Effects of a physical exercise program on psychological well-being in university women

Efectos de un programa de ejercicio físico sobre el bienestar psicológico en mujeres universitarias

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Abstract

Introduction: University students face multiple stressors throughout their academic journey, making them particularly vulnerable to psychopathologies such as anxiety and depression.
Objective: This study examined the effects of a six-week remotely supervised physical exercise program on symptoms of depression, anxiety, stress, and mood in female university students.
Methodology: Thirty-nine participants aged 18–27 were randomized into an experimental group (EG; n = 18), which completed the exercise program, and a control group (CG; n = 19), which did not. Assessments included the Brunel Mood Scale (BRUMS), Beck Inventories (BDI, BAI), and the Perceived Stress Scale (PSS). The structured training combined aerobic, strength, and bodyweight circuit exercises, designed and supervised by the researcher to ensure safety and promote health adaptations.
Results: A paired-samples Wilcoxon test revealed significant improvements for the EG in depression ($p = 0.002$), anxiety ($p = 0.032$), and stress ($p = 0.037$) after the intervention. These benefits persisted for 12 weeks, as indicated in the follow-up. No significant changes were observed in the CG.
Conclusions: Findings suggest that remotely applied, structured exercise can effectively reduce psychological distress in university women, highlighting its potential as a preventive and therapeutic strategy in mental health promotion.

Keywords

Physical exercise; physical activity; depression; anxiety; university students.

Resumen

Introducción: Los estudiantes universitarios enfrentan múltiples factores de estrés a lo largo de su trayectoria académica, lo que los hace particularmente vulnerables a psicopatologías como la ansiedad y la depresión.
Objetivo: Este estudio examinó los efectos de un programa de ejercicio físico supervisado de forma remota durante seis semanas sobre los síntomas de depresión, ansiedad, estrés y estado de ánimo en estudiantes universitarias.
Metodología: Treinta y nueve participantes de entre 18 y 27 años fueron asignadas aleatoriamente a un grupo experimental (GE; n = 18), que completó el programa de ejercicios, y a un grupo control (GC; n = 19), que no lo realizó. Las evaluaciones incluyeron la Brunel Mood Scale (BRUMS), los Inventarios de Beck (BDI, BAI) y la Escala de Estrés Percibido (PSS). El entrenamiento estructurado combinó ejercicios aeróbicos, de fuerza y circuitos con peso corporal, diseñados y supervisados por la investigadora para garantizar la seguridad y promover adaptaciones saludables.
Resultados: Una prueba de Wilcoxon para muestras pareadas mostró mejoras significativas en el GE en depresión ($p = 0,002$), ansiedad ($p = 0,032$) y estrés ($p = 0,037$) después de la intervención. Estos beneficios se mantuvieron durante 12 semanas, según el seguimiento. No se observaron cambios significativos en el GC.
Conclusiones: Los hallazgos sugieren que el ejercicio estructurado aplicado de forma remota puede reducir eficazmente el malestar psicológico en mujeres universitarias, destacando su potencial como estrategia preventiva y terapéutica en la promoción de la salud mental.

Palabras clave

Ejercicio físico; actividad física; depresión; ansiedad; estudiantes universitarios.

Introduction

The relationship between physical and mental health is increasingly recognized, highlighting the importance of this connection for overall physical and mental health outcomes. While the significance of mental health has been disseminated both scientifically and popularly, there remains a predominant focus on physical ailments. It is well-known that many physical diseases are related to psychological disorders, and vice versa. Studies indicate that depression is associated with chronic illnesses such as diabetes and hypertension, both of which can lead to significant morbidity, disability, and mortality, especially in low- and middle-income countries (Bădescu et al., 2016).

The benefits of regular physical exercise are well-established in scientific literature. Cardiovascular diseases, diabetes, cancer, hypertension, obesity, and osteoporosis are among the chronic health conditions frequently reported as reversible, given the benefits achieved through physical activity (Haskell et al., 2007; Knapen et al., 2015; Ruegsegger & Booth, 2018). Among groups of individuals whose symptom severity requires secondary and tertiary prevention, significant improvements in cardiovascular fitness, mood, anxiety, and depressive symptoms can be attained through systematic and regular physical activity.

Physical exercises and activities have increasingly been the focus of studies demonstrating a reduction in vulnerability to psychological stressors during periods that require greater workloads and cognitive performance (Stults-Kolehmainen & Sinha, 2014). University students, typically aged between 18 and 25, are in a developmental stage where they commonly adopt behaviors and lifestyles that extend into adulthood (Sánchez-Ojeda & Luna-Bertos, 2015). It is well known that university life often trends toward unhealthy habits, such as poor nutrition, irregular sleep patterns, increased alcohol consumption, and more sedentary behavior compared to active lifestyles, with limited time for physical activities (Esteves et al., 2017; Prati, Porto, & Ferreira, 2020).

In a survey on physical activity levels among university students and healthy lifestyle habits, Esteves et al. (2017) found that statistically, the number of students engaged in physical practices is below expected levels. Reasons for low adherence include lack of time, pre-established activity schedules that do not fit academic routines, the distance between activity locations and residences, and high costs. Conversely, even with low participation in any type of training, students recognize the importance of physical exercise for improving physical condition and overall health, as well as associating it with reduced stress levels.

As students enter university, they encounter increased demands, responsibilities, and pressures, while also facing indirect influences that lead to unhealthy lifestyles, such as a decrease in regular exercise and an increase in substance use, which heighten risk factors (Cuesta et al., 2014). Additionally, it is known that extended time spent in sedentary behaviors is associated with a higher risk of premature death and chronic diseases such as type II diabetes, metabolic syndrome, and cardiovascular diseases (Patterson et al., 2018; Biswas et al., 2015).

These evidences are increasingly accessible, and the harms of sedentarism and its impact on overall health have become common knowledge. According to the recommendations from the World Health Organization (WHO) and the American College of Sports Medicine (ACSM), healthy adults should engage in: a) moderate-intensity aerobic exercise (75% of maximum oxygen consumption) for 30 minutes a day, five days a week, or b) vigorous-intensity aerobic exercise (>75% of maximum oxygen consumption) for 20 minutes, three days a week, to maintain physical health (WHO, 2010; ACSM, 2013). Evidence suggests that time spent in sedentary behaviors among university students is increasing and progressive (Du et al., 2019). This population has documented high rates of sedentarism (Farinola & Bazan, 2011), often being compared to office workers who need to remain seated for prolonged periods (Moulin & Irwin, 2017). Relevant data indicates that this demographic spends an average of 8.3 hours per day in sedentary behaviors (Mussi et al., 2017). When compared to the general young population, university students show a higher engagement in passive behaviors, with a notable decline over the past decade, along with evident associations of risk and detriment to health (Castro et al., 2020).

The term mental health, widely used today, encompasses mental and neurological aspects and is related to conditions caused by substance use, suicide risk, and associations with psychosocial, cognitive, and

intellectual disorders (WHO, 2019). Consequently, several review studies and meta-analyses demonstrate significant relationships regarding the effects of physical activity or exercise on mental health, including depression (Krogh et al., 2017; Stanton & Reaburn, 2013), anxiety (Jayakody, Gunadasa, & Hosker, 2014; Stonerock et al., 2015), stress (Stubbs et al., 2017), body image and satisfaction (Panão & Carraça, 2020), and quality of life (Wu et al., 2017). Evidence indicates that the most substantial changes in depressive symptoms are typically observed with moderate to vigorous intensity aerobic training (Herbert et al., 2020). Antidepressant effects of aerobic exercise interventions can be observed in randomized clinical trials, where samples generally consist of individuals already diagnosed with depression, assigned to receive exercise intervention, psychotherapy, or both (Schuch et al., 2016; Morres et al., 2019).

There is growing concern regarding the emotional health of university students due to the exponential rise in indicators of depression, anxiety, stress, and even suicidal ideation, as reflected in recent surveys assessing the mental health conditions of this population (Vasconcelos-Raposo et al., 2016; Penha, Oliveira, & Mendes, 2020). It is observed that risk behaviors among university students may be linked to the physical, psychosocial, and developmental changes characteristic of this stage, which typically fosters feelings and sensations of freedom, relaxation, frustration, maturation, fears, and anxieties. Factors such as distancing from parents, family, and friends who form their social network, as well as increased responsibilities and academic demands that lead to exhausting moments and situations, insecurities regarding their professional and personal trajectories, and internal and external pressures (Gomes et al., 2020; Wege, Muth, Li, & Angerer, 2016; January et al., 2018) may be associated with risk behaviors during this phase.

In light of the above, this research aims to investigate the effects of a six-week remote exercise program on symptoms of depression, anxiety, stress, and mood in university women. The study is guided by the following questions: Does participation in a 6-week structured physical exercise program reduce levels of anxiety, depression, and stress among female university students? Are online exercise intervention programs effective? The research hypothesis posits that participation in the six-week remote exercise program will lead to a reduction in symptoms of depression, anxiety, stress, and mood disturbance among university women. It is important to clarify that the present study focuses on the reduction of psychological distress indicators and does not directly assess psychological well-being as a multidimensional construct.

Method

A randomized clinical trial design was chosen for this study, employing an analytical quantitative approach. Participants were allocated randomly into two groups: the Experimental Group (EG) and the Control Group (CG). The intervention was conducted over a six-week period. Participants were recruited through non-probabilistic convenience sampling. Data were collected at three assessment points: baseline (pre-intervention), post-intervention, and follow-up.

Participants

A total of 39 female university students, aged between 18 and 27 years, participated in the study. The participants were randomized into the following categories: a) the Experimental Group (EG), consisting of 18 students who participated in the supervised exercise program; and b) the Control Group (CG), comprising 19 students who did not participate in the supervised exercise program.

The participants were screened to analyze the basic inclusion and exclusion criteria based on the study's intervening factors. The inclusion criteria included being enrolled in an undergraduate or graduate program, being between 18 and 27 years of age, and being sedentary for at least six months. The exclusion criteria encompassed prior participation in physical activity before the offered program, as well as participants with health issues that would prevent them from exercising. Those who did not complete the proposed evaluations or attended fewer than 75% of the twelve scheduled sessions of the intervention were excluded from the study.

The control group consisted of sedentary university students who were randomly selected for this purpose and were instructed not to alter their daily activities or engage in any other regular exercise program. Weekly contact was maintained with the Control Group participants via messages to ensure that they did not engage in any other physical activity.

Ethical aspects

To meet the objectives of this study and the Ethical Research Criteria involving Human Subjects as per Resolution No. 466/12 of the National Health Council, this research project was submitted to the Research Ethics Committee of the Faculty of Sciences, São Paulo State University (UNESP/Bauru) (CAAE: 48317115.2.0000.5398. Opinion Number: 1.311.894).

Instruments

Participants were evaluated through an online form at three time points: pre-test (one session prior to the start of the intervention), post-test (one session after the completion of the interventions), and follow-up (six weeks after the end of the intervention). They responded to the following instruments:

Sociodemographic Inventory: This was used to identify participants and gather information on symptomatic description, medical history, common habits such as exercise or smoking, use of continuous medications, and medical recommendations.

Brunel Mood Scale (BRUMS): Developed for quick measurement of mood states in adult and adolescent populations (Terry, Lane, & Fogarty, 2003), this scale has been validated in Portuguese by Rohlfs et al. (2008). The Brazilian version of the Brunel Mood Scale (BRUMS) underwent a structured translation and back-translation process, followed by evaluation by bilingual experts and semantic adjustments to ensure cultural adequacy. In its first stage of validation with Brazilian athletes, the instrument demonstrated sensitivity to mood changes under different training intensities and coherent intercorrelations among subscales, providing preliminary evidence of construct validity. Additionally, the authors described the instrument as sensitive and trustworthy for assessing mood states in adolescent and adult Brazilian athletes (Rohlfs et al., 2008). It assesses six subjective and transient mood states: Tension (T), Depression (D), Anger (R), Vigor (V), Fatigue (F), and Confusion (C). The factors T, D, R, F, and C are considered negative, while Vigor is classified as a positive factor. The Total Mood Disturbance (TMD) is calculated using the following formula: TMD = (T + D + R + F + C) – V + 100 (Morgan et al., 1987). A mood profile characterized by high vigor and low values for the other variables is referred to as the "iceberg profile," indicative of positive mental health (Morgan et al., 1987).

Beck Inventory (BDI and BAI): The Beck Depression Inventory (BDI; Beck, Steer, & Brown, 1996) and the Beck Anxiety Inventory (BAI; Beck, Epstein, Brown, & Steer, 1988) were initially developed to assess symptoms of depression and anxiety in psychiatric patients and were later adapted for the general population. In Brazil, they were authorized and adapted by Cunha (2001). Both inventories can be administered orally or self-administered and are suitable for ages 17 to 80. The scales are restricted to psychologists, limiting their distribution.

The BDI measures the intensity of depression through symptoms reported by the participants, including: 1. Sadness, 2. Pessimism, 3. Feelings of failure, 4. Dissatisfaction, 5. Guilt, 6. Punishment, 7. Self-hatred, 8. Self-accusations, 9. Suicidal thoughts, 10. Crying, 11. Irritability, 12. Social withdrawal, 13. Indecision, 14. Changes in self-image, 15. Difficulty working, 16. Insomnia, 17. Fatigue, 18. Loss of appetite, 19. Weight loss, 20. Somatic concerns, 21. Loss of libido. Scores range from 0 to 3 for each item, with a total score determining the level of depression intensity, ranging from 0 to 63. The results are categorized into four intervals: minimal (0-11), mild (12-19), moderate (20-35), and severe (36-63).

Beck Anxiety Inventory (BAI): The BAI follows the same procedure and measures the intensity of anxiety symptoms. Its 21 items include: 1. Numbness, 2. Hot flashes, 3. Tremors in the legs, 4. Inability to relax, 5. Fear of the worst happening, 6. Feeling dizzy or lightheaded, 7. Palpitations or rapid heartbeat, 8. Lack of balance, 9. Terrified, 10. Nervous, 11. Feeling suffocated, 12. Tremors in the hands, 13. Shaky, 14. Fear of losing control, 15. Difficulty breathing, 16. Fear of dying, 17. Frightened, 18. Indigestion or discomfort in the abdomen, 19. Feeling faint, 20. Flushed face, 21. Sweating (not due to heat). The results are categorized into four intervals: minimal (0-10), mild (11-19), moderate (20-30), and severe (31-63).

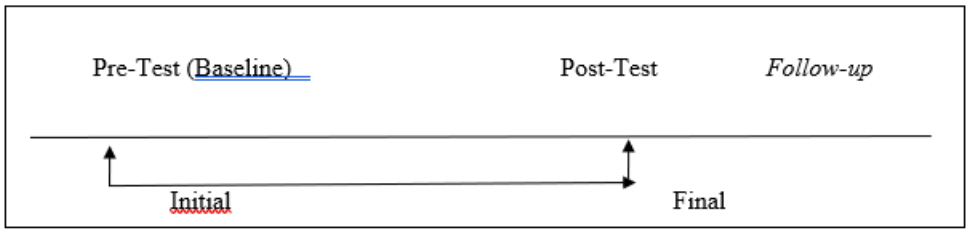
The BDI and the BAI have demonstrated adequate psychometric properties across clinical and non-clinical populations. Studies report satisfactory internal consistency, with Cronbach's alpha coefficients ranging from 0.79 to 0.90 in psychiatric samples, and mean coefficients around 0.86 in meta-analytic findings, indicating strong reliability. In non-psychiatric samples, alpha coefficients around 0.81 have also been observed, supporting their use in the general population. Additionally, evidence of construct and criterion validity has been consistently reported for both instruments, with the BDI effectively discriminating between levels of depressive symptom severity and the BAI accurately assessing anxiety symptoms, both showing convergence with other established measures. These findings support their use in populations similar to the present study (Cunha, 2001).Perceived Stress Scale (PSS): Developed by Cohen and Williamson (1988) and validated for the Brazilian population by Luft et al. (2007), the scale consists of 14 items with response options ranging from zero to four (0=never; 1=almost never; 2=sometimes; 3=almost always; 4=always). Positive-connotation questions (4, 5, 6, 7, 9, 10, and 13) have their scores inverted in the following manner: 0=4, 1=3, 2=2, 3=1, and 4=0. The remaining questions are negative and should be summed directly. The total score can range from zero (no stress) to 56 (extreme stress). Sources of stress were identified through an open-ended question about situations currently causing stress. Personal stress management strategies were assessed using Likert-scale questions ranging from 0 to 4 (0=I do not use; Andrade, 2011).

The PSS- has demonstrated adequate psychometric properties, with satisfactory internal consistency ($\alpha \approx 0.82$), indicating good reliability. Although its factorial structure has shown some variability, the instrument has been reported to be effective in differentiating groups when inferential analyses are applied, suggesting good sensitivity in detecting variations in perceived stress levels (Luft et al., 2007). These findings support its use in populations similar to the present study.

Procedure

Participants enrolled in the intervention program filled out the Informed Consent Form, as well as the other instruments mentioned in the Instruments section. Evaluations were conducted via online forms. The exercise program was disseminated to students from public and private universities through social media and institutional emails. After the enrollment period, participants who met the eligibility criteria were randomly allocated to the Experimental Group (EG) or Control Group (CG) using an online randomization tool. Randomization was performed in a 1:1 ratio by the principal investigator. The study design can be seen in Figure 1.

Figure 1. Design of the Overall Assessment Plan Conducted During the Six Weeks of the Physical Exercise Program



The participants in the Experimental Group (EG) began their activities in March 2021. with remote meetings held twice a week, each session lasting a total of 45 minutes. The training was conducted via the Google Meet platform. It was structured, periodized by the lead researcher, and supervised during each session. Participants were encouraged to engage in physical efforts safely, aiming for positive adaptations in terms of health promotion and improvements in physical condition.

The training included aerobic exercises, strength training, and localized muscle endurance, utilizing body weight in a circuit format and divided into three parts: 1) Warm-Up: Simple aerobic exercises designed to prepare the body for the main training session, focusing on the muscles that support posture; 2) Main Part: A circuit that combines strength exercises, physical conditioning, power, agility, and mobility; 3) Stretching and Relaxation: Activities aimed at calming the body and mind after the workout

The method of Subjective Perception of Effort (PSE) proposed by Foster et al. (2001) was also used to quantify the training load. This method is based on the question: "How was your training session?" asked immediately after the training session. The evaluator instructed the participants to choose a descriptor on a scale from 0 to 10. The maximum value (10) should represent the highest physical effort experienced by the individual, while the minimum value indicates absolute rest (0). In every session, all participants rated their subjective perception of effort (PSE on a scale of 0 to 10) after completing the daily training plan. Following recommendations (Ströhle, 2009), an activity diary was created to track the impressions from each exercise session, aiming to obtain individualized reports of the intervention experiences. Feedback on the association between exercise and psychological well-being may enhance adherence to the exercise program.

Data analysis

Data were analyzed using a non-parametric approach due to the small sample size and the violation of normality assumptions. Descriptive statistics were calculated (median, interquartile range, minimum and maximum values). Between-group comparisons at each time point were performed using the Mann–Whitney U test. Effect sizes (r) were calculated for all pairwise comparisons, interpreted as small (0.1), moderate (0.3), or large (0.5). A significance level of $p < .05$ was adopted. Insert the text of the method with Cambria font, size 11, justified and single line spacing.

This section explains how the research was done. The design of the same is described and it is explained how it was put into practice, justifying the choice of the methods used. This section should contain the type of quantitative research, the scope or depth of the research (exploratory, correlational and/or explanatory), population and sample, and the techniques used should be added. This section is fundamental, because it is the one that will allow the scientific community to reproduce the result. Most of this section should be written in the past tense, in a descriptive style.

Results

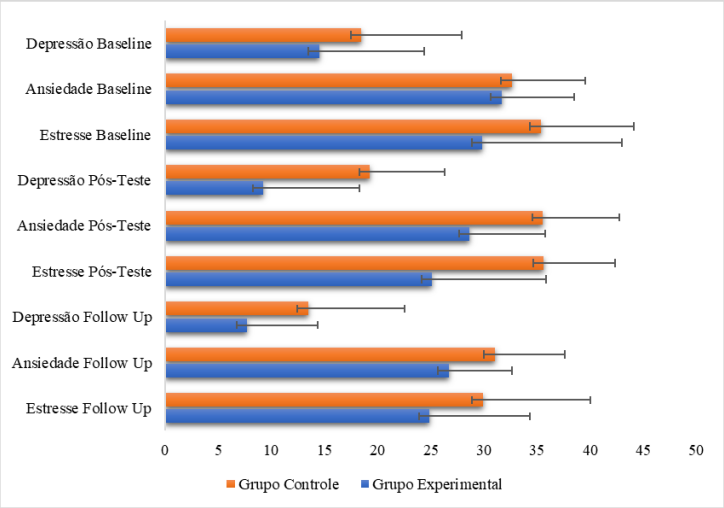
A total of 39 female university students participated in the study, with a mean age of 22.81 ± 2.64 years. Among them, 41% were employed in addition to their studies, while 59% were solely focused on their education. The participants did not report any prior chronic non-communicable diseases such as hypertension, diabetes, heart diseases, or cancer. Eleven participants (29%) reported the use of controlled medications, all of which were antidepressants, used continuously even by those who did not declare a diagnosis of the condition. The participants were randomly divided into the Experimental Group (n=19) and the Control Group (n=19). Table 1 presents the main characteristics of each group at the initial assessment.

Table 1. Descriptive Differences in Baseline Characteristics Between Groups

Characteristic	Experimental Group (n=19)	Control Group (n=19)
Age	23.73±2.40	21.89±2.62
Course Year		
1st Year	0 (0%)	2 (10.5%)
2nd Year	2 (10.5%)	3 (15.8%)
3rd Year	5 (26.3%)	4 (21.0%)
4th Year	6 (31.5%)	5 (26.3%)
5th Year	2 (10.5%)	5 (26.3%)
Postgraduate	4 (21.0%)	0 (0%)
Reported Psychopathology	Anxiety and Depression: 3 (15.8%) Anxiety: 5 (26.3%) Depression: 1 (5.3%) None: 10 (52.6%)	Anxiety and Depression: 0 (0%) Anxiety: 5 (26.3%) Depression: 1 (5.3%) None: 13 (68.4%)
Medication	Antidepressant: 6 (31.6%) No 13 (68.4%)	Antidepressant: 5 (26.3%) No 14 (74.7%)
Smoker	Yes 1 (5.2%) No 18 (94.8%)	Yes 1 (5.2%) No 18 (94.8%)
Work	Yes 10 (52.6%) No 9 (47.4%)	Yes 6 (31.6%) No (68.4%)
Physical Activity (minutes/week)	Light/Moderate 140.26±192.42 Vigorous 41.84±64.40	Light/Moderate 218.42±280.69 Vigorous 396.31±1647.8

After the start of the intervention program, three participants dropped out, with two from the control group and one from the experimental group, bringing the total to 35 participants: 17 in the Experimental Group and 18 in the Control Group. Some differences between the groups in the variables of anxiety, depression, stress, and mood analyzed pre- and post-test can be observed, as shown in Figure 2 and Table 2.

Figure 2. Illustrative comparison between groups on emotional health variables before and after the physical exercise intervention



When statistically analyzing the differences shown in Figure 1, the paired samples test (Wilcoxon) revealed significance for the Experimental Group (EG), indicating that after the remote physical exercise intervention, there was a significant change in the measures of depression symptoms (p=0.002), anxiety (p=0.032), and stress (p=0.037). Although improvements were observed post-intervention, these differences were not statistically maintained at follow-up sustained for 12 weeks post-intervention as reported in the follow-up measure. Such differences were not found in the same manner in the Control Group (CG), which showed a difference only in the anxiety measure (p=0.011).

Additionally, a statistical analysis for independent samples was conducted using the non-parametric Mann-Whitney test. The results demonstrated statistically significant values in the post-test measures for depression (p<0.000), anxiety (p=0.003), and stress (p=0.002). These data indicate that after the six-week intervention, the EG exhibited significantly lower values in the studied variables compared to the CG. There was no statistically significant difference between the groups in the pre-test and follow-up measures. The comparison tests are presented with all measures in Table 2.

The effect size indicated a large magnitude of difference between groups in the post-test for depression (r = 0.64), suggesting a substantial difference favoring the Experimental Group. Similarly, a large effect size was also obtained for the post-test measures of anxiety (r=0.5) and stress (r=0.54), with probabilities of 79.9% and 81.2%, respectively, for participants to show beneficial results in these variable levels while being in the group that underwent the physical exercise intervention.

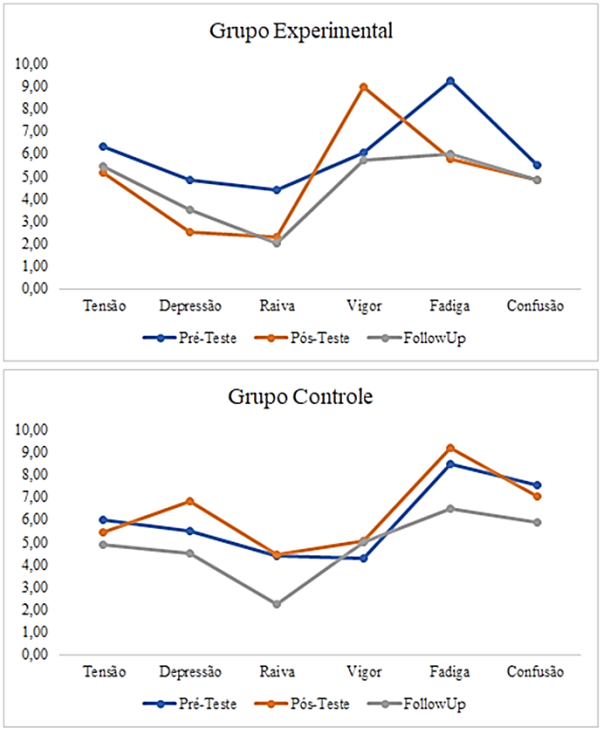
Table 2. Statistics comparing pre-test, post-test, and follow-up measures for the groups, as well as comparisons of measures between groups, can typically be structured as follows

Measure	Intervention		Control			
	Mean±SD	Mediana	Mean±SD	Median	Effect Size (r)	
			Beck BDI Depression			Valor p
Pre	14.47±9.86	14	18.63±9.19	15.5	0.22	0.169
Post	9.23±9.07	8	19.27±6.99	17	0.64	<0.000*
Follow Up	7.75±6.61	8	13.43±9.06	13	0.37	0.056
Paired Wilcoxon	0.002*		0.355			

			Beck BAI Anxiety			
Pre	31.64±6.81	30	32.52±6.72	31	0.02	0.907
Post	28.64±7.10	26	35.55±7.21	35.5	0.5	0.003*
Follow Up	26.68±5.96	24.5	31.0±6.56	33	0.36	0.061
Paired Wilcoxon	0.032*		0.011			
			PSS Stress			
Pre	29.82±13.14	32	35.47±8.51	36	0.18	0.279
Post	25.11±10.69	24	35.61±6.72	33.5	0.54	0.002*
Follow Up	24.88±9.41	22	29.87±10.14	33.5	0.34	0.056
Paired Wilcoxon	0.037*		0.862			

The mood profile variable was also assessed across all measures in both groups. Figure 3 illustrates the comparative performance of participants for each dimension evaluated using the BRUMS instrument. It is observed that the Post-Test measure for the Experimental Group approaches the "iceberg profile." This profile indicates high values for the positive subscale (vigor) and low values for the negative subscales (tension, depression, anger, fatigue, and confusion) at all time points.

Figure 3. Mood Profile of Participants from Both Groups for Pre-Test, Post-Test, and Follow-Up Measures



Discussion

Recent research reveals that there are factors associated with academic life that can exacerbate signs and symptoms of psychopathologies such as depression, anxiety, and stress. Some associations are evident in survey studies, including being female, young (ages 18 to 25), feeling pressured by coursework, reduced hours of sleep, low frequency of leisure activities, low satisfaction with academic performance, lack of emotional support in the academic environment, large volumes of information to comprehend, difficulty balancing limited study time with leisure and domestic activities, competition among students, personal issues, family aspects, competitive entrance exams, unfamiliar teaching methodologies in college, and basic cycles without contact with activities closer to medical practice (Mendes & Dias, 2021). This study considered whether physical exercise could be a positive element in helping to reduce these symptoms, as well as in supporting the physical and psychological well-being of university students. Therefore, the primary objective of this research was to investigate the effects of a six-week remotely

delivered physical exercise program on symptoms of depression, anxiety, stress, and mood in female university students.

The measures presented at different points in this clinical trial demonstrate that after the physical exercise intervention, the students exhibited a reduction in levels of depression, anxiety, and stress, as well as an improvement in dimensions associated with mood profiles. Additionally, when comparing the Experimental Group (GE) to the Control Group (GC), the results were again significant, showing that in the post-test, the participants who received the intervention had statistically significant scores compared to those who did not receive the intervention, particularly in anxiety, depression, and stress. As represented by the results, it is believed that physical exercise may have contributed positively to these psychological variables. Recent research has obtained similar results with the same study design and intervention duration, particularly with different types of training (Herbert et al., 2020; Paolucci et al., 2018; Papp et al., 2019; Yunus, Tam, & Romli, 2020). Similarly, Herbert et al. (2020) investigated whether a structured six-week moderate-intensity aerobic exercise program could impact the symptoms and emotional health of university students. Although their intervention was conducted online and not supervised, their results corroborate the data presented here, due to the improvement in the studied variables such as depressive and anxious symptoms, perceived stress, and body satisfaction among participants following the intervention.

Moreira-Neto et al. (2021) evaluated and compared whether different forms of physical training execution can differently affect depressive symptoms, including the remote exercise format. Their results demonstrate that individuals who engaged in online physical exercise during social distancing experienced better outcomes in vigorous physical activity compared to those who practiced self-guided exercise or did not engage in any physical activity. Additionally, they found similar results between remote and in-person exercise assessments regarding physical activity scores. The authors highlighted that supervised exercise strategies (whether remote or not) and self-guided workouts during social distancing can be more beneficial than not exercising at all, as vigorous physical activity has been associated with improved mental health. Therefore, the present research shows that symptoms of depression, anxiety, and stress significantly decreased when comparing the Experimental Group (GE) to the Control Group (GC), especially in the post-test measurement. Thus, it is believed that remotely supervised physical exercise can be an effective strategy for balancing symptoms of depression, anxiety, and stress in university women.

Some limitations should be noted for future studies. Firstly, it is important to highlight the lack of physical assessment, which does not allow for claims linking improvements in physical conditioning with reductions in psychopathological symptoms. This can be pointed out as a confirmation bias. Additionally, other considerations include the lack of material and infrastructure in each participant's home. Consequently, the intensity, variation, and change of stimuli were limited and noticeable for the development of physical conditioning, strength, power, and speed, as the exercises were performed only with body weight and without any other equipment. It was also observed that some participants struggled due to a lack of body awareness, as many had never engaged in any physical activity; therefore, starting in a remote format could be a hindering factor for adherence, continuity, and execution of the activity. In an effort to control the potential risk of biases within the research, a randomized clinical trial design was adopted. However, it is known that the sample in question is small, which could interfere with the results. Finally, specific aspects of experimental research involving humans in non-laboratory environments can be noted as study limitations, including the lack of clinical diagnoses for possible psychopathologies (such as depression, anxiety, post-traumatic stress, and others).

In this study, physical exercise proved relevant in addressing symptoms of anxiety, depression, and stress, demonstrating a significant reduction in the group that participated in the training compared to the group that remained inactive during the intervention. These results highlight the important role that physical exercise can play in reducing symptoms of anxiety, depression, and stress among university students, even in the face of limitations. Furthermore, it was confirmed that regular involvement in low to moderate intensity exercise for six weeks is effective in alleviating subclinical symptoms of depression and anxiety, as well as perceived stress in this sample. Interventions involving basic exercises, without the need for heavy loads, short-term, and conducted remotely can be on indicators of emotional

health in university students. We believe that physical exercise should be encouraged and even incorporated into the daily routines of universities as a preventive measure for physical well-being, emotional health, and overall health.

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