

Article

Physical Activity and Sleep Quality in Students of the Faculty of Physical Education and Sport of Braşov, Romania

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Abstract: Background and objectives: The purpose of this research is to assess the level of physical activity (PAL) and quality of sleep in students of the Faculty of Physical Education and Sport of Braşov, Romania. This research will also analyse the correlation between these two parameters. Materials and Methods: The study participants consist of 394 students (255 male and 139 female) of Transilvania University of Braşov. Participants in this study are from three specializations: Physical Education and Sport (PES), Kinetotherapy and Special Motility (KSM), Sport and Physical Performance (SPP). To assess PAL, we used the short version of the International Physical Activity Questionnaire Short Form (IPAQ-SF); and to measure sleep quality, we used the Pittsburgh Sleep Quality Questionnaire (PSQI). Results: The study shows one average intensity correlation between sleep quality and physical activity (PA), ρ (0.585). Certain correlations can be found between the two parameters, depending on the students' specialization. The biggest differences between the two parameters are found between PES and KSM, and SPP and KSM. Conclusions: PA is beneficial for the body, and can improve the quality and quantity of sleep, if carried out systematically and continuously.

Keywords: physical activity; students; sleep quality

1. Introduction

Physical activity (PA) and sleep constitute important elements of lifestyle in terms of primary prevention and therapeutic education. PA is defined as every movement produced by the skeletal muscles that moves the body and subsequently leads to a considerable increase in the energy consumption. This is in contrast to a rest period, defined by a lack of activity or daily rest.

An active lifestyle is known to reduce the risk of cardiovascular disease and is associated with lower blood pressure. It can also enhance memory and controllability, improve the lipid profile and overall wellbeing, and relieve stress and anxiety [1].

The results of numerous studies have shown that the lack of PA is a serious threat to health [2,3]. PA carries obvious benefits for health [4–6], as exercise is an important factor for a well-functioning body.

The minimum weekly Global PA Health Recommendation consists of 150 min of moderate-intensity aerobic PA, 75 min of vigorous-intensity aerobic PA, or an equivalent combination of moderate-intensity and vigorous-intensity activities [7].

Ksenija et al. (2014) studied the level of PA attained by students from different facilities over a seven-day period. This study showed a correlation between the participants' gender and the level of PA attained, with an average different of at least 30 min of PA per day. The results show that over the seven-day period, the level of PA in male students was higher than in the female students. This was particularly evident when reviewing the level of PA in a period lasting three days, or more [8].

Sleep can have a large impact on an individual's overall health. Sleep is a vital physiological phenomenon, and sleep disorders have a significantly negative impact on health. Roughly speaking, we spend one-third of our lives asleep, therefore, the general state of our "sleep health" continues to be an important question throughout our lives [9]. Over the years, sleep disorders have become an increasing notable public health issue [10]. Among these sleeping disorders, we can mention insufficient sleep and poor quality of sleep.

The lifestyle adopted by young adults poses a great risk, because of the academic demands and the wide use of electronic media. Along with the lack of PA [11] and a poor diet [12], this can lead to sleep deficiency and poor quality of sleep [13].

PA among university students can potentially be an excellent resource, which can improve their quality of sleep.

A study conducted by Podhorecka et al. (2017) shows that a significant statistical correlation exists between early falling asleep, waking up at night or before dawn, and intensive or moderate physical effort. This study also shows that people who performed intense or moderate PA woke up less frequently during the night, fell asleep faster, and reported better quality of sleep [14].

Another study analyzing sleep and PA was carried out by Sepehr et al. (2016). The study highlights that a high prevalence of sleep disorders was found specifically among female students. Analysis of the relationship between sleep disorders and academic performance indicates a significant relationship between the Pittsburgh Sleep Quality Questionnaire (PSQI) scores and factors such as marital status, habitat, smoking, PA, and academic performance [15].

This is another study that highlights the correlation between the level of PA and the quality of sleep experienced by students of the Faculty of Physical Education and Sport, during the license cycle (first, second and third study).

This research aims to assess the level of PA and the quality of sleep in students of the Faculty of Physical Education and Sport of Braşov, Romania. This research will also analyze the correlation between these two parameters.

2. Experimental Section

2.1. Participants

This research was carried from April to May 2018, with the help of 419 students surveyed (271 male and 148 female) from Transilvania University of Brasov. The participants were first, second and third-year students, all following traditional classroom courses in the Faculty of Physical Education and Mountain Sports. Participants were made up from students from the Department of Physical Education and Sports (PES) ($n = 98$ students, 79 male and 19 female), the Department of Sport and Physical Performance (SSP) ($n = 113$ students, 86 male and 27 female), and the Department of Kinetotherapy and Special Motility (KSM) ($n = 208$ students, 106 male and 102 female).

The IPAQ (International Physical Activity Questionnaire Short Form) and PSQI (Pittsburgh Sleep Quality Questionnaire) were administered during theoretical classes held by professors of the Faculty of Physical Education and Mountain Sports, in the second semester of the academic year, 2017–2018, in the period mentioned. We specify that the presence of the students at the theoretical courses it was supposed to be 80%.

Prior to the interview, and following the test protocol and the explanation of the objective, all students surveyed had given their written informed consent for participation. The university ethics committee had also given its approval. Twenty-five participants were removed from the study because of incomplete data. The final sample consisted of 394 students (64.72% men and 35.27% women, 255 male and 139 female participants). The characteristics of the study sample are described in Table 1.

Table 1. Physical characteristics of respondents by gender, age, year of study and specialization.

Parameters	Characteristics	Male (No 255)	Female (No 139)	X	SD	Minimum	Maximum
Age	18 years	86	35	2.10	921	1	5
	19 years	82	54				
	20 years	79	38				
	21 years	6	10				
	>21 years	2	2				
Year of study	1st year	110	48	1.89	828	1	3
	2nd year	72	48				
	3rd year	73	43				
Specialization	PES	68	18	2.29	803	1	3
	SPP	84	22				
	KSM	103	99				

Abbreviations: PES—Physical education and sport; SPP—Sport and physical performance; KSM—Kinetotherapy and special motility; X—Arithmetic average; SD—standard deviation.

2.2. PSQI Measures

In this study, sleeping habits were assessed using the PSQI, a tool that effectively measures sleep quality [16].

When assessing sleeping habits, we chose to score each item on a scale from 0 to 3 points, where 0 represents no sleeping difficulty, while a higher score is related to increasing sleep problems, as follows: “(1) subjective sleep quality (very good vs. very poor); (2) sleep latency (≤ 15 min to >60 min); (3) sleep duration (≥ 7 h to <5 h); (4) sleep effective ($\geq 85\%$ to $<65\%$ h sleep/hours in bed); (5) sleep disturbances (not during the past month to ≥ 3 times per week); (6) use of sleeping medications (none to ≥ 3 times a week) and (7) daytime dysfunction (not a problem to a very big problem) [16]”. Next, all 7 items are combined to create a scale from 0 to 21 points. As proposed by Buysse et al. [16], we divided the results into two categories: (1) ≤ 5 (good quality of sleep) as opposed to (2) >5 (poor quality of sleep). In our study, the reliability of the PSQI was satisfactory (Cronbach’s $\alpha = 0.73$) [17].

2.3. PA Measures

For the purpose of measuring the PAL (physical activity level), the official short form version of the IPAQ was administered [18]. This questionnaire consists of seven generic items. Our measurement evaluates the varying levels of PA intensity, and daily sitting time. This study considers that PA intensity, along with daily sitting time, estimates the total amount of PA in MET-min/week, and time spent sitting. IPAQ states that there are three categories of PA levels with respect to health-related recommendations: “low”, “moderate” and “high” [19].

The total weekly physical activity level, expressed as MET-minutes per week (MET-min/wk-1), was calculated as follows: duration \times frequency per week \times MET intensity. It also represented and summerised walking, moderate-intensity and vigorous-intensity PA for the week [20].

All questions are related to activities performed during the previous seven days [21].

The properties of IPAQ are appropriate for assessing the levels of PA in 18-to 65-year-old adults, in various environments [22]. In our study, the reliability of the IPAQ was satisfactory (Cronbach’s $\alpha = 0.80$) [18].

2.4. Data Analysis

As far as data analysis is concerned, statistical analyses were made using the program IBM SPSS Statistics 20 (Armonk, NY, USA). The statistical indicators used were: arithmetic average (X), standard deviation (SD), Student’s *T*-test (t), and percent%. Person correlations (r) define the relationships between PA and quality of sleep.

3. Results

Students' physical characteristics were determined depending on gender, age, year of study and specialization. Based on age, respondents were divided as follows: for the age of 18, $n = 121$ subjects (86 males and 35 females); for the age of 19, $n = 136$ subjects (82 males and 54 females); for the 20-year-old students, $n = 117$ subjects (79 males and 38 females); for the 21-year-olds, $n = 16$ subjects (6 males and 10 females) and for those over the age of 21, $n = 4$ subjects (2 males and 2 females). Depending on the year of study: for first-year students, $n = 158$ subjects (110 males and 48 females); for the second year of study, $n = 120$ subjects (72 males and 48 females) and for the third year of study, $n = 116$ subjects (73 males and 43 females). Based on specialization, students were divided as follows: for PES, $n = 86$ students (68 males; 18 females); for SPP, $n = 106$ students (84 males; 22 females) and for KSM, $n = 202$ students (103 males; 99 females) (Table 1).

In men, the highest percentage values of PA were reported in survey respondents with a high level of PA, (HPAL = 51.76%, $n = 132$), followed by those with a moderate level (MPAL = 30.58%, $n = 78$), and with a low level (LPAL = 17.65%, $n = 45$). In women, the percentage values in terms of PA were the following: 43.16% of women have a moderate level of PA ($n = 60$), followed by those with a high PAL (33.81%, $n = 47$), and a low PAL (23.02%, $n = 32$).

In terms of quality of sleep in men, the results were: 74.11% ($n = 189$) had a good quality of sleep and 25.88% ($n = 66$) reported a poor quality of sleep. For women, we registered the following values: 71.94% ($n = 100$) had a good quality of sleep and 28.05% ($n = 39$) reported a poor quality of sleep (Table 2).

Table 2. Number, percentage, standard deviation and p-value of subjects divided into groups with different level of physical activity (PAL) and sleep quality.

Variable	Category	Group	Number	Percent%	SD	p-Value
Physical activity level (IPAQ)	LPAL	Male	45	17.65	478	0.00
	MPAL		78	30.58		
	HPAL		132	51.76		
	LPAL	Female	32	23.02		0.00
	MPAL		60	43.16		
	HPAL		47	33.81		
Sleep quality (PSQI)	GSQ	Male	189	74.11	478	0.00
	PSQ		66	25.88		
	GSQ	Female	100	71.94		0.00
	PSQ		39	28.05		

Abbreviations: LPAL—low physical activity level; MPAL—moderate physical activity level; HPAL—high physical activity level; GSQ—good sleep quality; PSQ—poor sleep quality; SD—standard deviation; $p < 0.05$.

The analysis of results based on gender and year of study, in terms of PA, presents the following values: in men—for first-year students, 63 respondents had a high PAL, 31 respondents had a moderate PAL and 10 had a low PAL; for the second year of study, 47 students had a high PAL, 28 had a moderate PAL, and 15 had a low PAL; and for the last year of study, we have concluded that 22 male students had a high PAL, 19 had a moderate PAL, and 20 students had a low PAL (Table 3). Women are divided as follows: for the first year of study, 24 female respondents had a high PAL, 22 had a moderate PAL and 5 had a low PAL; in second-year students, 15 had a high PAL, 15 had a moderate PAL, and 9 have a low PAL; and for the last year of study, 8 students had a high PAL, 23 had a moderate PAL, and 18 had a low PAL (Table 3).

Table 3. Number of respondents depending on gender and year of study with different PAL and sleep quality.

Variable	Male (n = 255)		Female (n = 139)		p-Value
Year of study and physical activity level	1st year	LPAL-10 MPAL-31 HPAL-63	1st year	LPAL-5 MPAL-22 HPAL-24	<0.00
	2nd year	LPAL-15 MPAL-28 HPAL-47	2nd year	LPAL-9 MPAL-15 HPAL-15	<0.00
	3rd year	LPAL-20 MPAL-19 HPAL-22	3rd year	LPAL-18 MPAL-23 HPAL-8	<0.00
Year of study and sleep quality	1st year	GSQ-104 PSQ-16	1st year	GSQ-60 PSQ-7	<0.00
	2nd year	GSQ-52 PSQ-19	2nd year	GSQ-26 PSQ-13	<0.00
	3rd year	GSQ-33 PSQ-31	3rd year	GSQ-14 PSQ-19	<0.00

Abbreviations: LPAL—Low physical activity level; MPAL—Moderate physical activity level; HPAL—High physical activity level; GSQ—Good sleep quality; PSQ—Poor sleep quality; $p < 0.05$.

Following the analysis of the results related to the quality of sleep, we concluded the following: in the case of men, among first-year students, 104 reported good sleep quality and 16 reported poor sleep quality; for the second year of study, 52 students reported good sleep quality, and 19 students reported poor sleep quality; and lastly, there is a relative balance between the number of third-year students—with 33 students reporting good sleep quality and 31 reporting poor sleep quality (Table 3). Among the first-year female students, 60 reported good quality of sleep and 7 reported poor sleep quality; for the second year of study, 26 women reported good sleep quality, and 13 reported poor sleep quality; and in third year, 14 female students reported good sleep quality, and 19 reported poor sleep quality (Table 3).

Based on academic specialization, the percentage values of the PA level in men were: in PES, 20.58% of men had a low level of PA, 36.76% had a moderate level and 42.64% had a high level of PA; in SPP: 19.04% of male students had a low level of PA, 46.42% had a moderate level and 34.52% had a high level of PA; and in KSM: 14.56% had a low level of PA, 13.59% had a moderate level and 71.84% had a high level of PA. As far as women are concerned, we obtained the following results: in PES, 38.88% had a low PA level, 11.11% had a moderate level and 50% had a high level; in SPP: 22.72% of women presented a low level, the same percentage (22.72%) had a moderate level, and 54.54% of women had a high level of PA; in KSM, 20.20% had a low PA level, 53.53% had a moderate level and 26.26% had a high level of PA (Table 4).

The percentage values in terms of sleep quality were: in the case of men, in PES: 61.76% reported good sleep quality, and 38.23% reported poor sleep quality; in SPP, 77.38% enjoyed good sleep quality, whereas 22.61% reported poor sleep quality; in KSM, 79.61% of men reported good sleep quality, and 20.38% reported poor sleep quality. In the case of women: in PES, 72.22% enjoyed a good quality of sleep and 27.77% reported a poor quality of sleep; in SPP, 81.81% of women reported good sleep quality, and 18.18% reported poor sleep quality of sleep; and in KSM, 69.69% of women reported good sleep quality, and 30.30% reported poor sleep quality (Table 4).

For comparing the level of PA and quality of sleep it is found that the averages of *t*-test for the two parameters, shows a difference: $t = -31.781$; $df = 393$; $p < 0.00$. Confidence interval of difference (95%) is between 0.93 (lower limit) and 1.05 (upper limit).

Table 4. Number and percentage of subjects depending on specialization with different PAL and sleep quality.

Variable	Male (n = 255)		Female (n = 139)		Percent% Male	Percent% Female
Specialization and physical activity level	PES	LPAL-14	PES	LPAL-7	20.58	38.88
		PES		PES	36.76	11.11
		MPAL-25		MPAL-2		
		HPAL-29		HPAL-9	42.64	50.00
	SPP	SPP	SPP	SPP	19.04	22.72
		LPAL-16		LPAL-5		
		MPAL-39		MPAL-5	46.42	22.72
		HPAL-29		HPAL-12	34.52	54.54
	KSM	KSM	KSM	KSM	14.56	20.20
LPAL-15		LPAL-20				
MPAL-14		MPAL-53		13.59	53.53	
	HPAL-74		HPAL-26	71.84	26.26	
Specialization and sleep quality	PES	GSQ-42	PES	GSQ-13	61.76	72.22
		PES		PES PSQ-5	38.23	27.77
		PSQ-26				
	SPP	SPP	SPP	SPP	77.38	81.81
		GSQ-65		GSQ-18		
		PSQ-19		PSQ-4	22.61	18.18
	KSM	KSM	KSM	KSM	79.61	69.69
		GSQ-82		GSQ-69		
		PSQ-21		PSQ-30	20.38	30.30

Abbreviations: PES—Physical education and sport; SPP—Sport and physical performance; KSM—kinetotherapy and special motility; LPAL—Low physical activity level; MPAL—Moderate physical activity level; HPAL—High physical activity level; GSQ—Good sleep quality; PSQ—Poor sleep quality.

According to the specialization, there are statistical differences between the levels of PA and quality of sleep of the three study programs, especially between PES ($t = 27.406$, $m = 1.209$) and KSM ($t = 42.260$; $m = 1.490$), and between SPP ($t = 30.511$; 1.490) and KSM ($t = 42.260$; $m = 1.490$). The differences between PES and SPP were lower: for PES ($t = 27.406$; 1.2093) and for SPP ($t = 30.511$; 1.2075).

Depending on the year of study, the differences between levels of PA are the following: between first year and 2st: $t = 45.987$, $df = 154$, $p < 0.00$. for first year, and $t = 34.090$, $df = 128$, $p < 0.00$. for 2st year; between first year and 3st: $t = 45.987$, $df = 154$, $p < 0.00$. for first year, and $t = 25.702$, $df = 109$, $p < 0.00$. for 3st year; and between 2st year and 3st year: $t = 34.090$, $df = 128$, $p < 0.00$. for 2st year, respectively $t = 25.702$, $df = 109$, $p < 0.00$. for 3st year.

The differences between sleep quality are the following: between first year and 2st: $t = 46.633$, $df = 186$, $p < 0.00$. for first year, and $t = 29.674$, $df = 109$, $p < 0.00$. for 2st year; between first year and 3st: $t = 45.633$, $df = 186$, $p < 0.00$. for first year, and $t = 29.711$, $df = 96$, $p < 0.00$. for 3st year; and between 2st year and 3st year: $t = 29.674$, $df = 109$, $p < 0.00$. for 2st year, respectively $t = 29.711$, $df = 96$, $p < 0.00$. for 3st year.

The p -value, obtained in the bivariate analysis between the level of PA and the level of sleep quality, showed the existence of a statistically significant correlation. The intensity of the correlation is average, ρ (0.585) (Table 5).

Table 5. Correlations between physical activity (PA) level and sleep quality.

		PA_LEVEL	SLEEP_QUALITY
PA_LEVEL	Pearson Correlation	1	0.585 **
	Sig. (2-tailed)		0.000
	n	394	394
SLEEP_QUALITY	Pearson Correlation	0.585 **	1
	Sig. (2-tailed)	0.000	
	n	394	394

** Correlation is significant at the 0.01 level (2-tailed).

The correlation between PA and sleep quality for PES specialization had the value, rho (0.685); for SPP, rho (0.452) and for KSM, rho (0.632). These correlations were statistically significant for $p < 0.01$.

The correlation between PA for students in the first year of study, and sleep quality for students in the third year of study, had the value, rho 0.683. These correlations were statistically significant for $p < 0.01$. Also, the correlation between PA and sleep quality between students in their second and third year of study, had the value, rho 0.746. Another significant correlation was between students in the second year of study, and students from third year. This correlation had a value of 0.714. The correlation between PA for students in the third year of study and sleep quality for students in the second year of study had the value, rho 0.827.

4. Discussion

The key findings of this research are: (1) there is a substantial number of students with a high level of PA and a good sleep quality; (2) there are significant statistical differences between the level of PA and the quality of sleep, depending on the year of study, gender and academic specialization; and (3) there is a medium intensity correlation between PAL and sleep quality for all the students.

In our study, it is noted that men score higher percentage values compared to women in terms of PAL, namely: 51.76% of men and 33.81% of women.

A similar study that investigated the PAL of students was carried out by Dabrowska et al. [23]. This study used a sample of 300 college students, from the Medical University of Silesia, Poland. The authors demonstrated that 46% of the students attending therapy classes had a very high PAL, 54% of them had a moderate PAL and none of the students studied had a low PAL [23].

Our research shows gender and year of study were important factors regarding the level of PAL. This study showed high PAL for each year level, in both sexes, except for the case of third year girls.

Our research also showed both men and women reported high scores regarding their quality of sleep. Namely: 74.11% of men enjoy good sleep quality, followed closely by 71.94% of women. Depending on gender and year of study, the same trend observed in PAL is observed in sleep quality, for both sexes.

Additionally, our research shows one average intensity correlation between sleep quality and PA. Furthermore, there are certain correlations between the two parameters depending on the students' specialization. The biggest differences between the two parameters are present between PES and KSM, and SPP and KSM. Students of KSM specialization have a smaller number of practical activities in the curriculum, compared to the other two specializations (PES and SPP), which may account for this difference.

Soric et al. (2015) carried out a study conducted on 276 children, aged 10.5–12 years, from diverse urban settings in Croatia. This study concluded that sleep duration and efficiency were unrelated to PA. Within-subjects associations revealed that an extra hour spent in bed during the night was followed by a 16-min decrease in moderate-to-vigorous PA ($p < 0.001$). This study also found no evidence that linked short sleep to low or reduced PA. [24].

Another study, conducted by Pesonen et al. (2011), examined temporal associations between objectively-measured PA during the day and in the evening, and sleep quantity and quality. The results show that the relationship between a higher level of PA and poorer sleep was bidirectional [25].

As previously mentioned, men and women during their first and second year of college have a higher level of PA and a better quality of sleep compared to the third-year students (particularly in the case of girls). This difference usually results from a decreased amount of practical classes required in the curriculum during the third year of study, as more emphasis is placed on theoretical classes instead.

A study carried out by Wunsch et al. [26] show a beneficial effect of PA on the quality of sleep, in students, under stressful conditions. The author states that this effect seems to depend on the total amount of PA performed during a stressful period. Therefore, maintaining a high level of PA during periods of academic stress should be a primary objective for students [26].

Kristicevic et al. [17] revealed in a study, conducted in 2010 with 2100 students sampled, that a poor quality of sleep can be linked to an increased risk of overweight/obesity. Also, both short and long time spent in bed and poor sleep quality are associated with a higher likelihood of having an overweight/obese status in a large sample of young adults [17].

Another study carried out by Kredlow et al. [27] demonstrated that intense exercise has a beneficial effect on many objective sleep indices. Nevertheless, these effects are small and variably robust. Among the beneficial effects, the author mentions the following: beneficial effects on the sleep onset latency, on middle insomnia, and a small effect on rapid eye movement (REM) sleep [27].

Vargas et al. [28] showed that overweight individuals may experience more sleep disturbances. From the clinical perspective, and based on the findings of research, physicians should not use time spent in bed as a proxy of sleep duration. Rather, they should use sleep duration combined with sleep quality to achieve a better understanding of the associations between sleeping habits and BMI [28,29].

This study has several limitations. Firstly, respondents were few in number. Secondly, we used the amount of time spent in bed as an indicator of sleep duration, which does not reflect the true sleep duration in participants. Thirdly, in order to expand this study on a national scale to ascertain the factors that influence PA and quality of sleep, further research is required.

5. Conclusions

PA is beneficial to the body, if done regularly, and can improve sleep quality.

In our study, in the case of men, the percentage values in terms of PA were the following: 51.76% of men had a high PAL, 30.58% had a moderate PAL, and 17.65% had a low PAL. In the case of women, the percentage values in terms of PA were the following: 33.81% of women had a high PAL, 43.16% had a moderate PAL, and 23.02% have a low PAL.

In terms of sleep quality, men were divided as follows: 74.11% enjoyed a good quality of sleep, and 25.88% had a poor quality of sleep. The percentage values for women were: 71.94% reported a good quality of sleep, and 28.05% reported a poor quality of sleep.

The study shows that there is a correlation of medium intensity between PA and quality of sleep. This study provided evidence that the differences between the levels of PA and quality of sleep correlated to the participant's academic specialization and showed significant differences between PES and KSM students, and SPP and KSM students.

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