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Relationships Between Physical Activity, Psychological Symptoms, and Sleep Quality in Young Adults: A Body Composition Perspective

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ABSTRACT

Background: Physical activity, mental health, and sleep are interconnected factors influencing well-being in young adults. This study investigated the relationships among physical activity, psychological symptoms (depression, anxiety, stress), sleep quality, and body composition in a sample of Turkish university students.

Methods: A cross-sectional study included 572 university students, with 50.5% female participants and a mean age of 20.79±2.71 years. Physical activity was measured using the Physical Activity Scale–2 (PAS-2), psychological symptoms using the DASS-21, and sleep quality using the Basic Scale for Insomnia Complaints and Sleep Quality, Body composition was assessed with the InBody 120 (BIA). Descriptive statistics, Pearson correlation analyses, and multiple regressions were conducted to examine the relationships between the study variables.

Results: Physical activity did not show significant associations with psychological symptoms or sleep quality ($p>.05$). Higher depression and stress scores predicted poorer sleep quality ($\beta=.175$ and $\beta=.246$, respectively $p<.01$), while anxiety was not a significant predictor. Skeletal muscle mass and basal metabolic rate showed negative associations with psychological symptoms, while body fat percentage was positively linked to anxiety and overall DASS-21 scores.

Conclusions: Among university students, psychological symptoms and specific body composition measures appear to be more closely linked to sleep quality than physical activity. These findings underscore the complex interactions between mental health, physiological factors, and sleep, highlighting the need for multidimensional strategies to enhance well-being in young adults.

Keywords: Anxiety, Body composition, Depression, Physical Activity, Sleep quality, Stress.

ÖZET

Arka plan: Fiziksel aktivite, ruh sağlığı ve uyku, genç yetişkinlerde iyi oluşu etkileyen birbiriyle ilişkili faktörlerdir. Bu çalışma, Türk üniversite öğrencilerinde fiziksel aktivite, psikolojik belirtiler (depresyon, anksiyete, stres), uyku kalitesi ve vücut kompozisyonu arasındaki ilişkileri incelemeyi amaçlamıştır.

Yöntemler: Kesitsel tasarıma sahip bu çalışmaya, %50,5'i kadın katılımcılardan oluşan ve yaş ortalaması 20,79±2,71 yıl olan 572 üniversite öğrencisi dahil edilmiştir. Fiziksel aktivite Fiziksel Aktivite Ölçeği–2 (FAÖ-2), psikolojik belirtiler DASS-21 ve uyku kalitesi Uykusuzluk Şikayetleri ve Uyku Kalitesi Temel Ölçeği ile değerlendirilmiştir. Vücut kompozisyonu InBody 120 (BIA) cihazı ile ölçülmüştür. Değişkenler arasındaki ilişkileri incelemek için tanımlayıcı istatistikler, Pearson korelasyon analizi ve çoklu regresyon analizleri uygulanmıştır.

Bulgular: Fiziksel aktivite, psikolojik belirtiler veya uyku kalitesi ile anlamlı bir ilişki göstermemiştir ($p>.05$). Daha yüksek depresyon ve stres puanları daha düşük uyku kalitesini yordarken (sırasıyla $\beta=.175$ ve $\beta=.246$; $p<.01$), anksiyete anlamlı bir yordayıcı olmamıştır. İskelet kas kütlesi ve bazal metabolik hız psikolojik belirtilerle negatif ilişkili bulunurken, vücut yağ yüzdesi anksiyete ve genel DASS-21 puanları ile pozitif ilişkili bulunmuştur.

Sonuç: Üniversite öğrencilerinde, fiziksel aktiviteye kıyasla psikolojik belirtiler ve bazı vücut kompozisyonu değişkenleri uyku kalitesi ile daha yakından ilişkilidir. Bu bulgular, ruh sağlığı, fizyolojik faktörler ve uyku arasındaki karmaşık etkileşimleri vurgulamakta ve genç yetişkinlerde iyi oluşu artırmak için çok boyutlu yaklaşımlara ihtiyaç olduğunu göstermektedir.

Anahtar Kelimeler: Anksiyete, Depresyon, Fiziksel aktivite, Uyku kalitesi, Stres, Vücut kompozisyonu.

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Young adulthood is a critical developmental period during which physical health, psychological well-being, and lifestyle behaviors are established (1). Increasing academic demands and changing social roles may hinder healthy behaviors and increase psychological risks (2). In this context, physical activity, sleep, and mental health are key determinants of quality of life (3). The World Health Organization recommends at least 150 minutes of moderate or 75 minutes of vigorous physical activity weekly, yet a substantial proportion of adults do not meet these guidelines (4). Sedentary behavior is particularly common among young adults. Adequate sleep is essential for physical and psychological health, while insufficient sleep is associated with depression and anxiety (5). During the COVID-19 pandemic, increased screen time, reduced physical activity, and irregular sleep patterns negatively affected mental well-being (6). In contrast, regular physical activity may improve sleep quality and mental health (7). Therefore, understanding the interaction between these variables is essential.

The effects of physical activity on psychological well-being have been widely studied (1,8). Evidence suggests that regular exercise reduces symptoms of depression and anxiety (9). Activities such as walking, yoga, and resistance training can alleviate depressive symptoms, with effects sometimes comparable to psychotherapy or pharmacological approaches (10). Meta-analyses in university students indicate that aerobic exercise reduces anxiety symptoms (11). Overall, physical activity is associated with lower depression, anxiety, and stress levels, as well as improved quality of life (12). However, effects may vary depending on exercise type, duration, and population characteristics (9,13).

There is also strong evidence linking physical activity and sleep quality (14). Regular exercise may reduce sleep onset latency and improve sleep efficiency (5). These effects are explained by physiological mechanisms such as melatonin regulation, thermoregulation, and stress reduction (15). Studies in both adults and university students show improved sleep quality and fewer awakenings with regular physical activity (16-18). However, high-intensity evening exercise may delay sleep onset in some cases, suggesting that timing and intensity are important factors (19).

Body composition is another important determinant of physical and psychological health. Higher fat mass and lower muscle mass are associated with sleep problems and psychological distress through metabolic and hormonal pathways (20). Abdominal obesity negatively affects sleep quality, and exercise interventions may mitigate these effects (21). Hormonal mechanisms involving leptin and ghrelin help explain the relationship between obesity and sleep disturbances (22). Muscle mass and basal metabolic rate are also associated with sleep quality and psychological well-being (23). In athletes, greater muscle mass is linked to better sleep and higher well-being (24). Overall, body composition indicators such as fat percentage, muscle mass, and metabolic rate are important for both psychological health and sleep quality.

However, existing literature often examines these factors in isolation. Studies on physical activity and sleep frequently exclude psychological variables or body composition (5). While obesity–sleep research tends to focus on metabolic mechanisms with limited psychological integration (22). Integrated studies examining physical activity, mental health, sleep, and body composition together remain limited (21,24).

Accordingly, the present study aims to examine the interrelationships among physical activity, body composition, psychological status, and sleep quality in young adults from a holistic perspective. Specifically, the following hypotheses were proposed: (H_1) physical activity is related to levels of depression, anxiety, and stress; (H_2) physical activity predicts variations in sleep quality and the occurrence of sleep disturbances; (H_3) muscle mass and basal metabolic rate are linked to both psychological symptoms and sleep quality outcomes; (H_4) body fat percentage shows significant relationships with psychological symptoms as well as sleep quality.

Material and Methods

Research Design and Sample Size Determination

This cross-sectional study was conducted among university students. An a priori power analysis using G*Power 3.1.9.7 determined the minimum sample size needed. For the planned multiple linear regression examining the predictive effects of depression, anxiety, and stress on sleep quality, a model with three predictors was specified. Assuming a small effect size ($f^2 = .02$), $\alpha = .05$, and 80% statistical power, the minimum required sample was 485 participants. The study ultimately included 572 students, providing sufficient power to detect even small effects.

Participants

The target population consisted of university students in Türkiye. A stratified sampling method was used to improve representativeness across gender, faculty/department, and academic year. Participants were proportionally selected from each stratum to reduce sampling bias and enhance generalizability.

Data collection took place from January to March 2026. The final sample consisted of 572 students who satisfied the inclusion criteria and completed all study measures. Inclusion criteria were being aged 18–25 years, being a university student, having no chronic disease, no clinically significant weight loss in the last six months, and providing written informed consent. Individuals with a history of psychiatric disorders, as well as pregnant or breastfeeding participants and those using medications influencing metabolism, appetite, or energy regulation on a regular basis, were excluded from the study. All criteria were predefined and assessed using a standardized checklist.

Ethical Approval

The study followed the Declaration of Helsinki. Written informed consent was obtained from all participants. Ethical approval was obtained from the Ethics Committee of Uşak University (Approval No. 2026-01). Participation was voluntary, and withdrawal was permitted at any stage without consequence.

Data Collection and Implementation Conditions

Data collection was carried out in person during a single standardized session. To control for circadian influences, all measurements were scheduled between 09:00 and 12:00 in the morning. Prior to assessment, participants were asked to abstain from high physical activity, alcohol consumption, and high caffeine intake for 24 hours, to fast for at least three hours, and to void their bladder.

All procedures were performed by a trained research team in a controlled environment using standardized protocols. When multiple assessors were involved, inter-rater consistency was monitored. Devices were calibrated regularly according to manufacturer guidelines, and repeat measurements were taken when necessary to ensure reliability. Demographic and lifestyle data (age, gender, smoking, alcohol use) were collected first. Psychological status was assessed using the Depression Anxiety Stress Scale–21 (DASS-21), sleep quality using the Basic Scale for Insomnia Complaints and Sleep Quality (BaSIQS), and physical activity using the Physical Activity Scale-2 (PAS-2). Physical activity intensities were converted into Metabolic Equivalent (MET) values to calculate total activity. Participants received standardized instructions, and comprehension was checked via a pilot application. All data were anonymized using code numbers and double-checked by two independent researchers.

Data Collection Instruments

Physical Activity Scale–2 (PAS-2)

The Physical Activity Scale–2 (PAS-2), developed by Pedersen et al. (25) and adapted into Turkish by Gür (26), is a self-report instrument measuring occupational, transportation, leisure activities, and sedentary behavior. The scale includes nine items: the first four and eighth assess daily activities, while the fifth, sixth, and seventh evaluate weekly low, moderate, and high physical activity. The ninth item functions as a balancing component.

Each item is assigned a MET coefficient (sleep = 0.9, sitting work = 1.5, standing/walking work = 2.0, heavy work = 5.0, transportation = 4.0, sedentary leisure = 1.0, low activity = 3.0, moderate activity = 5.0, high activity = 6.0), and energy expenditure (MET-min/day) is calculated by multiplying MET by duration. If total duration is below 1440 minutes, the deficit is added to low activity; if above, excess is subtracted. The scale shows high content validity (.80–1.00; overall .92), a moderate correlation with International Physical Activity Questionnaire (IPAQ) ($r = .576$), and strong test–retest reliability ($r = .814$, $p < .01$). These results confirm that PAS-2 is a valid and reliable tool for assessing physical activity in the Turkish population.

Basic Scale for Insomnia Complaints and Sleep Quality (BaSIQS)

The BaSIQS, developed by Allen Gomes et al. (27), is a brief seven-item instrument assessing sleep disturbances and quality. It evaluates sleep onset latency, difficulty falling asleep, nocturnal awakenings, early awakenings, perceived problem of early awakening, overall sleep quality, and sleep depth. Items 6a and 6b are reverse scored (27). The Turkish adaptation was conducted by Mıhçıoğlu et al. (28).

Psychometric evaluation of the Turkish version showed good reliability, with Cronbach's alpha of .752 and a test–retest correlation of r = .639 (p < .01). Factor analysis identified a two-factor structure: "Sleep Onset Problems" and "Awakening Problems." These findings support its validity and reliability as a brief, practical screening tool for sleep-related problems in both research and clinical contexts (28). In the present study, the BaSIQS demonstrated acceptable internal consistency (Cronbach's α = .652).

Depression Anxiety Stress Scale–21 (DASS-21)

The DASS-21 was used to assess depression, anxiety, and stress. It was developed by Lovibond and Lovibond (29) and later adapted into Turkish by Sarıçam (30). The scale contains three subscales (Depression, Anxiety, and Stress), each with seven items rated on a 4-point Likert scale from 0 ("never") to 3 ("always").

Psychometric properties of the Turkish version confirmed its three-factor structure across clinical and non-clinical samples. In clinical populations, Cronbach's alpha values were .87 (depression), .85 (anxiety), and .81 (stress). Test–retest reliability ranged from r = .61 to r = .68, and item–total correlations ranged from .43 to .77. The scale also effectively discriminated between clinical and non-clinical groups, supporting its reliability and validity for measuring emotional symptoms.

InBody 120 (BIA)

Body composition was evaluated using the InBody 120 system (InBody Co., Korea), which operates based on segmental multi-frequency bioelectrical impedance technology. Impedance measurements were obtained at two frequencies (20 kHz and 100 kHz) across five anatomical regions (upper limbs, trunk, and lower limbs). Body composition parameters were derived directly from impedance values rather than estimation equations. Previous validation studies have demonstrated strong agreement of this method with reference techniques such as dual-energy X-ray absorptiometry, with high correlation coefficients and consistent test–retest reliability for both fat mass and fat-free mass (31,32). All measurements were conducted in accordance with standardized manufacturer guidelines. Participants were measured barefoot and wearing light clothing. Pre-assessment conditions included a minimum fasting period of three hours and avoidance of strenuous physical activity, alcohol intake, and excessive caffeine consumption prior to testing.

Statistical Analysis

Statistical procedures were carried out using IBM SPSS Statistics (version 25.0). The distribution of variables was examined through Kolmogorov–Smirnov testing together with skewness and kurtosis indices, all values remained within acceptable limits (±2), supporting the use of parametric approaches (33). Reliability of the measurement tools was determined by Cronbach's alpha coefficients (DASS-21: α = .922; BaSIQS: α = .652).

Participant demographics and key study variables were described using central tendency and dispersion measures, along with frequency distributions. Differences between male and female participants were assessed with independent sample t-tests. Associations between physical activity levels, psychological indicators, sleep-related measures, and body composition variables were examined using bivariate correlation analysis. To further explore predictive relationships, multiple regression models were constructed to evaluate the contribution of depression, anxiety, and stress to sleep quality outcomes. Model performance was interpreted based on explained variance metrics, and parameter estimates were tested for statistical significance. The threshold for significance was defined as p < .05.

Results

Table 1 shows the descriptive statistics for the study variables. The participants comprised 572 university students, with 50.5% identifying as female and 49.5% as male, and a mean age of 20.79 ± 2.71 years. Mean height was 171.17 ± 9.64 cm, weight 67.90 ± 14.61 kg, and Body Mass Index (BMI) 23.09 ± 3.98 kg/m^2. Mean body fat percentage was 22.49 ± 9.38%, skeletal muscle mass 29.36 ± 7.43 kg, total body water 38.54 ± 8.87 L, and basal metabolic rate 1502.90 ± 258.35 kcal. Regarding lifestyle, 22.7% reported smoking, 17.3% reported smoking sometimes, and 60.0% reported not smoking. Regarding alcohol consumption, 14.7% reported alcohol consumption, 17.3% reported consuming alcohol sometimes, and 68.0% reported not consuming alcohol. Physical activity levels averaged 475.78 ± 137.04 (low intensity), 1122.05 ± 420.27 (moderate), and 3336.46 ± 311.24 (high), with total MET-min/day of 1644.33 ± 289.52. Sleep scores indicated 11.62 ± 4.60 for overall complaints, 7.17 ± 3.61 for sleep onset, and 4.45 ± 2.21 for awakening problems. DASS-21 total score was 39.12 ± 11.90, with subscale means of 13.12 ± 4.88 (depression), 12.41 ± 4.05 (anxiety), and 13.59 ± 4.44 (stress) (Table 1).

Table 1. Descriptive Statistics of Study Variables			
Variable	**N**	**Mean ± SD**	**n (%)**
Age (years)	572	20.79 ± 2.71	–
Height (cm)	572	171.17 ± 9.64	–
Body weight (kg)	572	67.90 ± 14.61	–
Body mass index (kg/m²)	571	23.09 ± 3.98	–
Body fat (%)	571	22.49 ± 9.38	–
Skeletal muscle mass (kg)	571	29.36 ± 7.43	–
Total body water (L)	571	38.54 ± 8.87	–
Basal metabolic rate (kcal)	571	1502.90 ± 258.35	–
Sex			
Female	289	–	50.5
Male	283	–	49.5
Smoking status			
Yes	130	–	22.7
Sometimes	99	–	17.3
No	343	–	60.0
Alcohol consumption			
Yes	84	–	14.7
Sometimes	99	–	17.3
No	389	–	68.0
Low activity	572	475.78 ± 137.04	–
Moderate activity	571	1122.05 ± 420.27	–
High activity	572	3336.46 ± 311.24	–
Physical activity (MET)	572	1644.33 ± 289.52	–
Insomnia complaints / Sleep quality	572	11.62 ± 4.60	–
Sleep-onset problems	572	7.17 ± 3.61	–
Awakening problems	572	4.45 ± 2.21	–
Total DASS-21	572	39.12 ± 11.90	–
Depression	572	13.12 ± 4.88	–
Anxiety	572	12.41 ± 4.05	–
Stress	572	13.59 ± 4.44	–

Pearson correlations (Table 2) showed no significant associations between physical activity levels and DASS-21 total or subscale scores ($p > .05$). In contrast, higher depression, anxiety, and stress levels were positively associated with poorer sleep quality, greater sleep onset problems, and increased awakening issues ($p < .05$).

Table 2. Correlations Between Physical Activity, Psychological Symptoms, and Sleep Variables

Variable	1	2	3	4	5	6
DASS-21 Total						
r	-.005	-.006	-.045	.439**	.487**	.119**
p	.896	.881	.284	<.001	<.001	.004
%95 CI	[-.09, .08]	[-.09, .08]	[-.13, .04]	[.37, .50]	[.42, .55]	[.04, .20]
Depression						
r	.025	.032	-.037	.391**	.443**	.091*
p	.544	.442	.383	<.001	<.001	.029
%95 CI	[-.06, .11]	[-.05, .12]	[-.12, .05]	[.32, .46]	[.37, .51]	[.01, .17]
Anxiety						
r	-.003	.008	-.027	.359**	.394**	.105*
p	.944	.854	.516	<.001	<.001	.012
%95 CI	[-.09, .08]	[-.08, .09]	[-.11, .06]	[.29, .43]	[.32, .46]	[.03, .18]
Stress						
r	-.040	-.059	-.055	.417**	.457**	.123**
p	.345	.156	.187	<.001	<.001	.003
%95 CI	[-.12, .05]	[-.14, .02]	[-.14, .03]	[.35, .49]	[.39, .52]	[.05, .20]

*1 = Low physical activity level; 2 = Moderate physical activity level; 3 = High physical activity level; 4 = Sleep quality (BaSIQS total score); 5 = Sleep onset problems; 6 = Awakening problems. r = Pearson correlation coefficient; p = significance level; CI = 95% confidence interval. *p < .05, **p < .01.*

Table 3. Correlations Between Psychological Variables, Sleep, and Body Composition

Variable	SMM	BF%	WHR	BMR
DASS-21 Total				
r	-.150**	.084*	-.090*	-.159**
p	<.001	.044	.032	<.001
%95 CI	[-.23, -.07]	[.00, .17]	[-.17, -.01]	[-.24, -.08]
Depression				
r	-.062	-.003	-.078	-.068
p	.142	.943	.063	.104
%95 CI	[-.14, .02]	[-.08, .08]	[-.16, .01]	[-.15, .02]
Anxiety				
r	-.214**	.161**	-.071	-.215**
p	<.001	<.001	.088	<.001
%95 CI	[-.29, -.14]	[.08, .24]	[-.15, .01]	[-.29, -.14]
Stress				
r	-.138**	.082	-.089*	-.154**
p	.001	.051	.034	<.001
%95 CI	[-.22, -.06]	[-.00, .16]	[-.17, -.01]	[-.23, -.07]
Sleep Quality				
r	-.101*	-.023	-.129**	-.131**
p	.016	.590	.002	.002
%95 CI	[-.18, -.02]	[-.10, .06]	[-.21, -.05]	[-.21, -.05]

**p < .05; **p < .01; SMM = Skeletal Muscle Mass; BF% = Body Fat Percentage; WHR = Waist-to-Hip Ratio; BMR = Basal Metabolic Rate.*

Table 4. Regression Analysis of Psychological Variables Predicting Sleep Quality				
Variable	**B**	**SE**	**β**	**p**
Depression	.167	.052	.175	.001*
Anxiety	.079	.065	.069	.223
Stress	.257	.062	.246	.001**
*R = .443; R^2 = .196; Adj. R^2 = .192; F = 46.21; *p < .05, **p < .01*				

Correlations with body composition (Table 3) indicated that total DASS-21, anxiety, and stress were negatively associated with skeletal muscle mass and basal metabolic rate, and positively with body fat percentage (for anxiety). Sleep quality was negatively correlated with skeletal muscle mass, waist-to-hip ratio, and basal metabolic rate, but not body fat percentage.

Multiple linear regression (Table 4) showed that stress (β = .246, p = .001) and depression (β = .175, p = .001) significantly predicted sleep quality complaints, explaining 19.6% of the variance (R^2 = .196, F = 46.21, p < .01), whereas anxiety was not significant (β = .069, p = .223).

Discussion

A substantial body of literature has examined the relationship between physical activity, mental health, and sleep parameters (9). However, in the present study, no significant associations were observed between physical activity levels and depression, anxiety, stress, or sleep variables. This finding is consistent with previous research suggesting that the relationship between physical activity and psychological outcomes is not uniform across all samples. Studies conducted among university students indicate that these relationships are influenced by multiple factors, including lifestyle habits, academic stress, sleep patterns, and individual differences (8,12). Moreover, when physical activity behaviors are considered alongside psychosocial determinants such as motivation, dietary habits, and environmental barriers, they appear to exhibit a more complex structure in university populations (1). In this context, the current findings suggest that physical activity may not always exert a direct effect on psychological and sleep-related variables, and that these relationships may vary depending on contextual factors.

In contrast, significant associations were observed between psychological symptoms and sleep parameters. Depression, anxiety, and stress levels were associated with poorer sleep quality and greater difficulty in initiating sleep, highlighting the close interaction between mental states and sleep processes. Consistent with previous research, sleep disturbances in young adults have frequently been reported to co-occur with depressive and anxiety symptoms (3,11). The relationship between increased psychological stress and impaired sleep can be explained through both biological and behavioral mechanisms. Activation of the hypothalamic-pituitary-adrenal axis and elevated cortisol levels may disrupt sleep regulation, while alterations in circadian rhythms, melatonin production, and sleep hygiene behaviors may further contribute to sleep disturbances (13,18). These findings underscore the importance of the relationship between psychological health and sleep in university student populations as a key area for further research.

The present study also revealed significant associations between body composition indicators and psychological variables. In particular, anxiety and stress levels were negatively associated with skeletal muscle mass and basal metabolic rate and positively associated with body fat percentage. These findings suggest potential links between psychological states and metabolic indicators. Previous research has demonstrated that body composition is associated not only with physical health but also with psychological well-being and sleep quality (20,23). Studies conducted among university students further indicate reciprocal relationships between body composition, lifestyle behaviors, and psychosocial factors (8). In addition, dietary habits, chronotype, and daily routines have been reported to be associated with both metabolic indicators and mental health outcomes (14). Together, these findings highlight the importance of considering biological and behavioral factors jointly when evaluating psychological health in young adults.

Relationships between sleep quality and body composition indicators were also noteworthy. Negative associations between skeletal muscle mass and basal metabolic rate with sleep quality suggest potential links between metabolic status and sleep parameters. Previous studies have reported similar associations between

body fat percentage, metabolic health indicators, and sleep quality (20,22). The relationship between obesity and sleep disturbances has been explained through biological mechanisms involving leptin, ghrelin, and energy metabolism (22). Furthermore, research in athletic populations indicates that higher muscle mass and metabolic capacity are associated with better sleep quality and subjective well-being (24). These findings support the notion that body composition is linked to both sleep and psychological variables.

Overall, the findings of this study indicate that the relationships among physical activity, psychological symptoms, sleep quality, and body composition are multidimensional. The absence of significant associations between physical activity and psychological or sleep variables suggests that these relationships may not be direct or unidirectional. Instead, factors such as motivation, environmental influences, dietary habits, and broader lifestyle behaviors may act as mediators or moderators (1,8). Therefore, understanding mental health, sleep, and lifestyle behaviors in young adults requires multivariable and holistic research approaches.

A notable strength of this study is its relatively large sample size, which increases statistical power and allows for the detection of even small effect sizes. Moreover, assessing physical activity, psychological symptoms, sleep parameters, and body composition simultaneously provided a more integrated view of how these factors interact (8,13). Nevertheless, several limitations should be considered. The cross-sectional design limits the ability to draw causal conclusions (12). Physical activity and some lifestyle factors were self-reported, which may introduce biases such as recall errors or social desirability (2). Additionally, data were collected at a single point in time, preventing the evaluation of changes over time. Future research using longitudinal or experimental designs is warranted to clarify the relationships among physical activity, psychological health, and sleep.

Conclusion

This study found that physical activity levels were not significantly associated with depression, anxiety, stress, or sleep parameters among university students, suggesting these relationships may vary across populations. Mental health outcomes are multifactorial and cannot be explained by a single lifestyle factor (13). In contrast, psychological symptoms were significantly related to sleep parameters, consistent with research linking mental well-being and sleep quality (20). Additionally, associations between certain psychological variables and body composition indicate that metabolic and lifestyle factors may influence psychological and sleep health. Overall, the findings highlight the multidimensional interactions among mental health, sleep, and lifestyle behaviors in university students, underscoring the need for longitudinal studies incorporating biological indicators (12).

Declarations

Funding

This study received no funding.

Competing interests

The author declares no competing interests.

Ethics approval

This study was conducted in accordance with the principles of the Declaration of Helsinki and in compliance with relevant national and institutional ethical guidelines. Ethical approval was obtained from the Ethics Committee of Uşak University (Approval No. 2026-01). Prior to participation, all individuals were fully informed about the aims, procedures, and voluntary nature of the study. Written informed consent was obtained from all participants before data collection.

Availability of data and material

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Author Contributions

B.T. conceived and designed the study, collected and analyzed the data, interpreted the results, and wrote the manuscript. The author read and approved the final version of the manuscript.

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