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Relationship between physical exercise and symptoms of stress, depression and anxiety in medical students

Relação entre exercício físico e sintomas de estresse, depressão e ansiedade em acadêmicos de Medicina

Relación entre ejercicio físico y síntomas de estrés, depresión y ansiedad en estudiantes académicos de Medicina

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Isadora Giordano[1], Luísa Barbieri Kreibich[1], Daniela Maysa de Souza[2]

Abstract:
Objective: to identify physical exercise habits among medical students and analyze their relationship with symptoms of stress, depression, and anxiety. **Methods:** quantitative, descriptive, and analytical research, carried out in June 2024 through the application of a questionnaire to identify and assess physical exercise habits, associated with the Depression, Anxiety, and Stress Scale. The data were statistically analyzed with the help of Epi Info, and are presented in tables with absolute and relative frequencies, and estimates in intervals. The Chi-square, Mann-Whitney, and Shapiro-Wilk tests were applied to determine associations between variables and comparisons between groups. **Results:** women had higher levels of anxiety and stress than men; and on the depression scale, the mean score was significantly lower in the group of students who performed physical exercises. **Conclusion:** the development of stress, depression, and anxiety in medical students is multifactorial, and the practice of physical exercises only reduced the levels of depression.
Keywords: Exercise; Students, Medical; Stress, Psychological; Depression; Anxiety.

Resumo:
Objetivo: identificar os hábitos de prática de exercício físico entre acadêmicos de medicina e analisar sua relação com sintomas de estresse, depressão e ansiedade. **Método:** pesquisa quantitativa, descritiva e analítica, realizada em junho de 2024 por meio da aplicação de um questionário de identificação e de hábitos de prática de exercício físico, associados à Escala de Depressão, Ansiedade e Estresse. Os dados foram analisados estatisticamente com auxílio do Epi Info, sendo apresentados em tabelas com frequências absolutas, relativas e estimativas em intervalos. Para as associações entre variáveis e comparações entre grupos, aplicaram-se os testes Qui-quadrado, Mann-Whitney e Shapiro-Wilk. **Resultados:** as mulheres apresentaram níveis de ansiedade e estresse maior em relação aos homens; e na escala de depressão o escore médio foi significativamente menor no grupo de acadêmicos que realizavam exercícios físicos. **Conclusão:** o desenvolvimento de estresse, depressão e ansiedade no acadêmico de Medicina é multifatorial e a prática de exercícios físicos reduziu somente os níveis de depressão.
Palavras-chave: Exercício físico; Estudantes de Medicina; Estresse Psicológico; Depressão; Ansiedade.

Resumen:
Objetivo: Identificar los hábitos de práctica de ejercicio físico entre académicos de Medicina y analizar su relación con síntomas de estrés, depresión y ansiedad. **Método**: Investigación cuantitativa, descriptiva y analítica, realizada en junio de 2024 mediante la aplicación de un cuestionario de identificación y de hábitos de práctica de ejercicio físico, asociados a la Escala de Depresión, Ansiedad y Estrés. Los datos fueron analizados estadísticamente con ayuda del Epi Info, siendo presentados en tablas con frecuencias absolutas, relativas y estimaciones en intervalos. Para las asociaciones entre variables y comparaciones entre grupos, se aplicaron los test de Chi-cuadrado, Mann-Whitney y Shapiro-Wilk. **Resultados**: Las mujeres presentaron niveles de ansiedad y estrés mayores en relación con los hombres; y en la escala de depresión, la puntuación media fue significativamente menor en el grupo de estudiantes académicos que realizaban ejercicios físicos. **Conclusión**: El desarrollo de estrés, depresión y ansiedad en el estudiante de Medicina es multifactorial y la práctica de ejercicios físicos redujo únicamente los niveles de depresión.
Palabras clave: Ejercicio físico; Estudiantes de Medicina; Estrés Psicológico; Depresión; Ansiedad.

Corresponding Author: Daniela Maysa Souza – danimaysa@gmail.com

1. Undergraduate course in Medicine at the Universidade Regional de Blumenau, Blumenau/SC, Brazil
2. Department of Medicine at the Universidade Regional de Blumenau, Blumenau/SC, Brazil

INTRODUCTION

Physical activity can be defined as any bodily movement that occurs due to the contraction of skeletal muscles and that results in a caloric deficit due to energy expenditure[1]. Physical exercise, in turn, refers to a combination of structured, programmed and ordered movements, which aim at a specific goal; be it improving some physical capacity or increasing caloric expenditure[1].

Regarding the impact of physical exercise on cognitive function, there are several neurophysiological mechanisms resulting from physical exercise that are beneficial to mental health, with the release of neurotransmitters that include dopamine, serotonin, norepinephrine and endorphin, which are hormones related to the feeling of well-being[2]. Such neurotransmitters are reduced in disorders such as anxiety and depression[3]. Furthermore, this release of neurotransmitters stimulated by physical exercise causes a decrease in cortisol levels, a hormone directly linked to stress[4].

Regarding recommendations for physical exercise, the guidelines for physical activity and sedentary behavior, published by the World Health Organization (WHO), suggest that all adults, aged 18 to 64, should practice physical exercise regularly; totaling at least 150 to 300 minutes per week of moderate aerobic activity, or 75 to 150 minutes per week of vigorous aerobic activity[5].

In this regard, the routine of university students stands out, as they need to reconcile studies and work, with the practice of physical exercise, aiming at maintaining their physical and mental health. For medical students, in particular, whose courses are full-time, the difficulty in maintaining physical exercise is a worrying reality. A study carried out with medical students in Florida (USA) showed that the large amount of extra work, the unrealistic expectations and the internal and external pressure for academic performance are factors that make it difficult to carry out activities aimed at maintaining a healthy lifestyle[6].

Therefore, students have difficulty performing physical exercises regularly, since low motivation, signs of anxiety and lack of time act as barriers to adherence to the practice[7]. In this context, it is common for students in the health field to manifest symptoms of anxiety and depression throughout their education, which can influence their professional trajectory[8].

Regarding the prevalence of depression in Brazil, epidemiological studies show that approximately 15.5% of people will develop the disease over the course of their lives[9]. In the academic context, a survey of medical students found that approximately one third of the participants had depressive symptoms, of which approximately half had mild to moderate

symptoms, just over one third had moderate symptoms, and approximately 12% had signs of severe depression[10].

In the case of anxiety, the annual prevalence of the disorder in Brazil is notable, reaching 19.9% in the Southeast and South regions[11]. In the case of medical students, this number is even more significant, with a survey revealing that 66.3% of students had minimal anxiety and 33.7% had mild, moderate or severe anxiety[10]. Regarding stress, an analysis carried out with 1.53 million people from 113 countries, from 2009 to 2021, showed an increase from 25.16% to 31.9% of symptoms during this period[12]. Regarding medical students, a study showed that 60.09% presented stress, while 20.83% developed extreme stress[13].

People who live with depression, stress and anxiety can present symptoms that impair the execution of daily tasks, reduce the quality of life and interfere with mental health and, considering the context of medical students, such symptoms can be exacerbated by the high workload and numerous academic demands. Therefore, the importance of understanding the relationship between the practice of physical exercise and the manifestation of stress, depression and anxiety in the scenario of medical students is evident.

Given the high workload of medical students, their difficulty in practicing physical exercises and their susceptibility to presenting symptoms of depression, anxiety and stress, the present study has the following research question: *What is the relationship between the practice of physical exercise and the manifestation of symptoms of stress, depression and anxiety in medical students at the Universidade Regional de Blumenau (FURB*)?

Thus, this study aimed to identify the habits of practicing physical exercise among medical students and analyze its relationship with symptoms of stress, depression and anxiety.

METHODS

This is a quantitative, descriptive and analytical study carried out with medical students at FURB, located in the interior of the state of Santa Catarina, Brazil, which has a medicine course since 1990. The course is full-time and lasts six years, and is structured in three cycles, each lasting two years: Basic Cycle (2,646 class hours), Intermediate Clinical Cycle (3,006 class hours) and Medical Internship (3,204 class hours), plus 216 hours of Academic-Scientific-Cultural Activities, totaling 9,072 class hours at the end of the course[14]. Thus, the student spends an average of 738 hours per semester and approximately 46 hours per week on their academic obligations.

The 486 medical students from the first semester (Basic Cycle) to the twelfth semester (Internship) were invited to participate in the study. All regularly enrolled medical students

were eligible to participate in the study. Students under eighteen years of age at the time of data collection were excluded from the study.

Data collection was carried out in June 2024, through the application of a questionnaire on physical exercise habits, prepared by the authors, along with the Depression, Anxiety and Stress Scale (DASS-21). The instruments were applied individually, through online questionnaires on the Google™ platform, with the link made available to the participants. The questionnaires took an average of fifteen minutes to complete.

The identification questionnaire included data such as age, gender, course semester and whether the student lives alone or with family/friends. Regarding physical exercise habits, participants were asked whether or not they practiced physical exercise, frequency, modalities and duration of the physical exercise session.

The presence of symptoms of stress, depression and anxiety was assessed using the DASS-21 (Depression, Anxiety and Stress Scale), developed in 1995 and later adapted and validated for Brazil, with a view to measuring and distinguishing the symptoms of these conditions[15].

Several studies have shown that the DASS-21 scale is a valid and reliable instrument for assessing depression, stress and anxiety in both clinical and non-clinical populations of adults and adolescents, from various cultures and ethnicities[15].

This scale consists of 21 affirmative sentences, divided into 3 subscales ("a" for anxiety, "d" for depression and "s" for stress), which contain 7 questions for each disorder. The participant indicated, in each statement, based on a score ranging from 0 to 3 points, the presence of symptoms during the week prior to the questionnaire; where: 0 did not apply at all; 1 applied to some degree, or for a short time; 2 applied to a considerable degree, or a considerable part of the time; and 3 applied very much, or most of the time. Based on students' responses using the DASS-21 scale tool, subscale scores allow classification into: normal, mild, moderate, severe, and extremely severe.

After this, the results obtained through the DASS-21 scale were related to the physical exercise habits of the respective students. The data were transferred to a Microsoft Excel™ spreadsheet and statistically analyzed with the help of Epi Info. The data were presented in simple tables, containing absolute and relative frequencies and estimates in intervals.

For the associations, double-entry tables were prepared, which included absolute and relative frequencies, means, medians and results of statistical tests. Regarding the association between variables and the comparison between groups, the following statistical tests were performed: Chi-square test (associates qualitative or categorical variables), Mann-Whitney test

(to compare two independent groups). In addition, in order to verify the normality of the data, the Shapiro Wilk Normality Test was performed. In all cases, $p < 0.05$ indicates significant differences between groups.

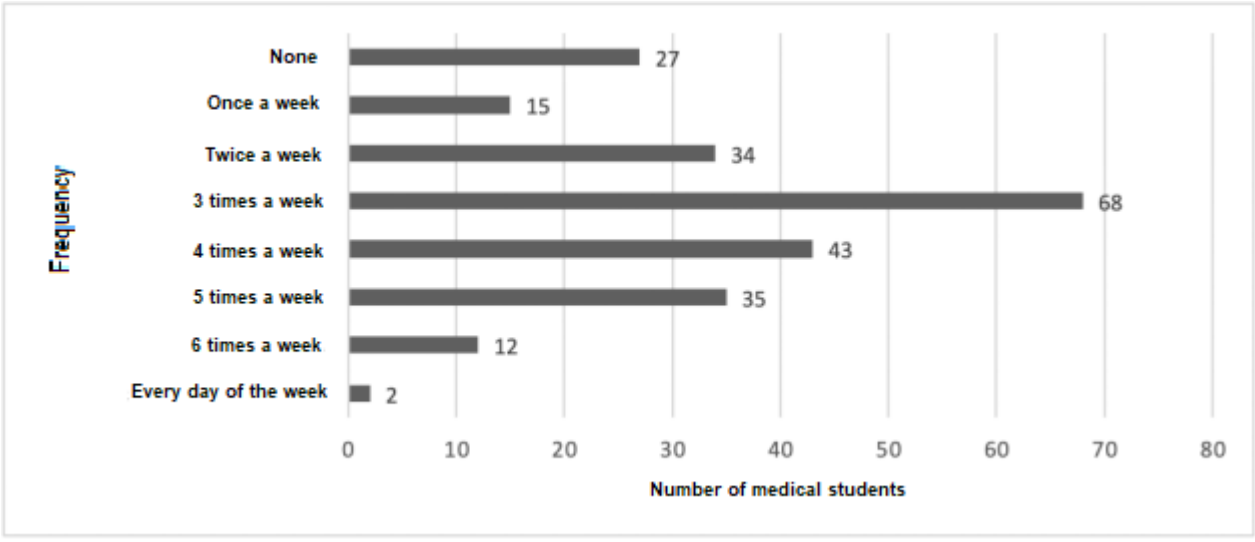
Ethical recommendations were followed, which value the confidentiality of information and the security of anonymity. The project was evaluated and approved by the Human Research Ethics Committee linked to the FURB Rectory, with Certificate of Presentation of Ethical Appreciation No. 75663923.7.0000.5370 and Approval Opinion No. 6,582,380.

RESULTS

A total of 236 medical students (48.5% of students) participated in the study. Regarding the profile of the participants, 39.8% were in the basic cycle, 43.2% in the clinical cycle and 16.9% in medical internship. 72.9% were female, while 27.1% were male. Regarding age, 35.6% were between 18 and 20 years old, 49.2% between 21 and 25 years old, 10.2% between 26 and 30 years old, 3.8% between 31 and 40 years old and 1.3% over 40 years old. 55.9% live with family members, 33.9% live alone and 10.2% live with friends/acquaintances.

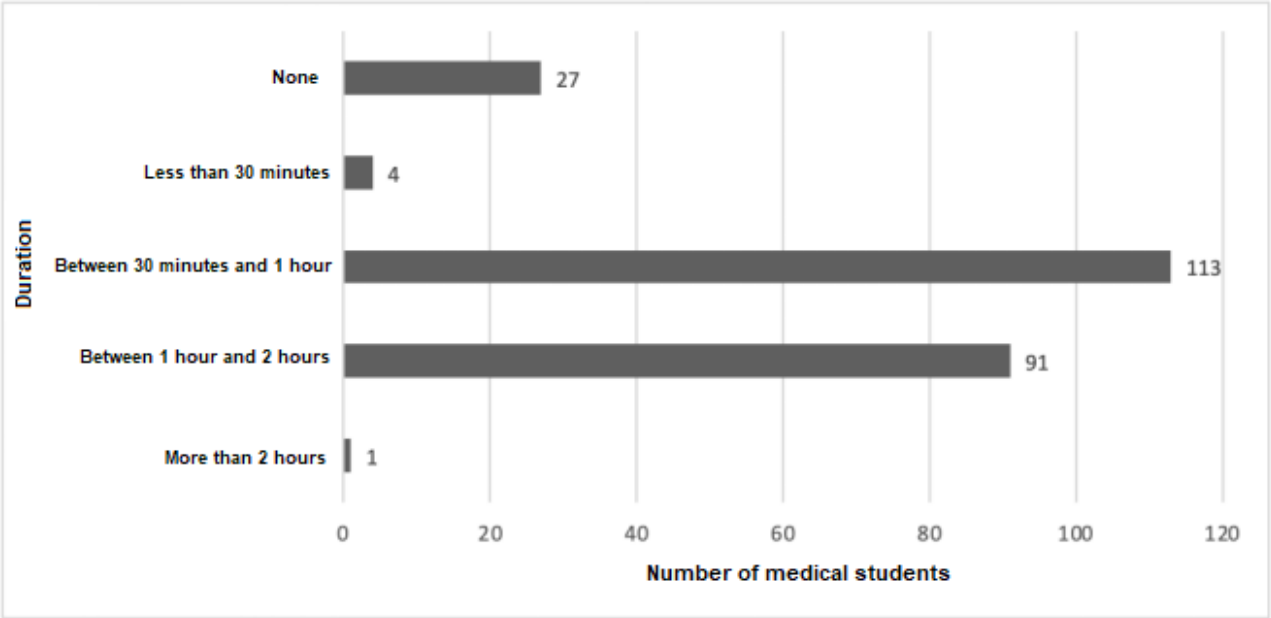
Of those surveyed, 88.6% said they exercised, and, in relation to frequency (Figure 1), 55.9% exercised up to three times a week.

Figure 1. Medical students according to weekly frequency of physical exercise. Blumenau/SC, Brazil, 2024.



Regarding the average duration of exercise sessions (Figure 2), the majority (54.0%) exercise for thirty minutes to one hour.

Figure 2. Medical students regarding the average duration of the physical exercise session. Blumenau/SC, Brazil, 2024.

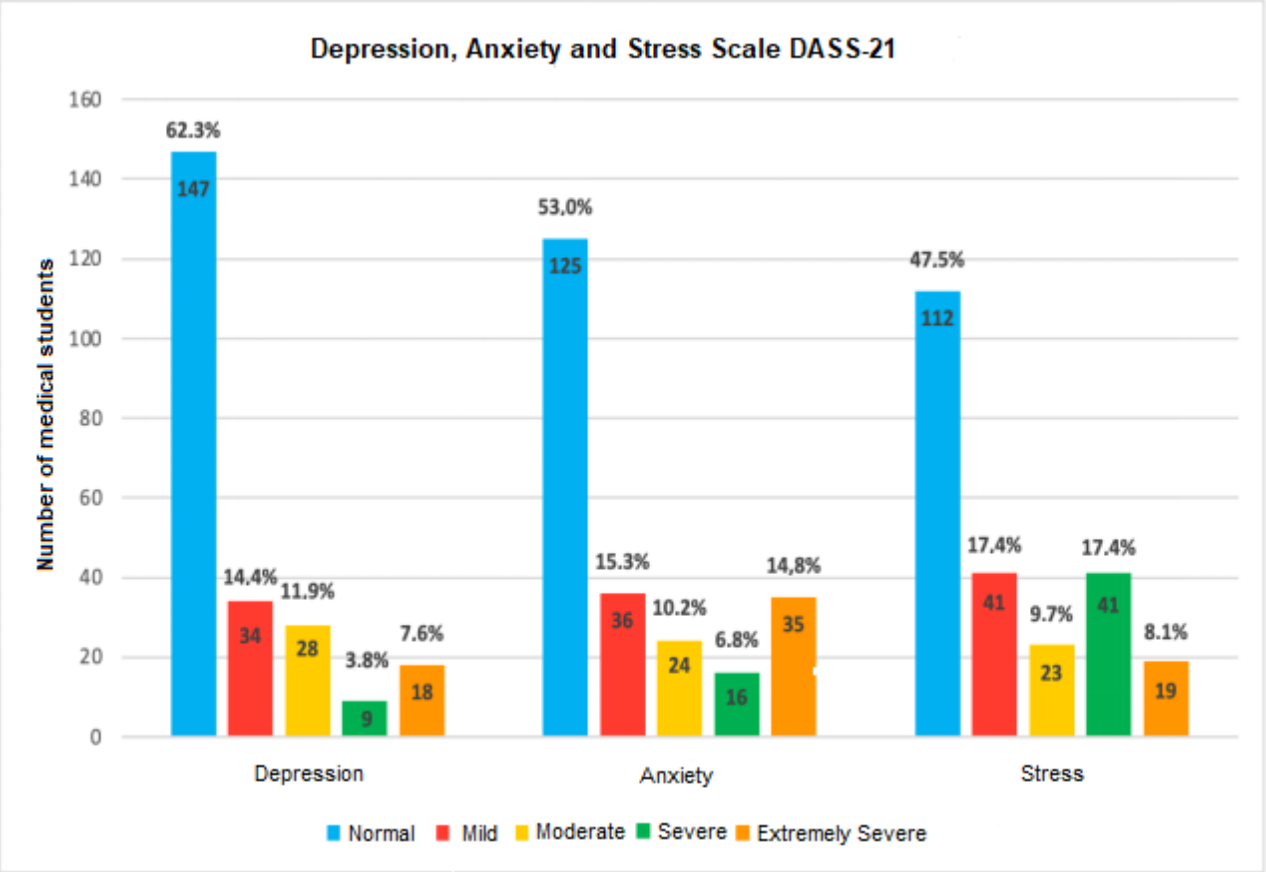


Regarding the type of physical exercise, 50.2% practice both strength exercise (weight training, CrossFit™) and aerobic exercise (running, jogging, cycling or swimming); 32.6% only strength exercsie and 17.2% only aerobic exercise. 62.2% practice exercise individually and 37.8% collectively (groups/with friends).

The students were asked whether the high workload of the medical course was a factor that hindered adherence to regular physical exercise practices, and 87.7% of the participants answered affirmatively .

Considering the classification in the moderate, severe and extremely severe levels of the DASS-21 scale, 23.3% of the students presented symptoms of depression, 31.8% of anxiety, and 35.2% of stress (Figure 3).

Figure 3. Medical students regarding DASS-21 scale results. Blumenau/SC, Brazil, 2024.



When comparing these results from the DASS-21 scale with the habits of physical exercise, considering depression (Table 1), there was no statistical difference between genders, age group or current semester. Regarding housing, the fact that the student lives alone or with friends or family does not change the levels of depression found.

It was also observed that the level of depression among those who practice physical exercise is lower than that of those who do not. Considering the frequency of physical exercise, it was evident that those who practice five times a week have lower scores for signs of depression than the others.

Students who considered that the high workload of studies interferes with the practice of physical exercise presented higher levels of depression.

Regarding the average duration of the exercise session, students who exercise from thirty minutes to one hour presented higher levels than those who exercise from one hour to two hours a day.

Regarding the type of physical exercise (aerobic or strength), there was no difference in results, as well as in practice, whether it is performed individually or collectively.

Table 1. Medical students according to the association between physical exercise habits and the DASS-21 Scale. Blumenau/SC, Brazil, 2024.

Characteristics	DASS-21 (Depression)			Total (n = 236)	*p*
	Normal or mild (n = 181)	Moderate (n = 28)	Severe or extremely severe (n = 27)		
Sex					
Female	133 (73.5%)	16 (57.1%)	23 (85.2%)	172 (72.9%)	0.0605
Male	48 (26.5%)	12 (42.9%)	4 (14.8%)	64 (27.1%)	
Age (years)					
18 to 20	67 (37%)	8 (28.6%)	9 (33.3%)	84 (35.6%)	0.8291
21 to 25	88 (48.6%)	13 (46.4%)	15 (55.6%)	116 (49.2%)	
26 to 30	17 (9.4%)	5 (17.9%)	2 (7.4%)	24 (10.2%)	
31 to 40	7 (3.9%)	1 (3.6%)	1 (3.7%)	9 (3.8%)	
Over 40	2 (1.1%)	1 (3.6%)	0 (0%)	3 (1.3%)	
What semester are you currently studying?					
1st	20 (11%)	4 (14.3%)	3 (11.1%)	27 (11.4%)	0.3268
2nd	13 (7.2%)	3 (10.7%)	3 (11.1%)	19 (8.1%)	
3rd	19 (10.5%)	1 (3,6%)	2 (7.4%)	22 (9.3%)	
4th	20 (11%)	3 (10.7%)	3 (11.1%)	26 (11%)	
5th	19 (10.5%)	3 (10.7%)	4 (14.8%)	26 (11%)	
6th	24 (13.3%)	2 (7.1%)	1 (3.7%)	27 (11.4%)	
7th	23 (12.7%)	7 (25%)	3 (11.1%)	33 (14%)	
8th	15 (8.3%)	0 (0%)	1 (3.7%)	16 (6.8%)	
9th	10 (5.5%)	0 (0%)	0 (0%)	10 (4.2%)	
10th	5 (2.8%)	3 (10.7%)	2 (7.4%)	10 (4.2%)	
11th	6 (3.3%)	0 (0%)	1 (3.7%)	6 (3.3%)	
12th	7 (3.9%)	2 (7.1%)	4 (14.8%)	7 (3.9%)	
Do you live alone?					
Yes, I live alone	62 (34.3%)	9 (32.1%)	9 (33.3%)	80 (33.9%)	0.7735
No, I live with family	99 (54.7%)	18 (64.3%)	15 (55.6%)	132 (55.9%)	
No, I live with friends, acquaintances	20 (11%)	1 (3.6%)	3 (11.1%)	24 (10.2%)	
Do you exercise?					
Yes	165 (91.2%)	25 (89.3%)	19 (70.4%)	209 (88.6%)	0.0066
No	16 (8.8%)	3 (10.7%)	8 (29.6%)	27 (11.4%)	
How frequently do you exercise?					
Once a week	13 (7.2%)	2 (7.1%)	0 (0%)	15 (6.4%)	0.0237
Twice a week	22 (12.2%)	3 (10.7%)	9 (33.3%)	34 (14.4%)	
3 times a week	51 (28.2%)	11 (39.3%)	6 (22.2%)	68 (28.8%)	
4 times a week	36 (19.9%)	4 (14.3%)	3 (11.1%)	43 (18.2%)	
5 times a week	30 (16.6%)	4 (14.3%)	1 (3.7%)	35 (14.8%)	
6 times a week	11 (6.1%)	1 (3.6%)	0 (0%)	12 (5.1%)	
Every day of the week	2 (1.1%)	0 (0%)	0 (0%)	2 (0.8%)	
I do not exercise	16 (8.8%)	3 (10.7%)	8 (29.6%)	27 (11.4%)	
Does the high workload of the Medicine course make it difficult for you to exercise?					
Yes	154 (85.1%)	27 (96.4%)	26 (96.3%)	207 (87.7%)	0.0829
No	27 (14.9%)	1 (3.6%)	1 (3.7%)	29 (12.3%)	
What is the average duration of your exercise session?					
Less than 30 minutes	2 (1.1%)	1 (3.6%)	1 (3.7%)	4 (1.7%)	0.0091
Between 30 minutes and 1 hour	83 (45.9%)	14 (50%)	16 (59.3%)	113 (47.9%)	
Between 1 and 2 hours	79 (43.6%)	10 (35.7%)	2 (7.4%)	91 (38.6%)	

More than 2 hours	1 (0.6%)	0 (0%)	0 (0%)	1 (0.4%)	
I do not exercise	16 (8.8%)	3 (10.7%)	8 (29.6%)	27 (11.4%)	
What type of exercise to you practice?					
Aerobic exercise (e.g.: running, jogging, cycling, swimming)	24 (13.3%)	5 (17.9%)	7 (25.9%)	36 (15.3%)	0.1246
Strenght exercise (e.g.: weight training, crossfit)	53 (29.3%)	10 (35.7%)	5 (18.5%)	68 (28.8%)	
Both	88 (48.6%)	10 (35.7%)	7 (25.9%)	105 (44.5%)	
I do not exercise	16 (8.8%)	3 (10.7%)	8 (29.6%)	27 (11.4%)	
How do you exercise					
I exercise alone	105 (58%)	17 (60.7%)	8 (29.6%)	130 (55.1%)	0.1522
I exercise in a group/with friends	60 (33.1%)	8 (28.6%)	11 (40.7%)	79 (33.5%)	
I do not exercise	16 (8.8%)	3 (10.7%)	8 (29.6%)	27 (11.4%)	

Regarding anxiety, women were the most affected group. There was no statistical difference regarding age group or course semester.

Regarding housing, whether the student lived alone or with friends or family did not change anxiety levels.

There were also no significant differences between the average scores of those who practiced physical exercise and those who did not ($p > 0.05$), as well as regarding the frequency of physical exercise and duration. And students who considered that the high study load interfered with the practice of physical exercise presented higher levels of anxiety symptoms.

The choice of exercise modality (aerobic and/or strength), practiced individually or collectively, also did not present statistical significance, since $p > 0.05$.

Regarding stress, women continued to be the most affected group, but there was no statistical difference regarding age group, course semester or housing option, since $p > 0.05$.

It was observed that, regarding the practice of physical exercise, the results were not significant for stress, since $p = 0.0617$, that is, the stress level is similar among those who practice physical exercise or not.

As for the weekly frequency of training, there was no statistical significance and again, as with depression and anxiety, students who considered that the high workload of studies interfered with the practice of physical exercise presented higher levels of stress.

In terms of duration, those who exercised for less than thirty minutes presented higher levels of stress when compared to other workloads, and the type of training (strength and/or aerobic) and whether it was done individually or collectively also did not present statistical significance.

Table 2 shows the association between physical exercise habits and the DASS-21 instrument. According to the statistical tests performed, it was observed that on the depression

scale the average score was significantly lower in the group of students who practice physical exercise, since $p < 0.05$.

In anxiety and stress, there were no significant differences between the average scores of those who practice physical exercise and those who do not, since $p > 0.05$. Therefore, it can be stated that, in the group studied, the practice of physical exercise substantially reduces only the depression score.

Table 2. Medical students regarding the association between physical exercise habits and the DASS-21 Scale. Blumenau/SC, Brazil, 2024.

DASS-21	5-Do you exercise?		Total (n = 236)	P
	Yes (n = 209)	No (n = 27)		
Depression (Scores)				
(Mean ± SD)	(8.82 ± 8.99)	(13.41 ± 11.42)	(9.35 ± 9.38)	0.0398
(Median ± QD)	(6 ± 5)	(10 ± 9)	(6 ± 6)	
Anxiety (Scores)				
(Mean ± SD)	(8.77 ± 8.91)	(10 ± 9.05)	(8.91 ± 8.92)	0.3482
(Median ± QD)	(6 ± 6)	(8 ± 5.5)	(6 ± 6)	
Stress (Scores)				
(Mean ± SD)	(16.76 ± 10.72)	(18.74 ± 10.79)	(16.98 ± 10.73)	0.2958
(Median ± QD)	(16 ± 8)	(20 ± 7)	(16 ± 9)	

Considering the results of signs of depression, anxiety and stress from the DASS-21 instrument expressed in the tables, it can be seen that: on the depression scale, the average score was significantly lower in the group of students who practice physical exercise, since $p < 0.05$. In anxiety and stress, there were no significant differences between the average scores of those who practice physical exercise and those who do not, since $p > 0.05$. Therefore, it can be stated that, in the group studied, the practice of physical exercise only reduces the depression score. However, students who practice physical exercise are in a better condition when compared to those who do not practice physical exercise.

DISCUSSION

High rates of depression among medical students are widely documented. This study revealed that 23.3% of participants presented symptoms of depression, according to the DASS-21 scale. Similar results were observed in a study that identified depressive symptoms in 28.0% of medical students[10]. Similarly, another study recorded a rate of 34.6% of depressive symptoms[16].

Considering the relationship between depression and the benefits of physical exercise for mental health, this activity is shown to be a relevant strategy for the prevention and management of depression. The mechanisms involved include increased blood flow and cerebral vascularization, in addition to the synthesis of neurotrophic factors, such as Brain-Derived Neurotrophic Factor (BDNF), which in turn stimulates neurogenesis, brain plasticity and the release of neurotransmitters, fundamental elements for mental health[2].

Neurogenesis is the neurochemical phenomenon associated with physical exercise that has the greatest impact on the Central Nervous System[17]. This impact on new neurons is both quantitative and qualitative, since, in addition to generating new neurons, exercise can influence the morphology of newborn neurons[17]. Thus, it is evident that physical exercise can reduce levels of depression, since reductions in brain volume, including structural changes such as neuronal loss and decreased BDNF, are related to depressive episodes[18]. Therefore, physical exercise can be a valuable complementary intervention to reduce depressive symptoms, contributing to mental health and well-being.

With regard to neurotransmitters, it is evident that they are responsible for the feeling of well-being after exercise, since there is a gradual increase in the release of serotonin, dopamine and endorphin, in addition to a decrease in the levels of cortisol, a hormone related to stress, which in turn is a factor that can predispose to the development of depression[4].

In this sense, studies have shown that physical exercise presents the best benefits when compared to other non-pharmacological interventions in depressive symptoms and depression, even in the absence of pharmacological treatment[19].

Another study found a significant role for exercise as a non-pharmacological therapy for depression, reducing its scores and symptoms, but emphasizing that it should be performed systematically and not sporadically for potential benefits[20]. This occurs because patients with depression exhibit changes in brain structure associated mainly with the frontal lobe, cingulate gyrus and hippocampus; since physical exercise has been shown to be effective in maintaining hippocampal neuroplasticity and preserving its volume, its role in stabilizing the mood of such patients is evident[18].

An international meta-analysis conducted to investigate the relationship between the frequency, intensity and duration of physical exercise and levels of depression demonstrated that those who exercised at higher levels and with greater frequency had reduced probabilities of incidence of depression when compared with those who practiced at lower levels[21]. This fact corroborates the results obtained in the present study, since students who exercise for thirty minutes to one hour of physical exercise presented higher levels of depression than those who exercise for one to two hours a day, as well as those who practice physical exercise five times a week have lower scores than the others, since $p < 0.05$.

On the other hand, in a study carried out in Norway with a population cohort, it was observed that the effect of physical exercise was the same in all groups, regardless of the intensity of the physical exercise, highlighting that the benefits of the practice are realized in the first hour performed each week and provide significant protection against future depression, but do not have an impact on the development of anxiety[22].

Correlating these findings with the present study, a divergence was observed regarding the impact of the duration of the exercise, since in the group studied, the levels of depression were lower in those who practiced more hours during the week; However, with regard to the reduction in anxiety levels, the findings are confirmed, since in the current study there were no significant differences in anxiety symptoms according to the frequency of physical exercise and duration.

Although good mental health is essential for human development, high levels of depression and anxiety are found among university students, especially among medical students[23].

In the current study, a rate of 31.8% of symptoms of moderate, severe and extremely severe levels of anxiety were found according to the DASS-21 scale; this is corroborated by a study that found a rate of 37.2% of anxiety symptoms in medical students[16]; and another that demonstrated anxiety in 41.4% of students[23]; in addition to a third study, also conducted with medical students, in which it was found that 33.7% of students presented symptoms of mild, moderate or severe anxiety[10].

This is due to the fact that most Brazilian university students enter college between late adolescence and early adulthood, a period marked by important psychosocial changes, such as the acquisition of greater autonomy, family separation when moving to another city, and greater responsibility for their own lives[10].

In addition, a study conducted with medical students at a university in Montreal (Canada) showed that there are factors inherent to medical training that contribute to the

worsening of such disorders and generate stress in students, such as: intense and extensive workload, difficulty in balancing personal and academic life, competitiveness among students, sleep deprivation, among others[24].

In the present study, 35.2% of students presented symptoms of stress, a percentage lower than that reported in the literature, where the prevalence of stress was 47.1% among students in general[15] and 60.0% among medical students[13]. It was also found that women had higher levels of anxiety and stress compared to men, which is in line with another study that associates the female gender with a greater predisposition to stress and mental disorders[25]. Among the factors that contribute to this vulnerability, mood swings resulting from hormonal changes and the multiple roles assumed by women in society stand out[25].

In addition, the practice of physical exercise substantially reduced the average depression score levels, but did not have an impact on anxiety and stress levels. It is inferred that this is due to the fact that in the context of medical students, there is a greater susceptibility to the development of stress, due to a need to change behavioral and professional attitudes in view of the new responsibilities that the faculty demands, in addition to frequently dealing with suffering, pain and illnesses of people who depend on their care.

Regarding the levels of anxiety symptoms, it is clear that excessive content, short-term assessments, concerns about graduation and the selection processes for admission to medical residency programs, insecurity regarding one's own competence and competition in the job market are factors directly related to the development of anxiety[26].

Medical students have significantly higher rates of depression when compared to students in other courses or even to the general population[27]. This occurs because intense daily demands, competitiveness and factors such as workload, family responsibilities, economic conditions and academic challenges impact the well-being of students, making the medical course environment challenging in many universities[27].

Thus, it is possible that the development of symptoms of stress and anxiety in medical students is multifactorial; and, therefore, the practice of physical exercise alone was not enough to reduce the levels of stress and anxiety in the group studied.

CONCLUSION

Regarding medical students, the extensive course workload and the high level of pressure are factors that trigger and/or aggravate an imbalance in general well-being, in addition to acting as sources of objection to the practice of physical exercise. It was found that physical exercise was able to significantly reduce depression levels in the group studied; however, no significant results were obtained in reducing anxiety and stress levels.

The methodological limitations of the study include its cross-sectional design, which prevents the determination of causal relationships and the generalization of the findings, since the external validity of the results may be restricted to similar contexts. In this sense, further research in the university environment is important to investigate whether HEIs have effective strategies aimed at promoting students' mental health and whether such strategies are being adequately implemented.

It is also essential to verify the promotion of measures for the prevention and management of symptoms related to stress, depression and anxiety. These investigations ultimately seek to contribute to a better quality of life and mental health of academics, promoting a healthier educational environment supported by effective preventive and psychological support practices.

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