Original Article

Does school climate affect student well-being? Anxiety in school situations as a predictor of stress in high-school students

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Abstract:

BACKGROUND: When the school climate is not ideal and coping skills for school situations are not strengthened in adolescents, school anxiety and stress may be manifested, potentially harming development and mental health during adulthood. This study aimed to analyze the predictive ability of school anxiety on elevated levels of stress in high-school students.

MATERIALS AND METHODS: This cross-sectional predictive study was conducted with 1588 students aged 12–18 (M = 14.82; SD = 1.86) years in 2023. The School Anxiety Inventory (SAI) and the Depression, Anxiety, and Stress Scale (DASS-21) were administered to the participants. An inferential data analysis method was applied. Specifically, binary logistic regression was used for data analysis. The influence of school anxiety on stress was examined using the odds ratio statistic.

RESULTS: The total score on school anxiety (OR = 1.02), the situational factors: anxiety about aggression (OR = 1.03), anxiety regarding social evaluation (OR = 1.02), anxiety about failure and school punishment (OR = 1.03), and anxiety about school evaluation (OR = 1.04), as well as the response systems: cognitive (OR = 1.04), behavioral (OR = 1.08), and psychophysiological (OR = 1.04), positively and significantly ($P = 0.000$) influenced the high scores on stress.

CONCLUSION: The results demonstrate the need to detect school anxiety in adolescents at an early state to intervene in both anxiety-provoking situations and responses and in the resulting high stress. Similarly, schools should promote mental health work and self-regulation to prepare students for adult life.

Keywords:

Adolescence, predictive ability, school anxiety, stress

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Introduction

The adolescent life phase is a critical period in psychosocial development.[1] Given that much of this phase takes place within the school setting, the quality of the school situations (i.e. the school climate) and the skills necessary to take on these situations (e.g. academic demands, relations between peers and student-teacher relations) are highly influential on the wellbeing of these students aged 10–19 years. Symptoms of stress and anxiety may appear, affecting the adolescent's development and mental health in adulthood.[2-4] Anxiety is an emotional response to excess intensity that may arise when anticipating risk situations that lack objectivity. Stress, on the contrary, is the activation of physiological processes given the inability to confront environmental demands.[5]

Regarding the delimitation of anxiety and stress when taking place specifically in the

educational field, school anxiety is considered to be the set of cognitive, psychophysiological, and behavioral student responses manifested when perceiving certain school-related situations as potentially dangerous.[6] In the adolescent population, these anxiety-producing school situations tend to refer to aggression, social and academic evaluation, and school failure and punishment.[7] Furthermore, anxious students may develop other issues such as school refusal behavior,[8] maladaptive perfectionism,[9] and depression.[10]

Regarding academic stress, affected students experience a physiological reaction when noticing academic failure or low competence.[11] Predominating risk factors regarding the appearance of academic stress in adolescents include those related to excess homework, exam taking, and uncertainty about the academic future, and, to a lesser degree, those referring to studying or completing schoolwork.[12] When these factors lead to high levels of academic stress in the adolescent, psychological disorders such as depression or suicidal tendencies may arise.[13]

According to the scientific literature, past studies have analyzed the relationship between anxiety and stress in the adolescent population. Al-Gelban[14] found positive and statistically significant correlations between both constructs, considering a sample of 1723 male Saudi Arabian adolescents aged 15–19 (M = 16.8, SD = 1.3) years. Bhasin *et al.*[15] recruited 242 adolescents aged 13–18 (M = 15, SD = 1.1) years from India and also found positive significant correlations between anxiety and stress. Other studies have also specifically examined the relationship between school anxiety and academic stress, all of which have found positive and statistically significant correlations between both variables. Specifically, Scrimin *et al.*[16] found this association in a sample made up of 205 Italian students aged 9–12 (M = 10.70, SD = 1.25) years. Subsequently, Scrimin *et al.*[17] found this result in an Italian sample of 61 students aged 13–14 (M = 13.31, SD = 0.47) years. Finally, Fernández-Sogorb *et al.*[18] identified this relationship in 756 Spanish students aged 8–11 (M = 9.6, SD = 1.12) years and also verified the existence of anxiety profiles and their differences in levels of academic stress. In socialization situations, students with a high overall anxiety profile and anxiety in the school setting displayed significantly higher levels of stress in peer interactions as compared to the profile of students with high anxiety about school performance.

Although anxiety and stress in the school environment are associated with various psychoeducational variables and psychological disorders and the co-occurrence of these constructs negatively influences the adolescent's preparation for adult life, previous research has only revealed a positive and significant relationship between the two variables; the influence of one on the other remains unknown. To bridge the evidence gap, this research focused on how the multidimensionality of school anxiety (i.e., school situations that are a threat for students and anxious response systems) influences the appearance of the physiological stress response during adolescence. As another novelty of this research, the influence of the multidimensionality of school anxiety on the physiological stress response was studied in Ecuadorian adolescents due to the concerning learning difficulties and developmental disorders that they manifest. Specifically, the purpose of the present study was to analyze the predictive ability of situations related to school anxiety and response systems on high stress scores in a sample of Ecuadorian adolescents. Given past scientific findings suggesting a positive and significant correlation between anxiety and stress[14,15] and school anxiety and academic stress[16-18] in adolescents, it was expected that both the total score and the feared school situations and the response systems of the school anxiety variable would positively and significantly influence high stress levels.

Materials and Methods

Study design and setting
This cross-sectional predictive study was developed from January to February 2023 among adolescents studying from eighth grade to the third year of BAC. The research was conducted in selected secondary schools in the city of Quito (Ecuador).

Study participants and sampling
The sample selection process was conducted using random cluster sampling in the city of Quito. Five geographical areas of the city were considered (north, south, east, west, and central), randomly selecting one or two schools from each area. Next, students were also randomly selected for participation in the study. The sample initially consisted of 1725 students from eighth graders to third-year high school students in eight schools. Immediately afterward, 137 students were eliminated due to errors in their answers or a lack of informed parental consent.

Data collection tool and technique
The School Anxiety Inventory (SAI)[19] is a self-report measure permitting the assessment of the degree of school anxiety in adolescents aged 12–18 years. It consists of 25 items related to school situations, distributed among four factors: anxiety about aggression, anxiety about social evaluation, anxiety about school failure and punishment, and anxiety about school evaluation. Each situational item has 19 potential responses organized into three independent scales: cognitive anxiety, behavioral

anxiety, and psychophysiological anxiety. The SAI also offers the possibility of obtaining a total school anxiety score. Students are asked to rate the response for each school situation by using a 5-point Likert-like scale (0: never; 4: always). The SAI was reported to be reliable. Specifically, coefficients of internal consistency (Cronbach's alpha) were adequate for the three response systems: between 0.97 (cognitive anxiety and behavioral anxiety) and 0.98 (psychophysiological anxiety), and for the test-retest reliability coefficients for a 4-week interval: between 0.79 (psychophysiological anxiety) and 0.82 (behavioral anxiety).[19] In the present study, the SAI also obtained adequate Cronbach's alpha coefficients of 0.96 (total score of the SAI), 0.93 (anxiety about social evaluation), 0.92 (anxiety about school failure and punishment and anxiety about aggression), 0.88 (anxiety about school evaluation), 0.86 (cognitive anxiety), 0.86 (psychophysiological anxiety), and 0.82 (behavioral anxiety).

Depression, Anxiety, and Stress Scales (DASS-21)[20] is a self-report measure that assesses the manifestation of symptoms of depression, anxiety, and stress. Each construct is evaluated in a factor of seven items, resulting in a total of 21 items included in the DASS-21, distributed across three factors. The subject must indicate in which grade he/she experienced the symptoms during the first week by using a 4-point Likert-like response scale (0: it is not at all like what happened to me or what I felt during the week; 3: yes, this happened to me a lot or almost always). This instrument has been validated in Spanish with a Spanish university population,[21] displaying acceptable internal consistency coefficients (Cronbach's alpha) for each of the factors: 0.80 (depression), 0.73 (anxiety), and 0.81 (stress), and for the total score of the DASS-21 as 0.90. In the present study, the items from the factor referring to stress were administered, with an adequate factorial reliability being found: 0.84 (Cronbach's alpha).

Descriptive statistics referring to the distribution of the sample based on sex and grade were expressed in absolute numbers and percentages. To study the predictive ability of school anxiety on stress, an inferential data analysis method was applied. Specifically, binary logistic regression was performed using the forward stepwise procedure based on the Wald statistic. Logistic modeling was used as it allows for the estimation of the likelihood that an event or result (such as stress) will take place when one or more predictors (such as school anxiety) occur. The odds ratio (OR) statistic allows us to determine this probability. The following pattern should be considered for its interpretation: OR > 1 indicates a positive prediction, OR < 1 indicates a negative prediction, and OR = 1 indicates no prediction.[22] Therefore, the influence of the predictor variable (school anxiety) on the criterion variable (stress) was analyzed using the OR.

Similarly, the fit of the proposed models was studied by considering two indicators: (1) the percentage of variance of the model providing Nagelkerke's R^2,[23] and (2) the percentage of cases that have been properly classified to determine if the predictor variable can be used to estimate the criterion variable. The dependent variable should be dichotomous in the logistic models. Therefore, it was determined that the stress variable would be considered to be low in the 25th centile and high in the 75th. Statistical analyses were conducted using the SPSS/PC 24.0 program (IBM Corp., Armonk, NY, U.S.A.).

Ethical consideration

This study followed the ethical standards established by the ethics committee of the University of Alicante (ref.: UA-2019-07-10) and the 1975 Helsinki Declaration (revised in 2000). An interview was conducted with the management teams from the participating schools to explain the study and request their authorization. Then, informed consent was requested from the parents of the students making up the sample. The SAI and DASS-21 were administered collectively in a 45-minute session (5 minutes of explanation, 20 minutes for the SAI, and 20 minutes for the DASS-21) in a regular classroom. A researcher was present in the administration sessions to ensure voluntary participation and anonymity of the responses, resolve any doubts, and verify that the instruments were duly completed.

Results

A total of 1588 students aged 12–18 (M = 14.82, SD = 1.86) years participated in this study. Table 1 presents the study participants' distribution by sex and grade.

Table 2 presents the results obtained regarding the probability of scoring highly in stress based on the four situational factors and the three scales referring to the school anxiety response systems.

Regarding the situational factors of school anxiety, the percentage of cases that were correctly classified by the logistic models for stress was 71.8% (χ^2 = 143.45, P = 0.000) for anxiety about aggression, 69.7% (χ^2 = 142.15, P = 0.000) for anxiety about social evaluation, 71.3% (χ^2 = 198.77, P = 0.000) for anxiety about school failure and punishment, and 71.9% (χ^2 = 177.23, P = 0.000) for anxiety about school evaluation. The goodness of fit values corresponding to Nagelkerke's R^2 for the models ranged from 0.19 to 0.26. Situational factors of school anxiety were found to be positive and statistically significant predictors of high levels of stress, with OR values greater than 1. Specifically, for each point that increased the scores on

Table 1: Number (percentage) of subjects from the total sample, classified by sex and grade

Sex	Eighth	Ninth	Tenth	Grade			
				1st year BAC	2nd year BAC	3rd year BAC	Total
Males	152 (9.6%)	162 (10.2%)	167 (10.5%)	150 (9.4%)	145 (9.1%)	191 (12.0%)	967 (60.9%)
Females	116 (7.3%)	144 (9.1%)	123 (7.7%)	60 (3.8%)	80 (5.0%)	98 (6.2%)	621 (39.1%)
Total	268 (16.9%)	306 (19.3%)	290 (18.3%)	210 (13.2%)	225 (14.2%)	289 (18.2%)	1588 (100.0%)

Table 2: Binary logistic regression for the probability of presenting high stress as a function of school anxiety factors and scales

Variable	Percentage of correctly classified cases	χ^2	R^2	B	SE	Wald	P	OR	95% CI
FI	Correctly classified: 71.8%	143.45	0.19	0.03	0.01	102.30	0.000	1.03	1.02–1.05
	Constant			−0.51	0.11	21.33	0.000	0.59	
FII	Correctly classified: 69.7%	142.15	0.19	0.02	0.01	118.16	0.000	1.02	1.01–1.03
	Constant			−1.46	0.19	60.44	0.000	0.23	
FIII	Correctly classified: 71.3%	198.77	0.26	0.03	0.01	139.30	0.000	1.03	1.02–1.04
	Constant			−1.03	0.14	57.52	0.000	0.35	
FIV	Correctly classified: 71.9%	177.23	0.24	0.04	0.01	134.13	0.000	1.04	1.03–1.05
	Constant			−1.09	0.14	56.68	0.000	0.34	
Acog	Correctly classified: 70.5%	175.51	0.23	0.04	0.01	132.72	0.000	1.04	1.03–1.05
	Constant			−1.42	0.17	68.30	0.000	0.24	
Abeh	Correctly classified: 70.3%	182.02	0.24	0.07	0.01	127.77	0.000	1.08	1.06–1.09
	Constant			−1.06	0.14	54.81	0.000	0.35	
Apsy	Correctly classified: 73.3%	188.10	0.25	0.04	0.01	127.99	0.000	1.04	1.03–1.05
	Constant			−0.84	0.13	44.81	0.000	0.43	
Total	Correctly classified: 71.8%	209.41	0.27	0.01	0.01	151.95	0.000	1.02	1.01–1.03
	Constant			−1.58	0.17	83.47	0.000	0.21	

Factor I=Anxiety about aggression, Factor II=Anxiety about social evaluation, Factor III=Anxiety about school failure and punishment, Factor IV=Anxiety about school evaluation, Acog=Cognitive anxiety, Abeh=Behavioral anxiety, Apsy=Psychophysiological anxiety, Total=Total score on school anxiety, χ^2=Chi squared, R^2=Nagelkerke R squared, B=Regression coefficient, SE=Standard error, Wald=Wald's test, P=Probability, OR=Odds ratio, 95% CI=Confidence interval at 95%

anxiety-generating school situations, the probability that students would experience high stress rose between 1.02 and 1.04.

Regarding school anxiety response systems, the results suggested that the proportion of cases classified correctly by the logistic models for stress was 70.5% ($\chi^2 = 175.51$, $P = 0.000$) for cognitive anxiety, 70.3% ($\chi^2 = 182.02$, $P = 0.000$) for behavioral anxiety, and 73.3% ($\chi^2 = 188.10$, $P = 0.000$) for psychophysiological anxiety. Nagelkerke's R^2 revealed adjustment values for the models of 0.23–0.25. School anxiety response systems also acted as positive and statistically significant predictors of high stress levels. Thus, it was found that for each point that the response system scores increased, the probability of high stress increased between 1.04 and 1.08.

Finally, the percentage of cases that the logistic model correctly classified in the total score on school anxiety for stress was 71.8% ($\chi^2 = 209.41$, $P = 0.000$), with an adjustment value of the model of 0.27, according to Nagelkerke's R^2. School anxiety was a positive and statistically significant predictor of high stress. Specifically, for each point that the school anxiety score increased, the probability of having higher levels of stress rose 1.02.

Discussion

This cross-sectional predictive study conducted with adolescent students from Ecuador who were in high school from the eighth year to the third year of Baccalaureate had the objective of analyzing the predictive ability of school anxiety on high levels of stress. The hypothesis was confirmed upon finding that for the total score on school anxiety, the situational factors: anxiety about aggression, anxiety about social evaluation, anxiety about school failure and punishment, and anxiety about school evaluation as well as the response systems, namely cognitive, behavioral, and psychophysiological, positively and significantly predicted high scores on stress. This finding is in line with the results obtained in past studies carried out in Saudi Arabia,[14] India,[15] Italy,[16,17] and Spain,[18] according to which the correlation between the two constructs is positive and significant when it is analyzed with students in the adolescent phase including the ages of 10–19 years.

A past study conducted on a Spanish population[18] revealed positive and significant correlations between anxiety and academic stress. It indicated that the student profile displaying elevated levels of generalized anxiety symptoms and anxiety in school situations had

significantly higher levels of stress, manifested through behaviors such as fighting with peers, as compared to the student group with high levels of anxiety in school performance. This specific profile is characterized by anxiety in social situations taking place in the school. In this study, social evaluation anxiety has been found to predict high levels of stress. Given that the stress factor of the DASS-21 assesses difficulties in relaxing, nervous excitation, and impatience or irritability, but does not refer to fighting responses, it may be affirmed that this study supports past empirical evidence in which students displaying intense emotional anxiety responses in social situations at school that they perceive as dangerous tend to be incapable of confronting these situations and thus will experience stress with a flight reaction more frequently than students having generalized anxiety or anxiety in the school environment who are more likely to react actively against their peers with fight responses. This may be explained by the fact that when experiencing stress, the sympathetic nervous system is activated, which responds to the situation considered highly demanding with a tendency to flee or fight.[24]

The results of this study have demonstrated the need for early detection of school-related anxiety through the use of valid and reliable instruments,[25] given this construct's ability to predict stress in adolescents. Similarly, the findings permit the creation of potential preventive measures or treatments for symptoms of anxiety and stress in the academic setting. According to Kumar *et al.*,[26] school health programs should be improved to strengthen adolescent mental health and to promote their transition to adulthood. This includes classroom work on conceptual content and the fostering of coping skills for school situations perceived as threats and the development of self-esteem. Therefore, it is recommended that collaborative learning be employed in the design of activities to be carried out on a daily basis. Kumar *et al.*[26] also suggested that curricula include relaxation practices such as yoga. The "mindfulness-based stress reduction program" has been shown to have a positive effect on the reduction of anxiety regarding evaluation and the improvement of emotional management,[27] as well as in the self-regulation of stress responses,[28] making its application highly beneficial for high school students.

Limitation and recommendation
This study has certain limitations that should be considered for future studies. First, the predictive model that has been established does not include certain variables that may intervene in the relationship between anxiety and stress in adolescents. One of these may be depression, given its high prevalence along with anxiety and stress during this developmental phase.[29] Furthermore, according to Scrimin *et al.*,[30] sex has a significant influence on the manifestation of adolescent

school anxiety. Therefore, it is another variable to be considered. Second, the sample used consisted only of an adolescent population. It may be useful to replicate the study by using younger and older participants to determine the predictive ability of school anxiety on stress over the long term in academic development. Some of this target sample may be university students, given the prevalence of these constructs in this population, due mainly to academic and future work pressure.[31] Third, given the lack of past studies analyzing the predictive ability of school anxiety on stress, and the fact that this work relied on a sample of students from only Ecuador, it is necessary to consider this topic in other countries to make cultural comparisons. It should be noted that the multidimensionality of school anxiety has revealed differences depending on the culture of origin of the students experiencing it.[32]

Conclusion

This work expands on the empirical knowledge of the relationship between school anxiety and stress in adolescence. It offers novel information on school anxiety in all of its dimensions (total score, situational factors, and response systems) and reveals the predictive ability of this emotion on elevated levels of stress. Furthermore, it has certain practical implications on evaluation, revealing the need for early assessment of school anxiety to prevent both constructs. It also has implications on treatment, which may be implemented through programs to strengthen relaxation skills and exercises.

Conflicts of interest
There are no conflicts of interest.

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