

Levels of physical activity and sleep patterns in university students: The effect on mood and daily life activities

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Abstract

The aim of this study was to assess the effect of sleep patterns and levels of physical activity on depression and daily life activities in university students. An identification form, the International Physical Activity Questionnaire – Short Form (IPAQ-SF), the Pittsburgh Sleep Quality Index (PSQI), the Beck Depression Inventory (BDI), and the Nottingham Health Profile (NHP) were used to collect the data. The mean age of the university students in the research was 20.37 ± 1.85 years. We found that, as the Part I subareas of the NHP (such as pain, emotional reactions, sleep, social isolation, physical activity, and energy) and the Part II scores increased, the PSQI score also increased ($p < .05$) and, in turn, the increase of the PSQI score brought to a proportional increase of the BDI score too ($p < .05$; $r = .393$). The correlation between variables was found to be low but statistically significant. As a result, periodical examinations on physical activity, sleep, depression, and daily living activities in university students should be highly recommended and students should be supported on these issues.

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1. Introduction

Physical activity, which is necessary for an individual to be healthy, is defined as a series of activities conducted in daily life by expending energy with the use of muscles and joints, resulting in increased heart and breathing rates and tiredness (Vural, Eler, & Atalay Güzel, 2010; Aysan, Karaköse, Zaybak, & Günay İsmaloğlu, 2014). Regular physical activity brings physiological, psychological, and metabolic parameters into a good condition, it lowers the risk of chronic illness and early mortality, and prevents diseases of the bones, muscles, and joints. Yıldırım and colleagues (2015) found that, as students' physical activities increased, their depression decreased (Yıldırım, Özşevik, Özer, Canyurt, & Tortop, 2015). Sleep is another important variable for good health. Inadequate sleep can have a negative physical, cognitive and emotional effect on students. In a study conducted on university students, Aysan and collaborators (2014) found that sleep quality among students was poor (Aysan *et al.*, 2014). Aktaş and colleagues (2015), moreover, observed a statistically significant correlation between sufficient physical activity levels and sleep quality (Aktaş, Şaşmaz, Kılınçer, Mert, Gülbol, Külekçiöğlü *et al.*, 2015). Depression is a serious mental state, which manifests itself not only as a sense of deep unhappiness but also as an unwillingness for thought, speaking, and movement. Depression in children and young people leads to a lack of academic success. It is thought that physical activity may be effective in protecting people from depression and in its treatment (Ölçücü, Vatansever, Özcan, Çelik, & Paktaş, 2015). Studies have shown that physical activity has a protective effect on mental health and that inactive people have twice as many depressive symptoms as active people (Şahbaz Piriñçi, Cihan, & Yıldırım, 2020). Examples of daily life activities are bathing, getting dressed, moving, eating and defecating regularly, which must all be performed to remain alive (Gümüş & Ünsal, 2014). If an active lifestyle can be secured in the early stages of life, physical inactivity will be removed from the risk factors for disease. For this reason, it is important to examine the health behaviors of the young population. In Turkey, a large part of the young population consists of university students (Şahbaz Piriñçi *et al.*, 2020). Based on these premises, we decided to focus our interest on assessing Turkish students' sleep patterns, levels of physical activity, depression, and daily life activities and to examine the possible correlations.

2. Aims of the study

A careful examination of the literature showed that only a handful of studies has been published regarding the correlations among physical activity, sleep patterns, depression, and daily life activities of university students. The purpose of this descriptive study was thus to examine the effects of sleep patterns and levels of physical activity on depression and daily life activities in university students. It would be most appropriate to plan educational programs and initiatives for behavior change based on the effects of these factors in university students.

3. Methods

3.1. *Participants*

This research included students studying at the Health Sciences Faculty of a Turkish university between 1 January and 30 June 2019 ($N \cong 1000$). The final sample of the study consisted of 249 students (the rate of participation in the research was 25%). Data was collected through a face-to-face interview by the researchers. The inclusion criteria to take part in the research were the following: 1) students aged between 18 and 35 years old, 2) students enrolled at the university where the research was conducted, and 3) students who agreed to take part in the research activity. Exclusion criteria were the following: musculoskeletal system deficiencies precluding physical activity, physical handicap, advanced neurological deficits, the presence of an uncontrolled chronic disease (diabetes, hypertension, cardiovascular or valve diseases), and not agreeing to take part in the research activity.

3.2. *Instruments*

The identification form consisted of 15 questions on the students' socio-demographic characteristics. The other instruments used to collect data were the International Physical Activity Questionnaire, the Pittsburgh Sleep Quality Index, the Beck Depression Inventory, and the Nottingham Health Profile. The forms were filled in approximately 30-45 minutes.

- International Physical Activity Questionnaire – Short form (IPAQ-SF; Lee, Macfarlane, Lam, & Stewart, 2011): The validity and reliability were tested following previous reports (Craig, Marshall, Sjöström, Bauman,

Booth, Ainsworth *et al.*, 2003; Öztürk & Arıkan, 2005). The Cronbach's alpha value of the IPAQ is .83. Physical activities performed once for ten minutes are the criterion for IPAQ. In this paper, we measured the duration of extreme and medium physical activity, walking, and the duration in one day of sitting. A total physical activity score (TPAS) of less than 600 (MET) is defined as "not physically active", in the range of 600-3000 MET as a "low physical activity level", and more than 3000 MET as an "adequate physical activity level".

The calculation of the total score of the short form included the sum of time (minutes) and frequency (days) of walking, moderate-intensity activity, and vigorous activity. The sitting score (sedentary behavior level) was calculated separately. In the evaluation of all the activities, the criterion was that each activity was performed for at least 10 minutes at a time. A score was obtained as "MET-minutes/week" by multiplying the minute, day, and MET value (multiples of resting oxygen consumption). Walking time (minutes) was multiplied by 3.3 METs to calculate the walking score. In the calculation, a value of 4 METs was taken as moderate-intensity activity and 8 METs as vigorous activity. Physical activity levels were classified as not physically active (< 600 MET-min/week), low physical activity (600-3000 MET-min/week), and adequate physical activity (beneficial for health) (> 3000 MET-minutes/week) (Craig *et al.*, 2003; Savcı, Öztürk, Arıkan, İnal İnce, & Tokgözoğlu, 2006).

- Pittsburgh Sleep Quality Index (PSQI; Buysse, Reynolds, Monk, Berman, & Kupfer, 1989): The scale shows the sleep pattern over the past month. Turkish validity and reliability were tested following Ağargün and colleagues (Ağargün, Kara, & Anlar, 1996). The score for each question ranges from 0 to 3, and a high score shows poor sleep quality. A total score of less than 5 indicates "good sleep quality", and a score ≥ 5 indicates "poor sleep quality". The Cronbach's alpha value of the PSQI is .71.

- Beck Depression Inventory (BDI; Beck, Ward, & Mendelson, 1961): Turkish validity and reliability were tested following Hisli (1989). It is a multiple-choice self-report inventory. Each item is scored from 0 to 3, and the total score ranges from 6 to 63. A score of 0-10 is evaluated as "no depression", 11-17 as "slight depression", 18-23 as "medium depression", and 24 or above as "severe depression". The Cronbach's alpha value of the BDI is .83.

- Nottingham Health Profile (NHP; Teixeira-Salmela, 2014): The NHP consists of two parts. Part I contains 38 questions in six subareas: pain, physical activity, energy, sleep, social isolation, and emotional reaction, and

each question is answered with a yes or no. Part II contains 7 general yes/no questions concerning daily living problems. The scoring for each section is 0-100, with 0 showing the best state of health and 100 the worst. Cronbach's alpha values for each subarea of Part I of the NHP are .78 for the pain section, .82 for the physical activity section, .78 for the energy section, .80 for the sleep section, .70 for the social isolation section, and .68 for the emotional reactions section. Cronbach's alpha value of Part II of the NHP is .73.

3.3. Statistical analysis

Analysis of the data obtained in this study was performed with the SPSS 21 package. When the data did not conform to a normal distribution, as a result of a normalcy test, two-group comparisons were performed with the Mann-Whitney *U* test, and three-group comparisons with the Kruskal-Wallis *H* test. Chi-square analysis was used in categoric data correlation tests. A significance level of .05 was chosen as threshold: all values scoring $p < .05$ were considered statistically significant while all values scoring $p > .05$ were non-significant.

3.4. Ethical considerations

The research was approved by an ethics committee (X University Non-Clinical Research Ethics Committee, decision No 2 dated 20.09.2018), and permission was obtained from all participants to take part in the research. All directives of the Helsinki Declaration were followed, and informed consent was obtained from the participants prior to conducting the research activity.

4. Results

As shown in Table 1, 82.7% of the university students were females, 92.8% had no chronic illness, 89.6% did not regularly use a medication, 86.3% did not smoke, 95.6% did not drink alcohol, 76.3% resided in student accommodation and 62.7% did not play any kind of sports activities (refer to Tab. 1 for more details).

Table 1 – *Socio-demographic characteristics of the university students under study*

Characteristics	<i>n</i>	%	
Gender	Female	206	82.7
	Male	43	17.3
Systemic illness	Yes	18	7.2
	No	231	92.8
Regularly use medication	Yes	26	10.4
	No	223	89.6
Smoking	Yes	34	13.7
	No	215	86.3
Alcohol	Yes	11	4.4
	No	238	95.6
Place of residence	Student accommodation	190	76.3
	Self-catering accommodation	11	4.4
	Apartment	48	19.3
Sports	Yes	93	37.3
	No	156	62.7
TOTAL		249	100

Data presented as number (*n*) and percentage (%) of students.

The mean age of the university students in the research was 20.37 ± 1.85 years, their mean height was 165.47 ± 7.42 cm, their mean body weight was 58.92 ± 9.98 kg, their mean body mass index (BMI) was 21.47 ± 2.93 , and their daily exercise level was found to be $.48 \pm .95$. In the study the rate of healthy sleep was found to be higher in those who played a sports activity, although the score was not statistically significant ($p > .05$). Moreover, medium and high depression rates were significantly higher in those who smoked than in those who did not ($p < .05$). According to the NHP, the emotion scores of those who did not play sports were significantly higher ($p < .05$).

Table 2 – *Correlation between IPAQ scores and pain, sleep, social relationships, and depression*

	Pain	Emotional reactions	Sleep	Social isolation	Physical activity	Energy	PSQI score	BDI score	
IPAQ score	<i>r</i>	.001	.030	-.006	.012	-.085	-.084	.052	.025
	<i>p</i> -value	.984	.635	.920	.851	.181	.188	.425	.690
	<i>N</i>	249	249	249	249	249	249	237	249

r = correlation coefficient; the *p*-value refers to the difference between the groups; *N* = number of students.

No significant difference was found between the IPAQ score and pain, emotional reactions, sleep, social isolation, physical activity, and energy (Tab. 2). Moreover, no significant difference was found between the IPAQ score and the Part II scores, PSQI, and BDI scores in the NHP ($p > .05$).

Table 3 – *Correlation between PSQI scores and pain, physical activity, social relationships, and depression*

	Pain	Emotional reactions	Sleep	Social isolation	Physical activity	Energy	Part I	Part II	BDI score	
PSQI score	<i>r</i>	.260**	.442**	.564**	.212**	.205**	.333**	.475**	.251**	.393**
	<i>p</i> -value	< .001	< .001	< .001	.001	.001	< .001	< .001	< .001	< .001
	<i>N</i>	237	237	237	237	237	237	237	237	237

r = correlation coefficient; the *p*-value refers to the difference between the groups; *N* = number of students.

As the scores of pain, emotional reactions, sleep, social isolation, physical activity, energy, and Part II in the NHP rose, the PSQI scores also rose ($p < .05$; refer to Tab. 3 for details). Moreover, as the PSQI score rose, the BDI scores also rose ($p < .05$; $r = .393$) so that the correlation between the variables was low but statistically significant.

Table 4 – *Correlation between BDI scores and pain, sleep, social relationships, and physical activity*

	Pain	Emotional reactions	Sleep	Social isolation	Physical activity	Energy	Part I	Part II	
BDI score	<i>r</i>	.377**	.594**	.377**	.525**	.410**	.535**	.662**	.330**
	<i>p</i> -value	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001
	<i>N</i>	249	249	249	249	249	249	249	249

r = correlation coefficient; the *p*-value refers to the difference between the groups; *N* = number of students.

As the scores of pain, emotional reactions, sleep, social isolation, physical activity, energy, and Part II in the NHP rose, the BDI also rose ($p < .05$; please see Tab. 4 for details).

5. Discussion

In our research we found a significant correlation between the IPAQ score and the other variables. Moreover, our study revealed that only 37.3% of the students participating were doing sports, corroborating previous findings. In fact, as shown by previously published reports, students tend to be largely inactive. In a study conducted to determine the total physical activity level of students, the authors reported that only one-fourth of the students had a sufficient physical activity level and that the group with the least activity of all was that in the 15-19 age group (Active Life Association, 2010). When occupation groups were considered in the same study, the authors revealed that students were the least active group with 72% of them being inactive and that the physical level of activity increased in working life. Savcı and colleagues (2006) found that approximately 15% of university students were not physically active and that males were more physically active than females (Savcı *et al.*, 2006). In contrast, Ersöz and co-workers (2016), who also performed a study on university students, observed that 46.9%, 16.9% and 36.2% of the participants ranked in the group of high, medium and low level of physical activity, respectively (Ersöz, Altındağ, Abbak, & Albayrak, 2016). In a further study, conducted on nursing and medical students, Blake and collaborators (2017) found that most medical students did not achieve the recommended levels of physical activity, and that nursing students were even less active than medical students (Blake, Stanulewicz, & McGill, 2017). İlaslan and colleagues (2020) observed that 77.9% of university students played no sports and that 45.3% of them spent 1-3 hours a day watching television or using a computer (İlaslan, Taylan, Özkan, & Adıbelli, 2020). In an additional study, which was designed to evaluate the correlation between the quality of life and physical activity of university students, Kılınç and colleagues (2016) found a significant positive correlation between physical activities of low/medium intensity and quality of life in terms of physical health and social relationships (Kılınç, Bayrakdar, Çelik, Mollaoğulları, & Gencer, 2016). In addition, Yaran and collaborators (2017), who carried out a study on university students with or without the habit of playing sports, also found

that the quality of life of students who played sports was better (Yaran, Ağaoğlu, & Tural, 2017).

The present study revealed that, as section scores in the NHP increased, PSQI scores also increased. According to previously published reports, students slept at a sufficient level. Özding and Turan (2019), who conducted a study on students enrolled in a health sciences faculty, found that students slept for 7.37 hours. A similar result was obtained by Yılmaz (2019) who found that students slept for a mean of 7.36 ± 1.48 hours. When the duration of physical activity was also examined on a daily basis, the author observed that students were physically active on average for 2.00 ± 1.70 hours a day (120.11 ± 102.39 minutes), i.e. they spent 17.36% of their free time on physical activities. The relationship between sleep and physical activity in college students was also examined in a meta-analysis performed by Memon and collaborators (2021) who found that moderate to high-intensity physical activity was associated with lower PSQI scores (Memon, Gupta, Crowther, Ferguson, Tuckwell, & Vincent, 2021). Saygılı and colleagues (2011) reported that the quality of sleep of students enrolled at an Economic Administration Sciences Faculty and at a Health Services Vocational High School was better compared to that of students of other faculties (Saygılı, Çil Akıncı, Arıkan, & Dereli, 2011). In a study conducted on university students in which the correlation between gender and physical activity levels was examined, Arslan and collaborators (Arslan, Taşkaya, & Kavalcı, 2020) found that 12% of males and 38.8% of females had low levels of physical activity, confirming previous findings (Savcı *et al.*, 2006). When the same authors examined the correlation between gender and quality of sleep they found that 25.3% of males and 32.8% of females had healthy sleep (Arslan *et al.*, 2020). İyigün and colleagues (2017) observed an interesting correlation in university students between quality of sleep and depression, anxiety, and physical activity levels (İyigün, Angın, Kırmızıgül, Öksüz, Özdil, & Malkoç, 2017). In a study by Çelik and colleagues (2018) examining depression and sleep in healthy college students, the authors found that approximately one-fifth of the students showed depressive signs and that the level of depression was inversely related to the quality of sleep (Çelik, Ceylan, Ünsal, & Çağan, 2018). A recent study conducted on a national sample of university students to evaluate the degree of subjective sleep quality, sleep latency, and sleep duration and to investigate the correlations of these components with selected variables, Albqoor and Shaheen (2021) found that university students suffered from poor sleep quality, delayed sleep stage, and sleep deprivation. Moreover, Dağbrowska-

Galas and collaborators (2021) found that, although most medical students are physically active, approximately one-third of them suffered from insomnia. The authors reported that this sleep issue was more common in students who experienced daily stress or who smoked (Dąbrowska-Galas, Ptaszkowski & Dąbrowska, 2021).

Our study revealed that, as the scores of statements in the NHP increased, the BDI score also increased, confirming previous findings. Alparslan and co-workers (2008), who performed a study with students enrolled in a Health College and a Technical Education Faculty, revealed that 34.1% of the students (37.8% of females and 31.5% of males), showed signs of depression and that 30.6% of them were enrolled in the Health College (Alparslan, Yaşar, Dereli, & Turan, 2008). İskender and co-workers (2018) found that a significant proportion of university students had high depression scores and that students' gender and use of cigarettes and alcohol affected their health and their self-perception, their participation in social activities, and their mean depression scores (İskender, Dokumacıoğlu, Kanbay, & Kılıç, 2018). Signs of depression were seen in approximately one-fifth and in a quarter of the college students, as demonstrated by Deveci and colleagues (Deveci, Ulutaşdemir, & Açıık, 2013) and by Aylaz and collaborators (Aylaz, Kaya, Dere, Karaca, & Bal, 2007), respectively. Dinç Hür and colleagues (2014), who conducted a research on health college students, found that 25% of the students showed depressive signs based on the examination of the students' BDI scores (Dinç Hür, Andsoy, Oksay Şahin, Kayhan, Eren, Zünbül *et al.*, 2014). An adequate level of physical activity was inversely related to BDI values, as demonstrated by Küçükdağ and colleagues (2018) in a study conducted on medical faculty students, although differences were not statistically significant (Küçükdağ, Sönmez, & Başer, 2018). Wc Lun and co-workers (2018) also reported that more than 50% of the university students stated that they manifested a degree of depressive and anxiety symptoms (68.5% and 54.4%, respectively) and that the participants who reported regular exercise, greater self-confidence and greater satisfaction with both their friends and in their academic performance showed fewer depressive and anxiety symptoms (Wc Lun, Chan, Ky Ip, Yk Ma, Tsai, Wong *et al.*, 2018). Faílde-Garrido and colleagues (2021) showed that physically inactive participants had significantly lower levels of intrinsic motivation, emotion regulation, and some dimensions of health-related quality of life (Faílde-Garrido, Ruiz Soriano, & Simón, 2021). Kim and collaborators (2021), in a study conducted to investigate the effect of university students' level of physical

activity on depression and personal relationships, found statistically significant correlations between the volume of physical activity and depression, and between physical activity and interpersonal relationships (Kim, Song, & Jeon, 2021). Finally, Shimamoto and collaborators (2021), who examined the relationship between mental health, physical activity, physical fitness, and daytime sleepiness, found a positive relationship between depression and the variables related to the level of physical activity (Shimamoto, Suwa, & Mizuno, 2021). The reason for the lack of physical activity and of sleep was explained by the intensive education plans of university students, which also affected their level of depression and the activities of daily living.

6. Limitations of the study and concluding remarks

In conclusion, in this research we observed that the level of physical activity and sleep affected depression and the activities of daily life in university students. Insufficient physical activity and poor sleep brought to a higher level of depression and to conducting less daily life activities in college students. Thus, adjusting education programs in colleges to increase the level of physical activity in students and to facilitate a healthy sleep should be promoted.

Despite the promising results obtained in this research, which support previous findings, there were a few limitations that should be stressed. First, most of the participants were females so future studies should be conducted on samples that are more equally distributed between males and females considering that gender may have an effect on the physical activity levels and sleep patterns in college students. Second, the research was conducted on university students, who did not work. Future research should be promoted on larger sample sizes and should be extended to other age groups of the population to examine the effect of work on the levels of physical activity and on sleep.

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