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Associations Between Mental Health and Academic Performance in High School Students: A Cross-Sectional Study in Southernmost Brazil

Mental Health and Academic Performance in Teens

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Abstract

Introduction. Psychiatric symptoms are prevalent among teenagers and consistently associated with impaired academic performance.

Objective: This study aimed to examine the relationship between symptoms of depression, anxiety, and stress and academic performance among high school students in southern Brazil.

Methods: This cross-sectional study (2022) involved students from the Federal Institute of Rio Grande do Sul (IFRS), Brazil. Mental health was assessed using the Depression, Anxiety, and Stress Scale (DASS-21), and academic performance was estimated based on the average grades taken in the academic year. Data were analyzed using STATA 15.1 with Poisson regression for prevalence ratios. Results: Among 480 eligible students,

391 had complete data (response rate: 81.5%). The mean age was 17.0 years (SD = 1.5); 56% were male, 46% first-year students, 33% physically inactive, 5% smokers, 36% reported alcohol consumption, and 32% had good or very good sleep quality. The mean DASS-21 score was 15.2 (95%CI 14.4–16.5). Severe or very severe symptoms were observed in 16.2% for depression, 15.3% for anxiety, and 9.1% for stress, with 22.3% presenting at least one severe outcome. The mean academic grade was 7.8 (SD = 1.4); 21% scored <7.0 and 17% ≥9.0. Higher mental health scores were associated with lower and reduced higher academic performance. Depression and stress, but not anxiety, were associated with poorer performance; only depression showed an inverse association with high performance.

Conclusion: This study demonstrated a negative association between depressive and stress symptoms and academic performance in high school students, while anxiety symptoms were not significantly associated.

Keywords: Mental health, school performance, youth depression, academic anxiety.

INTRODUCTION

Psychiatric disorders such as depression and anxiety, as well as stress - understood as an adaptive response - and their deleterious effects on educational development are widely studied in the young population.[1-10] Given this scenario, one of these effects can be emphasized, since Fusar-Poli et al.[11] consider cognitive ability and academic performance to be two of the central empirical domains for good mental health. Furthermore, it is worth noting that mental disorders are defined by the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-V)[12] as a syndrome characterized by clinically significant disturbance in an individual's cognition, emotional regulation, or behavior that reflects a dysfunction in the psychological, biological, or developmental processes underlying mental functioning. Such disorders are often associated with significant distress or disability that affects social, professional, or other important activities. In this context, the manifestations of the aforementioned psychiatric pathologies, despite presenting greater cognitive impairment in individuals with recurrent episodes,[3] are capable of persistently impairing the individual's cognitive function, even after a single episode.[13,14]

Anxiety disorders, depression and stress are the leading causes of illness and disability among young people worldwide, with prevalence rates of approximately 28% and 27%, 36%, respectively.[15] In Brazil, according to a meta-analysis with university students, prevalence of anxiety was 38% and depression was 28%.[16] Furthermore, the last results of the Global Burden of Disease (GBD),[17] published in 2025, highlighted that the causes of death with the greatest increase in the age-standardized rate of Disability-Adjusted Life Years (DALYs) from 2010-2023 were anxiety disorders (63%) and depressive disorders (26%).[17,18] Considering only young individuals (10 to 19 years old), anxiety is the main cause of DALYs in the world, and depression is the third one.[17] In addition, adolescence is a period that encompasses several milestones in development and learning,[16] including increased academic expectations as school years progress, which is intrinsically related to academic performance and well-being.[19,20]

Some studies have already assessed the relationship between academic performance and mental health through variables such as anxiety[7,8] or depression.[21,22] In contrast, other studies have investigated this association through parameters of mental resistance,[23] academic pressure,[10] or emotions during the learning process.[2] However, analyses of this association become more essential in a post-pandemic context, since this period generated abrupt changes in the course of young people's development, in addition to an epidemiological explosion of mental disorders in this group.[24-26]

Academic performance is one of the domains for good mental health[11] and adolescence is the period of greatest prevalence for the emergence of mental disorders, occurring in a proportion of approximately 48.4% of individuals under the age of 18.[27] Despite this, this topic is poorly explored among high school students in Brazil, as most studies focused on under-graduation students,[16] or were conducted in high income countries.[27] Therefore, the present study aims to investigate the association between mental health variables and academic performance in high school students in the extreme south of Brazil.

METHODS

This was a cross-sectional, census-based study conducted with students regularly enrolled in high school at the Instituto Federal do Rio Grande do Sul (IFRS), Rio Grande Campus, Rio Grande do Sul, Brazil. Because the study was census-based, no a priori sample size calculation was performed. The eligible population comprised all students from the 1st to the 3rd year of high school enrolled in the second academic semester of 2022, totaling 510 enrollments distributed across 24 classes. All students present during the data collection period who agreed to participate were included in the study. Students with physical or cognitive conditions that prevented them from completing the questionnaires were excluded. The study was approved by the Research Ethics Committee of the Federal University of Rio Grande (approval no. 3,824,558; CAAE: 26359019.00000.5324).

Prior to data collection, the study was presented to the IFRS administration for authorization. Subsequently, the study was presented to the 24 participating classes, with clarification of the study objectives and reading of the informed consent form for students under 18 years of age and the assent form. Data collection was carried out throughout the month of October 2022, during Physical Education classes, using self-administered questionnaires applied on individual tablets provided by the Federal University of Rio Grande. Data collection was conducted one class at a time, with an average of 25 to 30 students responding simultaneously. The application of the instruments was conducted by previously trained interviewers (undergraduate and graduate students), who were responsible for guiding participants and distributing and collecting the electronic devices. Students who chose not to participate were considered refusals, and those who were not located after four collection attempts were considered losses. The average time required to complete the questionnaire ranged from 20 to 30 minutes. The collected data were stored on the REDCap® (*Research Electronic Data Capture*) platform.

The exposure variables investigated were severe or very severe symptoms of depression, anxiety, and stress, assessed using the *Depression, Anxiety and Stress Scale* (DASS-21).[28] The DASS-21 is a self-administered Likert-type scale in which the three domains are determined by summing the scores of 21 items, divided into three factors: Depression (items 3, 5, 10, 13, 16, 17, and 21), Anxiety (items 2, 4, 7, 9, 15, 19,

and 20), and Stress (items 1, 6, 8, 11, 12, 14, and 18). Each item is scored from 0 to 3, corresponding to the following responses: 0 (“did not apply to me at all this week”), 1 (“applied to me to some degree, or some of the time”), 2 (“applied to me to a considerable degree, or a good part of the time”), and 3 (“applied to me very much, or most of the time”). Each outcome was categorized as normal, mild, moderate, severe, or very severe.[28] For analytical purposes, symptoms were dichotomized as severe or very severe anxiety (no/yes), severe or very severe depression (no/yes), and severe or very severe stress (no/yes). Additionally, a variable indicating the presence of severe or very severe symptoms of anxiety or depression or stress (no/yes) was created, as well as a score representing severe or very severe mental symptoms, ranging from 0 to 3 according to the presence of each condition.

Academic performance was obtained from the IFRS institutional academic system at the end of the 2022 academic year and was defined as the arithmetic mean of the final grades of all subjects completed, ranging from 0 to 10. A cutoff point of 7.0 was used, corresponding to the institutional minimum requirement for approval. Thus, academic performance was analyzed dichotomously (<7.0 vs. ≥7.0) in association analyses with mental health outcomes.

Potential confounders included variables previously associated with mental health and academic performance in adolescents: sex (male/female), age (completed years), school grade (1st to 3rd year), economic status (asset index), and leisure-time physical inactivity (absence of leisure-time physical activity beyond Physical Education classes; no/yes). Alcohol consumption (no/yes), current smoking (use of conventional and electronic cigarettes; no/yes), and perceived sleep quality (very poor, poor, regular, good, or very good) were assessed using objective questions. All these variables were measured using a self-administered questionnaire.

After data collection, the database was transferred to Excel and subsequently to the STATA statistical software, version 18.1, for analysis. Initially, descriptive analyses were performed, with numerical variables presented as means and standard deviations and categorical variables as absolute and relative frequencies. Fisher’s exact test was used to compare levels of mental health with academic performance in ordinal or dichotomous analyses. To assess dichotomous outcomes, crude and adjusted analyses

were conducted using Poisson regression with robust variance adjustment, reporting prevalence ratios (PR) and 95% confidence intervals (95% CI). In the adjusted analysis, all intervening variables were entered simultaneously into the model. The level of statistical significance was set at 5% for two-tailed tests.

RESULTS

Out of the 480 eligible students, 391 had complete data for mental health and academic performance, totaling a response rate of 81.5%. The average age was 17 years (SD=1.5), ranging from 15 to 22 years. Of these, 55.6% were male, 45,9% were in the first year of the course, 32.7% were physically inactive, 4.8% were smokers, 35.5% consumed alcohol and 32.4% had good or very good sleep quality (Table 1).

Table 1. Sample description - Instituto Federal do Rio Grande do Sul (IFRS) - Campus Rio Grande, Rio Grande do Sul, Brazil (2022).

Variable	N	%
Sex		
Male	218	55.6
Female	174	44.4
Age (years)		
15 to 17	198	51.3
18 or more	188	48.7
School grade (year)		
1st	181	45.9
2nd	134	34.0
3rd	79	20.1
Physical inactivity		
No	264	67.3
Yes	128	32.7
Smoking		
No	375	95.2
Yes	19	4.8
Alcohol consumption		
No	247	64.5
Yes	136	35.5
Sleep quality		
Poor or regular	265	67.6

Good or very good	127	32.4

% Prevalence

The mean DASS-21 score was 15.2 points (SD=0.6) (95%CI 14.4 to 16.5) with a median of 12 points, ranging from 0 to 63 points. The prevalence of any symptom (light, moderate, severe or very severe) of depression, anxiety and stress is shown in Figure 1. The prevalence of severe or very severe symptoms of depression, anxiety and stress was, respectively, 16.2% (95%CI 12.6 to 19.9), 15.3% (95%CI 11.7 to 18.8), 9.1% (95%CI 6.3 to 12.0). The prevalence of severe or very severe symptoms of any mental health outcome was 22.3% (95%CI 18.1 to 26.4).

The average academic grade was 7.8 points (SD=1.4), ranging from 1.2 to 10.0, with a median of 8.1 points. The proportion of students with an average below 7.0 was 21% (95%CI 17 to 25). In return, the proportion of students with an average equal to or greater than 9.0 was 17% (95%CI 13 to 21).

In Table 2, we present the association between mental health scores and academic performance. For each increase in the mental health scores, there was an increase in the probability to achieve, on average, an academic grade less than 7 points. Accordingly, for each increase in the mental health scores, there was a reduction in the probability to achieve, on average, an academic grade equal or higher than 9 points.

Table 2. Association between academic performance and mental health scores. Instituto Federal do Rio Grande do Sul (IFRS) - Campus Rio Grande, Rio Grande do Sul, Brazil (2022).

Exposure	**Crude analysis**	**Adjusted analysis***
Outcome: academic grade less than 7 points	Percentage increase (95%CI)	Percentage increase (95%CI)
DASS score	**2.0 (0.8; 3.3)**	**1.9 (0.6; 3.2)**
Depression score	**2.7 (1.2; 4.2)**	**2.4 (0.7; 4.0)**
Anxiety score	**2.1 (0.2; 4.1)**	1.8 (-0.3; 4.0)
Stress score	**2.7 (0.9; 4.5)**	**2.5 (0.7; 4.4)**
Outcome: academic grade equal or higher than 9 points	Percentage reduction (95%CI)	Percentage reduction (95%CI)

DASS score	**-2.8 (-4.6; -0.8)**	**-2.9 (-5.4; -0.3)**
Depression score	**-3.7 (-6.3; -1.0)**	**-3.7 (-6.7; -0.6)**
Anxiety score	**-3.3 (-6.0; -0.5)**	-3.2 (-6.8; 0.5)
Stress score	**-2.9 (-5.1; -0.7)**	**-2.9 (-5.7; 0.0)**

DASS: Depression, anxiety and stress scale
* Adjusted for: sex, age, school grade, asset index, physical inactivity, smoking, alcohol consumption and sleep quality.
In bold: significant associations (p-value<0.05)

Analyzing the occurrence of each mental health disorder and severe or very severe symptoms, we found a significant association between depression and stress with lower academic performance (average academic grade less than 7 points), but not with anxiety. Considering the achievement of a mean academic grade equal or higher than 9 points, we found an inverse association only for depression in the crude analysis (Table 3).

Table 3. Association between academic performance and mental health outcomes. Instituto Federal do Rio Grande do Sul (IFRS) - Campus Rio Grande, Rio Grande do Sul, Brazil (2022).

Exposure	**Crude analysis**	**Adjusted analysis***
Outcome: academic grade less than 7 points	PR (95%CI)	PR (95%CI)
Depression (yes)	**1.72 (1.17; 2.54)**	**1.58 (1.07; 2.34)**
Severe or very severe depression	**1.87 (1.24; 2.81)**	**1.75 (1.18; 2.59)**
Anxiety (yes)	1.13 (0.77; 1.67)	1.04 (0.71; 1.52)
Severe or very severe anxiety	1.23 (0.75; 1.99)	1.28 (0.76; 2.13)
Stress (yes)	**1.55 (1.05; 2.29)**	**1.50 (1.02; 2.22)**
Severe or very severe stress	**2.05 (1.29; 3.25)**	**1.76 (1.08; 2.86)**
Outcome: academic grade equal or higher than 9 points		
Depression (yes)	**0.60 (0.38; 0.96)**	0.65 (0.40; 1.07)
Severe or very severe depression	**0.41 (0.17; 0.98)**	0.47 (0.19; 1.17)
Anxiety (yes)	0.96 (0.61; 1.50)	1.02 (0.60; 1.75)
Severe or very severe anxiety	0.45 (0.19; 1.07)	0.56 (0.22; 1.39)

Stress (yes)	0.90 (0.55; 1.32)	0.98 (0.61; 1.57)
Severe or very severe stress	0.15 (0.02; 1.04)	0.18 (0.02; 1.30)

DASS: Depression, anxiety and stress scale

* Adjusted for: sex, age, school grade, asset index, physical inactivity, smoking, alcohol consumption and sleep quality.

In bold: significant associations (p-value<0.05)

DISCUSSION

This study analyzed the association between students' self-reported mental health and academic performance assessed through high school curricular grades at the Instituto Federal, Rio Grande-RS campus. Thus, the results indicated that each additional point on the DASS-21 represented, simultaneously, a greater probability of having low grades and a lower probability of having high grades. Students with reported symptoms of depression or stress, especially severe or very severe ones, presented higher probability to have a poor school performance (average academic grade below 7 points).

These findings are in line with those of Ahern et al.,[14] who examined cognitive function in patients with a first episode of depression compared to healthy controls, evidencing cognitive deficits in several skills, including processing speed, memory, and verbal fluency. The fact that severe or very severe symptoms of depression are associated with almost twice the prevalence of an average grade lower than 7.0 points may be a consequence of the fact that students with recurrent episodes have more severe depressive symptoms and, consequently, progressive declines in cognitive abilities with each additional episode, resulting in worse academic performance.[13] Similarly, stress in the school environment negatively affects academic performance.[29] Although Pérez-Jorge et al., has suggested that this relationship is weak, it still indicates a negative correlation, with academic performance decreasing as stress levels increase.[30]

From this, it is crucial to understand the functional triad model of human learning, which encompasses cognitive, conative and executive functions. In this sense, cognitive processes are mainly composed of the triad of cognitive functions and subfunctions: input, integration and output; conative functions, such as motivation, emotion and the individual's personality; and executive functions are continually cooperating with each other for permanent learning.[31]

Thus, the negative association between depression, stress and academic performance becomes evident, so that the impact is a result of the interference of depression in cognitive functions, being able to impair, mainly, memory and attention, the information input functions; in conative functions, generating emotional states such as demotivation, displeasure and despair; and in executive functions, which includes the set of related mental skills.[13,14,31]

Despite the significant association with depression and stress, in the present study, no statistically significant association was found for anxiety and academic performance. This finding goes against other studies that have shown a negative association between anxious students and academic performance.[32-35] Lopes et al.[35] suggest that students have a mild level of anxiety to achieve good academic performance, maintaining a balance between absence, moderate and severe anxiety. Furthermore, Brumariu et al.[34] state that, even if such an association was found, the findings show that anxiety does not significantly impair academic performance, with this being stronger with mathematics.

Furthermore, it is valuable to analyze the inverse path of the relationship, in which difficulty in a specific subject can be the underlying cause for the development of mental disorders. According to Vieira et al.,[36] students who have difficulty in mathematics experience more internalizing problems, such as depression and anxiety, than their peers without these difficulties. However, they do not show any difference when compared to other students with reading problems or in other areas. Other studies reinforce that participants with greater anxiety assessed had not only lower performance in mathematics, but also lower levels of academic self-concept in this subject.

Given this scenario, it is understood that academic difficulties, regardless of their nature, act as a vulnerability factor for the development of internalizing problems, in addition to being able to act in a bidirectional flow, where the presence of depression and anxiety act in the development of academic difficulties, and vice versa. Furthermore, Nelson et al.[37] state that difficulty in mathematics is a strong predictor of poor future performance, since students diagnosed with difficulties in childhood tend to continue to present these challenges in the long term, which contributes to the maintenance of this harmful cycle.

The main limitation of the present study is its cross-sectional design, which impaired the establishment of a causal relationship between the group with the highest DASS-21 score

and the worst academic performance. Thus, although significant associations were found, it was not possible to confirm the causal relationship between the variables and, therefore, it is important to conduct longitudinal studies to explore these associations. Another limitation of this study is the reduced number of participants in some stratified analyses, which may have limited the detection of statistically significant associations. The generalization of the findings to students from other institutions or other places may be limited, because we included only one institution from Southern Brazil.

Furthermore, this study's reliance on mental health data collected without prior professional evaluation is also a limitation due to the self-reported nature of the information, which may lead to underestimation compared to more accurate methods of clinical evaluation, such as an evaluation with a psychiatric diagnosis. Finally, another important limitation is the fact that academic performance was assessed limited to the result of the curriculum grade, without using other variables such as measuring the level of cognition with more specific instruments. These data could increase our understanding of the impact of mental health on students' academic development, impacting not only academic performance but also their entire future professional life.

Regarding the strengths of the study, it is worth highlighting the fact that this study used a validated instrument for screening for anxiety, stress and depression in young people (DASS-21), as well as a collection of objective grades from students throughout the year, these data being collected from a census of the high school student population of the IFRS-Campus Rio Grande institution, with a high response rate. To the best of our knowledge, this is the first study to evaluate such associations in Southern Brazil students.

Our data can be used to implement policies on implementing mental health education in schools. Although schools are very demanding spaces where young people often seek help[38] and many teachers play a crucial role in students' well-being and are able to recognize emotional needs, there are still many challenges to providing adequate assistance, such as the lack of mental health training, uncertainty about their responsibilities and the scarcity of resources, which make effective support difficult.[39] These initiatives could reduce absenteeism and improve school results and academic performance of young people in the post-pandemic period.

CONCLUSION

This study found a statistically significant association between poorer mental health, particularly depression and stress, and worse academic performance. Moreover, poorer mental health scores were also associated with a lower likelihood of achieving high grades. Finally, we emphasize the importance of developing longitudinal studies on this topic, covering students from other regions, to better understand the impacts of mental health on academic performance. This knowledge is essential for promoting effective prevention and harm reduction within the context of development and education.

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