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ARTIGO ORIGINAL

RELATIONSHIP BETWEEN SLEEP QUALITY AND PSYCHOLOGICAL ASPECTS IN COLLEGE ATHLETES

Relação da qualidade do sono com aspectos psicológico em atletas universitários

Relación entre la calidad del sueño y los aspectos psicológicos en atletas universitarios

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Julio Cesar Barbosa de Lima Pinto[1] **Micael Domingos de Medeiros**[2] **André Igor Fonteles**[3]

[1] Federal University of Rio Grande do Norte, Natal, Brazil; [2] Terra Nordeste College, Caucaia, CE, Brazil; [3] Federal Institute of Education, Science, and Technology of Ceará – IFCE, Itapipoca, CE, Brazil

Corresponding author: Julio Cesar Barbosa de Lima Pinto - julioduibmx@gmail.com

ABSTRACT

Introduction: Insufficient sleep is associated with poor cognitive performance, which can negatively impact psychological aspects in athletes. **Objective**: To evaluate sleep quality and sleepiness in college athletes and the relationship between sleep variables and mood state and stress tolerance. **Methods**: This is an observational, cross-sectional study with a quantitative approach. Sixty-six college athletes of both genders from a public higher education institution participated. Information on participant characteristics was collected, along with questionnaires to assess sleep quality, sleepiness, mood state, and stress tolerance. Data normality was verified using the Shapiro-Wilk test, and an independent t-test was used to compare characterization variables and sleep and psychological variables between genders. Pearson's correlation coefficient was used to analyze the relationship between sleep and psychological variables. **Results**: 57% (n=38) of participants had poor sleep quality, and 18.2% (n=12) were classified as having a sleep disorder, while 36.4% exhibited excessive daytime sleepiness. Significant correlations were found between sleep variables (PSQI and sleepiness) and both mood state and stress tolerance. **Conclusion**: College athletes have a high prevalence of poor sleep quality, a positive relationship between sleep quality and mood state, and a negative relationship with stress tolerance. Worse mood and stress scores were related to sleep variables.

Keywords: Athletes; Sleep quality; Mood; Stress.

RESUMO

Introdução: Sono insuficiente se associa a um baixo desempenho cognitivo, podendo impactar negativamente em aspectos psicológicos em atletas. **Objetivo**: avaliar a qualidade do sono e a sonolência em atletas universitários e a relação das variáveis de sono com o estado de humor e tolerância ao estresse. **Métodos**: Trata-se de um estudo observacional, com delineamento transversal e natureza quantitativa. Participaram 66 atletas universitários de ambos os sexos de uma instituição de ensino superior pública. Forma coletadas informações sobre caracterização dos participantes e questionários para avaliar a qualidade do sono, sonolência, estado de humor e tolerância ao estresse. A normalidade dos dados foi atestada pelo teste de Shapiro-Wilk, utilizou-se Test-t independente para comparar as variáveis de caracterização e as variáveis de sono e psicológicas entre os sexos. Utilizou-se o coeficiente de correlação de Pearson para analisar a relação entre as variáveis de sono e psicológicas. **Resultados**: 57% (n=38) apresentaram sono ruim e 18,2% (n=12) foram classificados com distúrbio, 36,4% apresentaram sonolência diurna excessiva. Houve correlações das variáveis de sono: IQSP, sonolência com o estado de humor e a tolerância ao estresse. **Conclusão**: Os estudantes atletas apresentam uma alta prevalência de má qualidade de sono, relação positiva da qualidade do sono com estado de humor e negativa com tolerância ao estresse. Os piores escores de humor e de estresse se relacionaram com as variáveis do sono.

Palavras-chave: Atletas; Qualidade do sono; Humor; Estresse.

RESUMEN

Introducción: El sueño insuficiente está asociado con un bajo rendimiento cognitivo y puede afectar negativamente los aspectos psicológicos de los atletas. **Objetivo**: Evaluar la calidad del sueño y la somnolencia en atletas universitarios, y la relación entre las variables del sueño, el estado de ánimo y la tolerancia al estrés. **Métodos**: Este estudio observacional transversal, de naturaleza cuantitativa, contó con la participación de 66 atletas universitarios de ambos sexos de una institución pública de educación superior. Se recopilaron datos sobre la caracterización de los participantes y se aplicaron cuestionarios para evaluar la calidad del sueño, la somnolencia diurna, el estado de ánimo y la tolerancia al estrés. La normalidad de los datos se comprobó mediante la prueba de Shapiro-Wilk. Se utilizó la prueba t independiente para comparar las variables del sueño y psicológicas entre sexos, y el coeficiente de correlación de Pearson para analizar la relación entre las variables del sueño y los aspectos psicológicos. **Resultados**: El 57% de los participantes (n=38) presentó mala calidad del sueño, el 18.2% (n=12) fue clasificado con trastorno del sueño, y el 36.4% mostró somnolencia diurna excesiva. Se encontraron correlaciones entre las variables del sueño con el estado de ánimo y la tolerancia al estrés. **Conclusión**: Los atletas universitarios presentan una alta prevalencia de mala calidad del sueño, con una relación positiva entre la calidad del sueño y el estado de ánimo, y una relación negativa con la tolerancia al estrés, observándose los peores puntajes de ánimo y estrés en quienes presentaron problemas de sueño.

Palabra Clave: Atletas; Calidad del sueño; Estado de ánimo; Estrés..

INTRODUCTION

Sleep is a fundamental component of human life. Depending on the stage of life - childhood, adulthood, or old age - different amounts of sleep are recommended[1]. According to the National Sleep Foundation[1], young adults require an average of eight hours of sleep per day, while adolescents need between eight and ten hours. However, maintaining adequate and high-quality sleep is often challenging. These difficulties are frequently experienced by university students and athletes[2], especially those who fall into both categories, as they must juggle the competing demands and concerns of a dual role as student-athletes[2,3].

The impact of poor sleep quality and insufficient duration is increasingly concerning, and university athletes are no exception. The literature indicates that inadequate sleep can lead to reduced cognitive performance and negatively affect mood in university athletes[2,4,5]. In addition to mood, stress is a significant modulator of sleep quality, with evidence showing a positive correlation between stress levels and poor sleep quality[5,6]. Supporting these findings, it was observed by Charest and Grandner[6] that poor sleep quality and short sleep duration are associated with cognitive effects related to stress the following day. Moreover, researchers found reverse associations, where stressful and cognitively demanding experiences throughout the day lead to delayed sleep and wake times.

Similarly, the impact of poor sleep quality was reported by Benjamin et al.[7], who investigated the relationship between sleep dysfunction and mood states in athletes. Their findings revealed that sleep dysfunction was associated with decreased vigor and increased tension, depression, anger, and fatigue. In parallel, it was reported by Amaral et al.[8] that university students experience sleep difficulties due to perceived stress.

The literature thus documents poor sleep quality and short sleep duration among university students. However, there is still a lack of consistent evidence regarding how these factors are associated with psychological aspects in university athletes and whether male and female athletes exhibit similar patterns. Therefore, the aim of this study was to evaluate sleep quality and sleepiness in university athletes, as well as the relationship between sleep variables, mood states, and stress tolerance.

METHODS

Study Design

This observational study employed a cross-sectional design with a quantitative approach. Data collection occurred between September and November 2022. The study complies with Resolution No. 466/12 of the National Health Council and the Declaration of Helsinki for research involving human subjects. It was approved by the Research Ethics Committee of the Federal University of Ceará under approval number 3.836.031.

Sample

The study included 66 university athletes of both sexes from a public higher education institution, participating in basketball, handball, volleyball, and futsal. These athletes trained at least three times per week in their respective sports and performed supplementary training (strength training specific to each sport) at least once a week. University athletes under the age of 18 (n = 4) and those who did not complete the questionnaires correctly (n = 6) were excluded.

Instruments and Procedures

After the research objectives and procedures were presented to the sports activity coordinator and the university athletes, participants provided voluntary and informed consent. The instruments were organized using the Google Forms survey management tool and shared via messaging apps (WhatsApp). The form included a restatement of the research objectives, information about potential risks and benefits, participant characterization questionnaires, and instruments for assessing sleep quality, daytime sleepiness, mood, and stress tolerance.

Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), which was translated and validated for Brazilian Portuguese by Bertozali et al.[9]. The questionnaire consists of 11 items grouped into seven components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. The total score ranges from 0 to 21, with scores from 0 to 4 indicating good sleep quality, 5 to 10 indicating poor sleep quality, and scores above 10 indicating a sleep disorder. The Brazilian Portuguese version of the questionnaire has a reliability coefficient of 0.82 (Cronbach's α)[9].

Daytime sleepiness was assessed using the Epworth Sleepiness Scale, which evaluates the likelihood of dozing off in eight daily situations[10] (sitting and reading, watching TV, sitting in a public place, riding in a car as a passenger, sitting quietly after lunch, and sitting in a car stopped in traffic). Athletes rated each situation from 0 to 3, where "0" indicates no chance of dozing, "1" a slight chance, "2" a moderate chance, and "3" a high chance of dozing. The total score ranges from 0 to 24, with scores above 10 indicating excessive daytime sleepiness. This instrument was previously translated and validated for use in Brazil, showing reliability (ICC = 0.85) and internal consistency (Cronbach's $\alpha = 0.79$)[10].

Mood was assessed using the Brunel Mood Scale (BRUMS), which was previously translated and validated for use in Brazil[11]. The instrument provides quick insight into the mood state of adults and youth and has acceptable internal consistency (Cronbach's $\alpha = 0.76–0.90$)[11]. The scale contains 24 items related to mood states, addressing feelings of anger, vigor, nervousness, and dissatisfaction. Each item is rated on a scale from 0 to 4: "0 not at all" to "4 extremely"[11].

The Daily Analysis of Life Demands in Athletes (DALDA) questionnaire was used to measure participants' stress tolerance. It is divided into two parts: Part A (sources of stress) and Part B (symptoms of stress). Part A contains 9 items, and Part B contains 25. University athletes rated each item as "worse than normal," "normal," or "better than normal" according to their perceptions. The instrument was previously translated and validated for use in Brazil[12] and demonstrates internal consistency in the literature (Cronbach's $\alpha = 0.90$)[13].

Descriptive statistics (mean, standard deviation, percentage, and frequency) were used to present the data. Due to the nature of the variables (psychometric instruments), independent t-tests were used to compare characterization variables, and the Mann–Whitney test was used to compare sleep and psychological variables between sexes. Spearman's correlation coefficient was used to analyze the relationship between sleep and psychological variables. Statistical significance was set at $p < 0.05$.

RESULTS

A total of 66 individuals were evaluated, with 65.2% (n = 43) being female and 34.8% (n = 23) male. Regarding sleep quality (PSQI), 57% (n = 38) were classified as having poor sleep, and 18.2% (n = 12) were identified as having a sleep disorder. Excessive daytime sleepiness was present in 36.4% of the sample.

Table 1 presents the sample characterization data, stratified by sex. Age, body weight, and height were lower among females. Sleep-related variables did not differ between males and females. Psychological variables showed sex-based differences, with higher levels of depression, fatigue, and tension, and lower levels of vigor and stress tolerance among women.

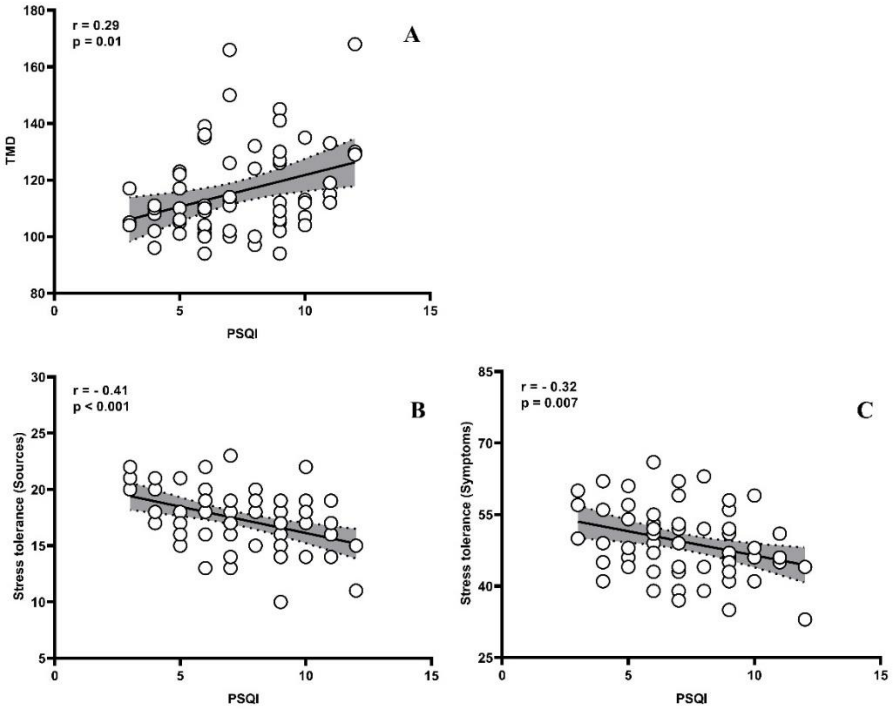
Table 1 – Sample Characterization.

	All	Male	Female	T	p-value
Age (years)	22.82(2.73)	21.82(2.14)	23.35(2.88)	-2.233	0.029*
Body mass (kg)	68.18 (14.29)	77.82(12.02)	63.02(12.51)	4.581	<0.001*
Height (m)	1.69(0.10)	1.79(0.07)	1.64(0.07)	8.338	<0.001*
BMI (kg/m²)	23.52(3.20)	24.00(2.78)	23.26(3.41)	0.897	0.373
Sleep variables				Z	p-value
PSQI (au)	7.25(2.40)	7.52(2.10)	7.11(2.55)	-0.693	0.488
Sleepiness (au)	8.21(3.77)	7.52(2.76)	8.58(4.19)	-1.196	0.232
Psychological variables				Z	p-valor
Anger (au)	3.24(4.00)	2.17(2.93)	3.81(4.40)	-1.287	0.198
Confusion (au)	3.81(3.47)	3.00(2.67)	4.25(3.78)	-1.162	0.245
Depression (au)	3.40(3.69)	2.26(2.97)	4.02(3.92)	-2.380	0.017*
Fatigue (au)	7.39(3.76)	5.91(3.35)	8.18(3.76)	-2.202	0.028*
Tension (au)	5.30(3.56)	4.08(2.25)	5.95(3.96)	-1.912	0.056
Vigor (au)	7.13(3.18)	8.21(3.56)	6.55(2.83)	-2.055	0.040*
TMD (au)	116.03(16.17)	109.21(11.13)	119.67(17.11)	-2.626	0.009*
ST sources (au)	17.40(2.62)	17.91(2.60)	17.13(2.62)	-0.922	0.357
ST symptoms(au)	49.15(7.03)	51.47(6.27)	47.90(7.16)	-2.089	0.037*

Abbreviations: ST = Stress Tolerance; BMI = Body Mass Index; PSQI = Pittsburgh Sleep Quality Index; TMD = Total Mood Disturbance; au = Arbitrary Units; T = Independent t-test; Z = Mann-Whitney U test.
*Significant difference.

Figure 1 presents the correlations between PSQI scores, total mood disturbance, and stress tolerance. The PSQI score showed a weak positive correlation with total mood disturbance (TMD) ($r = 0.29$, $p < 0.01$ [Figure 1A]); a weak negative correlation with stress tolerance related to sources ($r = -0.41$, $p < 0.01$ [Figure 1B]) and symptoms ($r = -0.32$, $p < 0.01$ [Figure 1C]). Additionally, PSQI scores showed weak positive correlations with the depression subscale score ($r = 0.33$, $p < 0.01$) and the tension subscale score ($r = 0.25$, $p = 0.03$).

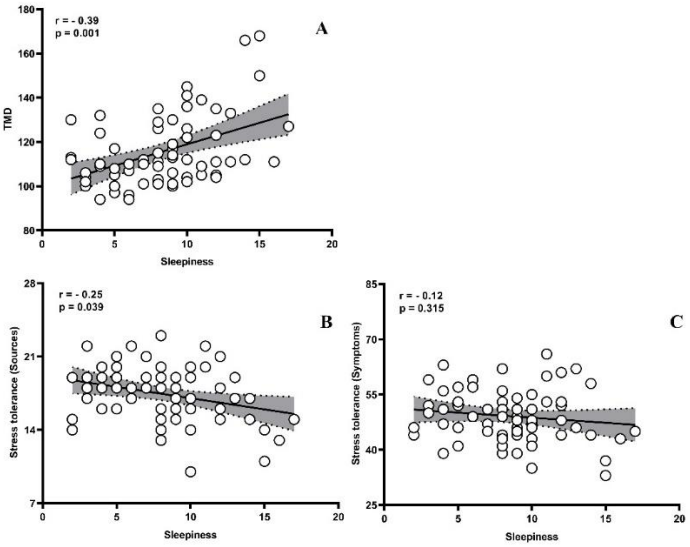
Figure 1 - Correlations between PSQI scores and total mood disturbance as well as stress tolerance.



A: Correlation between total mood disturbance and PSQI scores; B: Correlation between stress tolerance (sources) and PSQI scores; C: Correlation between stress tolerance (symptoms) and PSQI scores.

Figure 2 presents the correlation between sleepiness scores, total mood disturbance, and stress tolerance. Sleepiness scores showed a weak positive correlation with total mood disturbance (TMD) ($r = 0.39$, $p < 0.01$ [Figure 2A]); a weak negative correlation with stress tolerance related to sources ($r = -0.25$, $p = 0.03$ [Figure 2B]); and no correlation with stress tolerance related to symptoms ($p = 0.31$ [Figure 2C]). Additionally, sleepiness was weakly positively correlated with anger ($r = 0.33$, $p < 0.01$), confusion ($r = 0.29$, $p = 0.01$), fatigue ($r = 0.40$, $p < 0.01$), and tension ($r = 0.39$, $p < 0.01$).

Figure 2 - Correlations of sleepiness scores with total mood disturbance and stress tolerance.



A: Correlation between total mood disturbance and sleepiness; B: Correlation between stress tolerance (sources) and sleepiness; C: Correlation between stress tolerance (symptoms) and sleepiness.

Table 2 presents the correlations separated by sex. Sleep and psychological variables correlated only in women. The PSQI score correlated negatively and with moderate magnitude with stress sources and symptoms ($p < 0.05$). Furthermore, the PSQI score correlated positively and with weak magnitude with total mood disturbance and the confusion and depression subscales ($p < 0.05$). Sleepiness, in turn, correlated positively and with weak magnitude only with stress sources ($p < 0.05$); while sleepiness correlated positively and with moderate magnitude with the fatigue subscale ($p < 0.05$), and with weak magnitude with the anger ($p < 0.05$), tension ($p < 0.05$), and total mood disturbance ($p < 0.05$) subscales

Table 2 – Correlations between PSQI and sleepiness scores with mood subscales, total mood disturbance, and stress tolerance (sources and symptoms).

		Anger		Confusion		Depression		Fatigue		Tension		Vigor		TMD		Sources		Symptoms	
		r	p-value	r	p-value	r	p-value	r	p-value	r	p-value	r	p-value	r	p-value	r	p-value	r	p-value
PSQI	M	0.02	0.91	0.06	0.78	0.39	0.07	0.27	0.21	0.01	0.99	-0.19	0.38	0.25	0.26	-0.34	0.11	-0.09	0.67
	F	0.20	0.21	0.31*	0.04	0.43*	0.01	0.26	0.09	0.30	0.05	-0.25	0.10	0.39*	0.01	-0.47*	0.01	-0.44*	0.01
Sleepiness	M	0.27	0.21	0.13	0.57	0.38	0.07	0.24	0.27	0.34	0.11	-0.08	0.71	0.41	0.05	-0.10	0.65	0.13	0.55
	F	0.34*	0.03	0.23	0.15	0.05	0.77	0.43*	0.01	0.37*	0.01	0.03	0.85	0.31*	0.04	-0.32*	0.03	-0.19	0.22

PSQI: Pittsburgh Sleep Quality Index; TMD: Total Mood Disturbance; M: Male; F: Female; * Significant correlation.

DISCUSSION

The present study evaluated sleep quality, daytime sleepiness, and their relationship with psychological variables in collegiate athletes. The main findings revealed that 83.3% of student-athletes exhibited poor sleep quality, and sleep-related variables were correlated with measures of stress tolerance and mood state. Additionally, a novel contribution of this study to the literature is that, when participants were divided by sex, only female collegiate athletes maintained correlations between sleep and psychological variables.

This study identified poor sleep quality in 83.3% of collegiate athletes across different sports disciplines. This may be associated with substantial use of electronic devices and social media, time management challenges, and academic demands[14]. These results exceed those reported in some previous studies; however, a recent investigation found that 42.4% of collegiate athletes had poor sleep quality[15]. These findings warrant attention, as sleep problems can directly impact academic performance. Turner et al.[16] found that difficulty falling asleep was associated with a higher likelihood of lower grades among collegiate athletes. Furthermore, Wilkes et al.[17] emphasized that sleep is essential for maintaining optimal health. Collegiate athletes represent a population with unique characteristics—time constraints, elevated stress levels, and sleep behaviors typical of youth - which can negatively affect athletic performance and increase injury rates.

In the present study, excessive daytime sleepiness was observed in 36.4% of student-athletes. Although daytime sleepiness remains underexplored in collegiate athletes[6], our findings are consistent with previous studies[6,15,18]. Instruments used to assess sleepiness and daily functioning reported prevalence rates of 19%[18] and 22%[19]. A prevalence of excessive daytime sleepiness around 51% was found by Araújo et al.[20] when investigating students under similar conditions. The authors attributed these findings to high academic demands, early morning classes, use of electronic devices before bedtime, sleep deprivation, and irregular sleep-wake schedules - common among university students. For collegiate athletes, subjective sleep information is a relevant metric for coaches, physical trainers, and strength and conditioning professionals. Special considerations should be made when evaluating and interpreting sleep characteristics and implementing sleep interventions in this population[19].

The findings of this study showed that the PSQI score was negatively correlated with stress tolerance, both in terms of sources and symptoms. The daily life of student-athletes, marked by poor sleep quality, impacts their stress tolerance and supports recent literature emphasizing that sleep is a key determinant of health, well-being, and performance in collegiate athletes[2]. It was found by Lund et al.[21] that emotional and academic stress negatively affected sleep in most university students. Moreover, short and poor-quality sleep has been consistently and independently associated with elevated stress levels in university students[22]. Factors supporting this association include reduced emotional coping capacity and diminished ability to effectively deal with frustration when student-athletes are chronically exposed to inadequate sleep[22,23]. It was highlighted by Kroshus et al.[2] that during college years, a multitude of daily factors combined with training and competition schedules may contribute to poor sleep quality and high stress levels.

A positive correlation was observed between mood state and both sleep quality and daytime sleepiness among collegiate athletes, particularly in the variables tension, depression, anger, confusion, and total mood disturbance. It was emphasized by Andrade et al.[24] that coaches and athletes should adopt techniques and strategies for proper sleep and mood management to ensure athletes are well-prepared for important competitions. Associations between mood subscales (confusion, depression, and fatigue) and poor sleep quality are well-documented in the literature[24], reinforcing the findings of the present study. Similarly, comparable results were reported by Benjamim et al.[7], showing that among male and female

collegiate athletes, higher levels of tension, depression, and total mood disturbance were present in those with poor sleep quality. Adequate attention should be given to collegiate athletes, as prolonged sleep problems expose them to an even greater risk of mood deterioration due to sleep insufficiency[4].

An interesting and noteworthy finding in this investigation is that correlations between sleep measures and psychological aspects remained consistent only among female collegiate athletes, not among males. Although no significant differences were found in sleep variables between men and women, the literature supports that female athletes report poorer sleep quality[2]. Some studies suggest that female collegiate athletes exhibit poor sleep behaviors, which are associated with higher total mood disturbance and lower stress tolerance[25]. However, other evidence indicates that men tend to score lower on mood subscales compared to women[26]. Several conditions documented in the literature may contribute to poor sleep quality and its association with psychological aspects, such as exposure to training loads and competition schedules[27]. Additionally, during different phases of the menstrual cycle, female athletes experience symptoms that influence sleep and alter mood states, potentially exerting a stronger impact on women[28]. These findings highlight the need for more comprehensive management of female collegiate athletes to better support their performance.

Although this study presented relevant findings, it is important to consider some limitations. First, the sample size could have been larger to provide broader coverage and allow the results to better reflect the reality of most individuals in the collegiate sports context. Furthermore, the instruments used were subjective methods for assessing sleep and psychological aspects. Despite these limitations, it is important to emphasize that, although subjective, the instruments employed in this research (sleep parameters and psychological measures) are validated and possess robustness and reliability for application and extrapolation to similar populations. Moreover, they are sufficiently useful for managing the health of collegiate athletes.

CONCLUSION

It is concluded that collegiate athletes present a high prevalence of poor sleep quality. Additionally, sleep quality shows a positive relationship with mood state and a negative relationship with stress tolerance. In parallel, collegiate athletes exhibit low levels of excessive daytime sleepiness. Finally, the worst scores in mood and stress were related to sleep variables, and this relationship remained consistent only among female collegiate athletes.

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