3%), and developing

anonymous counseling options (32.3%) (see Table 7). In addition to the quantitative data, students’ qualitative responses also highlighted the need to be listened to, to have a safe space to share concerns, and to receive practical support from the school.

3.6 Association between the school environment and emotional and behavioral difficulties

Correlations between the school environment and emotional and behavioral difficulties.

Table 8. Correlation matrix of the study variables

Variable	1	2	3	4	5	6
1. School environment (total)	—					
2. APB	0.72***	—				
3. TBU	0.69***	0.58***	—			
4. HGN	0.81***	0.62***	0.65***	—		
5. MPH	0.75***	0.59***	0.61***	0.68***	—	
6. NTS	0.64***	0.51***	0.49***	0.56***	—	
7. SDQ-25	-0.42***	-0.35***	-0.30**	-0.45***	-0.28**	—

Notes: APB = Safety and violence prevention; TBU = Respect, equality, and interpersonal conduct; HGN = Support from teachers and the school; MPH = Learning environment and positive development; NTS = Mental health awareness and attitudes. **p < 0.01; ***p < 0.001.

The correlation analysis presented in Table 8 showed that school environment and emotional and behavioral difficulties were negatively related. Specifically, the total school environment score was negatively correlated with the SDQ-25 score ($r = -0.42, p < 0.001$), indicating that students who perceived the school environment more positively tended to report lower levels of emotional and behavioral difficulties. At the level of specific components, support from teachers and the school showed the strongest correlation with SDQ-25 ($r = -0.45$), followed by school safety ($r = -0.35$), while the remaining factors also showed negative correlations.

Among the specific components, support from teachers and the school showed the strongest correlation with SDQ-25 ($r = -0.45$), followed by safety ($r = -0.35$) and learning environment and positive development (MHP) ($r = -0.33$), while the remaining factors also showed negative correlations.

Regression analysis predicting emotional and behavioral difficulties.

Table 9. Results of the linear regression analysis predicting SDQ-25 scores

Independent Variable	B	SE	(β)	t	p
Constant	1.842	0.121	—	15.23	< 0.001
School environment (total)	-0.214	0.031	-0.38	-6.90	< 0.001
Gender (Male = 1)	0.087	0.034	0.15	2.53	0.012
School (reference: School 1)					
School 2	0.076	0.036	0.12	2.11	0.036
School 3	0.069	0.035	0.11	1.97	0.049

The regression results presented in Table 9 showed that the study model was statistically significant ($p < 0.001$) and explained 21% of the variance in SDQ-25 scores ($R^2 = 0.21$). The school environment showed a statistically significant negative association with SDQ-25 scores in the regression model ($\beta = -0.38$, $p < 0.001$), indicating that students who perceived the school environment more positively tended to report fewer emotional and behavioral difficulties. Among the predictors included in the model, school environment was the strongest. In addition, gender was also a significant predictor ($\beta = 0.15$, $p = 0.012$), suggesting that male students reported higher levels of emotional and behavioral difficulties than female students in the present sample. The school variable also showed significant effects in some groups, suggesting that school context may be related to differences in students' psychological difficulties. However, the model explained only part of the variance in SDQ-25 scores, indicating that student mental health is likely shaped by multiple factors beyond school environment alone.

The regression findings are important because they show that the school environment remained a statistically significant predictor of emotional and behavioral difficulties even after selected background variables were controlled for. At the same time, the value of $R^2 = 0.21$ indicates that the model accounted for only part of the variance in the dependent variable. This suggests that, in addition to school environment, students' mental health may also be influenced by other factors not included in the present model, such as family circumstances, peer relationships, academic pressure, or individual characteristics.

4 DISCUSSION

The findings of this study support the usefulness of approaching the school environment as a multidimensional construct in relation to student mental health. The five-domain Mental Health-Friendly School Environment Scale provides preliminary evidence for a context-specific instrument that may be useful for examining school environment in the Vietnamese high school context. At the same time, the measurement evidence should be interpreted with caution, as the validation of the scale remains preliminary.

Students generally perceived the school environment relatively positively, and these perceptions did not differ significantly by gender, grade level, or school. However, emotional and behavioral difficulties were still present to a certain extent, suggesting that a positive school environment, although important, is not sufficient by itself to eliminate psychological difficulties. This interpretation is broadly consistent with previous research indicating that school climate may serve as a protective context, while student mental health is also shaped by multiple academic, social, and developmental pressures [2], [5].

The findings also showed differences in emotional and behavioral difficulties according to gender and school, whereas no significant differences were found across grade levels. Male students tended to report higher SDQ-25 scores, which may reflect differences in behavioral expression, emotional regulation, or help-seeking patterns. The absence of grade-level differences suggests that emotional and behavioral difficulties may occur across the high school years rather than being concentrated in a single grade. By contrast, differences across schools point to the importance of school-level context, suggesting that institutional climate, support practices, and relational norms may shape student well-being in different ways [5], [10].

Students' needs for mental health care activities were clear, with priorities focusing on reducing academic pressure, increasing extracurricular activities, and improving

support from teachers. This indicates that effective interventions need to be closely linked to students' everyday school experiences, rather than being limited to isolated counseling activities. In particular, the correlation and regression results provide empirical evidence that the school environment is associated with emotional and behavioral difficulties and remains statistically significant in the regression model. Even after controlling for individual and contextual factors, the school environment remained a statistically significant predictor of emotional and behavioral difficulties, indicating that it is an important point of intervention in educational practice. However, because the model explained only 21% of the variance in SDQ-25 scores, this finding should be interpreted as showing that school environment is one meaningful factor among several that may shape student mental health.

An important implication of this finding is that the school environment should not be viewed merely as a contextual background but as a meaningful explanatory factor in students' emotional and behavioral adjustment. The fact that the school environment remained statistically significant even after controlling for relevant variables strengthens the argument that school-based conditions are closely linked to student mental health. Several possible mechanisms may help explain this relationship. First, a safe, respectful, and non-stigmatizing school environment may enhance students' sense of emotional safety, thereby reducing daily stress and psychological vulnerability. Second, supportive school climates may encourage help-seeking behavior by making students feel more comfortable sharing difficulties and accessing support from teachers or school-based services. Third, the quality of student-teacher relationships may play an important role, as positive and trusting relationships can strengthen students' sense of belonging, emotional regulation, and coping capacity. Although the cross-sectional design does not permit causal conclusions, these findings suggest that improving the school environment may be an important direction for promoting student mental health in practice.

Based on these findings, interventions should be developed according to three main directions: (i) they should be grounded in empirical evidence; (ii) they should be appropriate to the practical conditions of schools; and (iii) they should be implemented using a whole-school approach. Accordingly, priority should be given to improving school-based support procedures, reducing academic pressure, strengthening psychological support activities integrated into teaching and learning, enhancing teachers' capacities, and expanding student participation. At the same time, coordination among schools, families, and external support services should be strengthened in order to build a multi-tiered support network. Overall, the findings suggest that the school environment is not merely a contextual condition, but also a potential target for school-based mental health intervention. Building a school environment that is safe, respectful, and supportive should therefore be regarded as an essential part of strategies to improve educational quality at the high school level.

5 STUDY LIMITATIONS

The cross-sectional design, together with the use of student self-report data, means that the present study does not allow causal conclusions to be drawn regarding the relationship between the school environment and emotional and behavioral difficulties. The findings are therefore primarily limited to describing the current situation, assessing the reliability and preliminary validity of the scale, and examining differences across student groups. In addition, because all data were collected through self-report from the same respondents at a single time point, the study

may be subject to common method bias, which could have inflated the observed associations among variables.

At the same time, although the school environment scale showed acceptable reliability and preliminary structural validity, some micro-level factors specific to individual schools or classrooms may not have been fully captured by the questionnaire. In addition, the validation of the Mental Health-Friendly School Environment Scale remains preliminary. Although the scale demonstrated acceptable internal consistency and exploratory structural validity, confirmatory factor analysis (CFA) was not conducted, and additional tests of construct validity, including convergent validity and discriminant validity, were not performed. Therefore, the scale should be interpreted as having initial psychometric support within the present sample rather than as a fully validated measurement instrument. Accordingly, the findings should be interpreted primarily as identifying contextual patterns and suggesting intervention priorities, rather than as confirming direct mechanisms of influence.

In addition, the regression model included only a limited set of control variables; therefore, the observed association between school environment and SDQ-25 scores should be interpreted with caution, as other relevant individual, family, and peer-level factors were not included. Variables such as socioeconomic status, family context, academic stress, and peer relationships may also play an important role in shaping students' emotional and behavioral difficulties. Furthermore, the study sample included students from only three high schools in Da Nang City; therefore, the generalizability of the findings to other localities remains limited. In the future, additional qualitative data sources such as in-depth interviews and classroom observations should be incorporated. Further correlation analyses, multivariable regression analyses, or longitudinal studies should also be conducted in order to clarify more fully the relationships between the different components of the school environment and students' emotional and behavioral difficulties.

6 CONCLUSION

Based on the systematization of the theoretical foundation and the review of previous studies related to high school students' mental health and a mental health-friendly school environment, this study was conducted with 400 students from three high schools in Da Nang City. The results showed that the school environment scale used in the study demonstrated acceptable preliminary psychometric support, with Cronbach's alpha coefficients ranging from 0.721 to 0.913 and a five-factor structure supported by exploratory factor analysis. These findings suggest that the measurement instrument has acceptable preliminary psychometric support and may be useful for reflecting students' perceptions of the school environment in relation to mental health in the present context.

The survey findings also indicated that students generally evaluated the school environment as fairly positive. However, data from the SDQ-25 showed that certain emotional and behavioral difficulties were still present among students. The study did not identify statistically significant differences in school environment scores according to gender, grade level, or school, but it did show that SDQ-25 scores differed by gender and by school. Specifically, male students tended to exhibit higher levels of emotional and behavioral difficulties than female students, and students in some schools had higher SDQ-25 scores than those in the remaining schools. These findings suggest that the school environment is a meaningful contextual factor related to

students' mental health, while also indicating that the level of psychological difficulties is not distributed entirely evenly across student groups and school settings.

In addition, the set of questions on needs, suggestions, and directions for intervention showed that students had relatively clear needs for better mental health support within the school setting. Based on the research findings, the study proposes a system of interventions following a whole-school approach, including: improving school-based psychological support procedures; enhancing teachers' capacity to identify and provide initial support for students with emotional and behavioral difficulties; strengthening communication, social-emotional education, and students' active participation; promoting coordination among the school, family, and community; and establishing mechanisms for periodic assessment and monitoring of the school environment and students' psychological difficulties. These interventions were developed on the basis of empirical findings, in alignment with the context of high schools in Da Nang, and with attention to implementation feasibility.

From these findings, it may be recommended that schools view student mental health as a component of overall educational quality and, accordingly, proactively integrate psychological support activities into educational management and school organization. For educational authorities, greater attention should be paid to professional support, staff training, and the gradual standardization of tools for monitoring a mental health-friendly school environment. For future research, it is necessary to expand the scope of the sample and to incorporate more in-depth analyses, such as correlation, regression, or longitudinal studies, in order to clarify further the relationship and regression-based explanatory value between the school environment and students' emotional and behavioral difficulties, thereby enhancing both the scientific value and the practical applicability of the research findings.

7 NOTES

7.1 Conflicts of interest

The author(s) declare(s) **no conflicts** of interest to report regarding the present study.

7.2 Funding statement

This study received no external funding.

7.3 Acknowledgements

None.

7.4 Ethics approval

The research team adhered strictly to the principles of the Declaration of Helsinki (World Medical Association, 2013) and the UNICEF/UNESCO Ethical Research Involving Children (ERIC) guidelines.

7.5 Author contributions

Conceptualization, Hoang Bui Cam Nhung; Methodology, Hoang Bui Cam Nhung; Data analysis, Bui Thi Kim Hue; Writing original draft, Hoang Bui Cam Nhung; Writing review and editing, Lam Thi Le. All authors have read and approved the final manuscript.

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