Original article

Self-Determined Engagement in Physical Activity and Sedentary Behaviour of College Students in Eastern Croatia - Does the Major Subject of Study Make a Difference?

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Abstract

Aim: The aim of this study was to investigate physical activity and sedentary behaviour of college students who study health sciences (physiotherapy) and students who study non-health-related majors (law and economics) at the same college to find out if there is any impact of their major subject of study on how they spend their leisure time, as well as to examine sex differences in physical activity and sedentary behaviour.

Methods: A cross-sectional study was conducted during the winter semester of 2017. A total of 112 students volunteered to participate in the study, of whom there were 42 males (37%) and 70 females (63%). Physical activity was measured by using a short form of IPAQ (International Physical Activity Questionnaire) and sedentary behaviour by an SBQ (Sedentary Behaviour Questionnaire). Additionally, some general questions were included, such as sex, body height , body weight and field of study. Study participants were divided into two groups, according to their major: 1. students of physiotherapy (55 participants); and 2. students of law and economics (57 participants).

Results: The participants reported a high physical activity level, but also a significant amount of time spent on sedentary activities. Results showed that there was no difference in physical activity levels, but that there was a slight difference in sedentary behaviour between physiotherapy students and students of law and economics with regard to the following: total time spent in sedentary activities during weekdays ($p=0.006$), involvement in sitting and driving/riding in a car, bus or train on weekdays, and time spent playing computer/video games on weekend days ($p=0.046$).

Conclusion: Presented results lead to the conclusion that the majority of students are sufficiently active, but still spend much time on sedentary activities. Students with different preferences also differ in how they spend their leisure time, but do not differ in physical activity level.

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Introduction

Physical inactivity is the fourth leading risk factor responsible for 6% of deaths around the world, according to the World Health Organization (WHO) (1). It presents a threat to global health due to its great prevalence among all age groups and correlation with weight gain, cardiovascular diseases, diabetes and many other medical conditions (2). Current international physical activity (PA) guidelines recommend that an adult must engage in at least 150 minutes of moderate-intensity aerobic activity or 75 minutes of vigorous-intensity activity (600 MET-min) weekly (3). When it comes to inactivity, young adults are one of the vulnerable age groups since they are at a stage of life when their habits and lifestyle are forming. In the past decade, there has been a growing number of studies investigating physical activity and inactivity among young adults, mostly university and college students. Studies have measured physical activity mostly by self-evaluation on the basis of questionnaires, with the IPAQ (international physical activity questionnaire) being one of the most popular due to its good metric properties (4-10). Most of the studies investigating physical activity among university and college students reported low physical activity, with a minority of them meeting physical activity guidelines (11, 12). Also, sedentary behaviour is fairly widespread among young adults (13), measured by screen-time or the use of mobile phones. Sedentary behaviour is also regarded as a risk factor for many diseases and it is affecting health independently of physical inactivity (14).

Physical inactivity should be differentiated from sedentary behaviour. People can be both highly active and highly sedentary (15). For those reasons, sedentary behaviour and physical activities should be investigated as two distinct modes of behaviour. Female students are usually more inactive than male (16,17), but that does not necessarily mean that they are spending more time in sedentary activities.

However, we found that there is a lack of studies investigating the difference between students from different study groups. Yang and collaborators reported that a 7-week course on knowledge, attitude and practice of health behaviour improved health-related behaviour in Chinese college students, including an increase in high physical activity involvement and a decrease in screen-time (18). This led to an increase in interest for examining the differences between students of health sciences and students majoring in non-health-related studies. Students of health sciences should be better informed about the benefits of physical exercise and the effects of sedentary behaviour on health than the students who study non-health related majors. Physical therapy students should be especially aware of physical activity benefits, as well as of adverse effects of sedentary behaviour, considering that, after graduation, their profession should include active lifestyle promotion and safeguarding of health.

The main hypothesis of this paper was developed based on the aforementioned and states as follows: students of physiotherapy are more active, with higher physical activity levels, and spend less time in sedentary activities, compared to students who study law or economics at the same college. We also examined sex differences in physical activity levels and sedentary behaviour.

Participants and methods

Participants

A cross-sectional study was conducted during the winter semester of 2017. All first-year students at the College of Applied Sciences in Vukovar were invited to participate in the study. One hundred and twelve students volunteered to participate. Among them, there were forty-two males (37%) and 70 females. The participants' age was between 18 and 22 years (median age 19). Study participants were divided into two groups, according to their major subject of study:

1. students of physiotherapy (55 participants); and

2. students of law and economics (57 participants).

All participants signed informed consent forms.

Measures

The survey included a short form of IPAQ (International Physical Activity Questionnaire) (19) and an SBQ (Sedentary Behaviour Questionnaire) (20). Additionally, some demographic items were included, such as sex, body height, body weight and field of study.

The short form of IPAQ consists of seven items. Six items measure three levels of physical activity (light (walking), moderate and vigorous) and one measures daily sitting time. According to Craig and colleagues (21), IPAQ is characterized by a good test-retest reliability coefficient (ICC) ranging between 0.81 and 0.89 and criterion validity (Spearman coefficient) ranging from 0.26 to 0.27. Metabolic equivalent minutes (MET min/wk) and time spent in physical activity per week were calculated by following the scoring protocol (22). Time spent in physical activity (PA) per week was converted into time spent in physical activity per day (min PA/7).

SBQ measures time spent in 9 sedentary activities during weekdays and weekend days separately. There are 9 items that determine the amount of time spent doing 9 sedentary activities during weekdays and weekend days: watching television, playing computer/video games, sitting while listening to music, sitting and talking on the phone, doing paperwork or office work, sitting and reading, playing a musical instrument, doing arts and crafts, sitting and driving/riding in a car, bus, or train. According to Rosenberg and colleagues (23), the ICCs were acceptable for all items and the total scale (range=0.51-0.93). For men, there were significant relationships of SBQ items with IPAQ sitting time and BMI. For women, there were relationships between the SBQ and accelerometer inactivity minutes, IPAQ sitting time, and BMI.

The participants gave their answers by selecting the amount of time they spend performing the relevant sedentary activity on a typical weekday in the first part, and on a typical weekend day in the second part of the SBQ (from when they wake up until they go to bed). Frequencies of answers were compared between the tested groups.

BMI (body mass index) was calculated based on self-reported height and weight.

Statistical analysis

Statistical analysis was performed using IBM SPSS Statistics 20.

Numerical variables: BMI value, time spent in sitting, walking, and in moderate and vigorous activities were tested for normal distribution. Normally distributed data were presented as a mean and standard deviation, while non-normally distributed data were presented as median and range. The difference between study types (majors) was tested by applying the Mann-Whitney U-test for independent samples. It was used to compare IPAQ results.

The difference in frequency of answers in the SBQ was tested by using the chi-square test, as well as the difference in frequency between physical activity levels according to IPAQ score, and the difference in frequency between BMI categories. Level of significance was set at p=0.05.

Results

Total engagement in physical activities reported by the participants was from 0 to 630min/day, with the median being 120min/day, and mode being 60min/day. There was no statistically significant difference between physiotherapy students and students of law and economics (p=0.183), or between male and female students (p=0.204). Table 1. shows the reported physical activity engagement levels during one typical day for physiotherapy students and for students of law and economics.

Table 1. Difference in time (min/day) spent in physical activities between physiotherapy students and students of social sciences

Type of physical activity	Time spent in physical activity (min/day)								p*
	physiotherapy students (N=55)				students of social sciences (N=57)				
	min	max.	median	mean	min	max.	median	mean	
Vigorous PA	0	120	20	24.4	0	200	30	45.2	0.161
Moderate PA	0	180	30	40	0	300	30	30	0.061
Walking	0	420	30	78	0	240	60	84	0.707

* statistical significance of difference derived from the Mann-Whitney U-test

The reported sitting time (IPAQ) in a typical day is between min. 30min and max. 720min, with the median being 360min, and mode being 300min. There was no statistical difference between males and females (p=0.29), but the difference between physiotherapy students and students od law and economics was statistically significant, indicating that physiotherapy students spend more time in sitting activities in comparison to students of law and economics (p<0.0001). Physiotherapy students reported between 120 and 720min of sitting per day, with median value being 420min/day, while the students of law and economics reported that they sit between 30 and 600min/day, with median value being 300min/day.

Reported physical activity converted to MET-min/week yielded results presented in Table 2. Physical activity of 74% participants (83 of 112 participants) was high, with their MET-min/week being over 3000 (68% of physiotherapy students and 81% of students of social sciences), while 6 (5%) participants reported physical activity lower than 600 MET-min/week, which represents low physical activity (7% of physiotherapy students, and 3% of students of law and economics). Pearson Chi-square revealed no significant difference between physiotherapy students and students of law and economics in terms of physical activity levels (p=0.345)..

Table 2. Difference in physical activity level expressed in MET-min/week between physiotherapy students and students of social sciences

Type of physical activity	MET-min/week								p*
	physiotherapy students (N=55)				students of social sciences (N=57)				
	min	max.	median	mean	min	max.	median	mean	
Vigorous PA	0	960	160	195.5	0	1600	240	362.1	0.161
Moderate PA	0	1440	200	280	0	2400	280	521	0.061
Walking	0	1386	198	287	0	792	198	253	0.707
TOTAL	0	2994	677	743	0	4330	640	1105	0.202

* statistical significance of difference derived from the Mann-Whitney U-test.

The SBQ results revealed that participants were involved in sedentary activities between 60 and 720min/day on weekdays, with median value being 300min/day, and between 15 and 720 min/day on weekend days, with median value being 300min/day. There was no statistically significant difference between males and females in terms of total time spent engaging in sedentary activities during weekdays (p=0.591) or weekend days (p=0.788). A statistically significant difference was noted between physiotherapy students and students of law and economics in terms of their sedentary behaviour during weekdays, as could be seen in Table 3..

Table 3. Difference in total time spent in sedentary activities (min/day) between physiotherapy students and students of social sciences during weekdays and weekend days

	Time spent in sedentary activities (min/day)								
	physiotherapy students (N=55)				students of social sciences (N=57)				p*
	min	max.	median	mean	min	max.	median	mean	
Weekdays	60	720	240	246	60	600	300	340	**0.006**
Weekend days	30	600	300	300.5	15	720	330	332.5	0.372

* statistical significance of difference derived from the Mann-Whitney U-test.

Students of social sciences are more involved in sedentary activities during weekdays. The total time spent on engaging in sedentary activities is a sum of all reported times spent on engaging in sedentary activities. All those activities, along with the distribution of reported times spent in each activity, are presented for students with different majors in Table 4., as are the results of the Pearson Chi-square test used to determine differences among groups.

Table 4. Difference in frequency of answers on time spent in each sedentary activity/day between physiotherapy students and students of social sciences (p = statistical significance derived from the chi-square test).

			0 min /day	up to 15 min /day	15-30 min/day	30-60 min /day	1-2 hours /day	2-3 hours /day	3-4 hours/ day	4-5 hours /day	6 or more hours/day	p
Weekdays	watching TV	*physioth (N=55)*	13	8	1	17	10	3	2	1		0.238
		soc sci (N=57)	7	5	9	15	13	4	2	2		
	playing computer /video games	*physioth (N=55)*	27	3	7	10	6	2				0.379
		soc sci (N=57)	29	7	6	6	4	1	1	3		
	sitting while listening to music	*physioth (N=55)*	1	10	4	20	5	6	4	1	4	0.257
		soc sci (N=57)		3	8	14	11	6	5	2	8	
	using phone	*physioth (N=55)*	1	9	3	12	10	6	4	4	6	0.657
		soc sci (N=57)	5	8	5	10	8	6	2	7	6	
	doing paperwork or office work	*physioth (N=55)*	3	6	3	18	18	4	1	2		0.174
		soc sci (N=57)	7	8	11	15	13	1	1	1		
	sitting and reading	*physioth (N=55)*	22	13	6	7	6			1		0.742
		soc sci (N=57)	23	14	5	11	1	1	1	1		
	playing a musical instrument	*physioth (N=55)*	49	3	2	1						0.221
		soc sci (N=57)	55		1						1	
	doing arts and crafts	*physioth (N=55)*	26	6	2	11	9	1				0.095
		soc sci (N=57)	28	2	7	5	9	5		1		
	sitting and driving/riding in a car, bus, or train	*physioth (N=55)*	13	8	13	13	8					**0.009**
		soc sci (N=57)	2	5	7	26	12	2	2	1		
Weekend days	watching TV	*physioth (N=55)*	8	6	5	10	12	7	4	1		0.983
		soc sci (N=57)	7	4	6	15	13	7	3	1		
	playing computer /video games	*physioth (N=55)*	29	4	3	4	7	6	1			0.522
		soc sci (N=57)	28	5	5	9	5	4	0		2	

Continued

		0 min/ day	up to 15 min/ day	15-30 min/day	30-60 min/ day	1-2 hours/ day	2-3 hours/ day	3-4 hours/day	4-5 hours/ day	6 or more hours /day	p
sitting while listening to music	*physioth (N=55)*	5	4	5	14	9	2	5	3	6	**0.046**
	soc sci (N=57)		1	4	10	16	7	5	1	13	
using phone	*physioth (N=55)*	2	10	5	10	8	7	2	2	8	0.193
	soc sci (N=57)	7	3	8	10	7	7	5	6	5	
doing paperwork or office work	*physioth (N=55)*	8	8	6	15	11	5	0		1	0.121
	soc sci (N=57)	22	3	6	15	8	2	1		1	
sitting and reading	*physioth (N=55)*	26	8	5	9	3	2	1			0.935
	soc sci (N=57)	25	9	9	7	3	2	1		1	
playing a musical instrument	*physioth (N=55)*	49	2		3						0.119
	soc sci (N=57)	56		1						1	
doing arts and crafts	*physioth (N=55)*	23	1	7	5	14	3	1			0.438
	soc sci (N=57)	28	0	5	11	8	3	2		1	
sitting and driving/riding in a car, bus, or train	*physioth (N=55)*	11	7	14	14	5	2			1	0.262
	soc sci (N=57)	6	8	8	17	11	5	2		1	

The difference between physiotherapy students and students of law and economics was statistically significant in terms of sitting and driving/riding in a car, bus, or train during weekdays, and in terms of sitting while listening to music on weekend days. Physiotherapy students reported a maximum of 1-2 hours/day spent sitting and driving/riding in a car, bus, or train during weekdays, while some students of law and economics reported that they travel by car, bus or train for over 2-3 or more hours/day. Students of law and economics also reported longer times spent sitting while listening to music on weekend days in comparison to physiotherapy students.

There is a greater difference in distribution of time spent in sedentary activities between sexes. Females spend more time in sedentary activities: using the phone (p=0.041 for weekend days, and p=0.009 for weekdays), doing paperwork or office work (p=0.046 for weekend days and p=0.004 for weekdays) and sitting and reading (p=0.003 for weekend days and p=0.045 for week days), while males spend more time playing computer/video games compared to females both during weekdays (p<0.001) and weekend days (p<0.001). Also, females reported spending more time in doing arts and crafts on weekdays in comparison to males (p=0.036).

BMI ranged between 17 and 35kg/m2, with mean value being 22.4±3.13kg/m2. Most participants (86 of them, or 77%) were of normal weight (BMI from 18.5 to 24.9kg/m2), 7 (6%) were underweight, and 19 (17%) were overweight, with 4 overweight participants being in the obese category (BMI>30kg/m2). There was no

statistical difference between physiotherapy students and social sciences students (p=0.073) in terms of frequency distribution by their BMI categories.

Discussion

The main finding of this study was that there was no difference in the physical activity level, but there was a slight difference in sedentary behaviour between physiotherapy students and students of law and economics. Participants reported high physical activity levels, but also a significant amount of time spent in sedentary activities.

Most students reported high physical activity, while only 5% of them reported low physical activity (<600 MET-min/wk) and did not meet the physical activity recommendations. Studies with similar objectives presented various results. Some reported low physical activity levels and great amounts of time spent in sedentary activities (11-13, 24-26), while others reported results similar to ours with high prevalence of sufficiently active students (15, 27-29). The reasons for such discrepancies are still to be determined. Differences in research methodology could be affecting the results and could be one of the reasons for occurrence of such discrepancies. Smetaniuk and co-workers (30) identified the main themes related to the facilitators of and barriers to physical activity and sedentary behaviour in Master of Physical Therapy students: 1) priorities and life balance; 2) commitment and accountability; 3) environment; and 4) Master of Physical Therapy programming. Variations in results pertaining to physical activity levels of participants in different studies in different places probably could be partially explained by differences in the aforementioned facilitators and barriers. In their study conducted among college students from the Mid-Atlantic Region, US, Vainshelboim and cooperatives (29) reported results similar to ours. They reported that 84-94% of examined students met the physical activity recommendations. Another similarity pertains to sedentary behaviour. Our results showed that approximately half of the questioned students spend 6 hours/day in sedentary activities, while they reported that 69% females and 46% males are highly sedentary. Those individuals who are highly active and highly sedentary at the same time are known as "active couch potatoes" (31). They regularly exercise and meet the physical activity recommendations, but still spend great amounts of time in sedentary activities. Barkley and Lepp (32) reported that cell phone use is a significant positive predictor of being an "active couch potato". Mobile phones use was shown to be associated with sedentary behaviour of college students (32). However, Penglee and associates examined the correlation of smartphone use and physical activity among college students in the United States and in Thailand (33), and reported that greater smartphone use per day is inversely related to days per week of engaging in physical activity among Thai students, but not among US students. It is common belief that sedentary behaviour is displacing physical activity, so when sedentary behaviour increases, physical activity should decrease. However, this does not have to be the case when it comes to mobile phone use. There are some smartphone functions and applications that can encourage physical activity. There are many ways in which mobile phones can be used, and if someone is a "heavy" user, their use does not have to necessarily represent time spent in sedentary behaviour. In our study, only 6 participants reported not using phones during weekdays, and 9 reported not using them on weekend days, while others use phones during the greater part of the day (Table 4). We also found that there was no difference between males and females in terms of total time spent in sedentary behaviour. However, there was a difference between sexes regarding the distribution of that total time in terms of time spent on different sedentary activities. This is probably a consequence of sex differences in terms of preferences and interests. According to the review of Castro et al. (34), these results differ from the results of other studies. They found that sex has no association with total sedentary time, with screen-time, or with preferences to any type of sedentary activity. We ascertained that females use phones more than males, they also spend more time doing paperwork or office work and sitting and reading, as well as doing

arts and crafts on weekdays, while males spend more time playing computer/video games compared to females, both during weekdays and weekend days. However, there is no difference between males and females in terms of total time spent in sedentary activities.

As for the differences regarding sedentary activities between physiotherapy students and students of law and economics, we ascertained a significant difference in the total amount of time spent in sedentary activities during weekdays, but no difference in the total amount of time spent in sedentary activities during weekend days. During weekdays, students of law and economics reported more time spent performing the listed sedentary activities compared to physiotherapy students, even though, in the IPAQ, the physiotherapy students reported more time spent sitting. This discrepancy in the results could stem from the differences pertaining to class schedule, because sitting in a classroom was not listed as sedentary behaviour in the SBQ. Doing paperwork and office work was included, but that could easily be understood for doing homework, preparing for class or performing other activities at home, after classes. Physiotherapy students are more oriented towards practical lessons that require their involvement. This means that they do not always sit and listen during their classes, but are required to move and be physically active, unlike students who study law and economics, where classes, in general, require the students to sit and listen. In addition, other variables could also affect the differences pertaining to total time spent in sedentary behaviour during weekdays and weekend days, e.g. the distance between a student's residence and college, which could affect the total time that a student spent sitting while driving to class.

Weight status of the participants was mostly within normal weight thresholds (BMI between 18.5 and 24.99kg/m2), but every fifth participant was overweight. Physical inactivity is strongly correlated to BMI, and regular exercise and an active lifestyle are the best way to reduce weight and reach a healthy weight status. There were no differences between physiotherapy students and students of law and economics in terms of distribution across weight categories. Young adults in general should be more educated about the risk of health problems connected to high BMI.

The limitations of the study include the use of subjective measures, although valid and reliable. Although researchers tried to explain the questions to the participants and help them understand and answer them as accurately as they can, the answers are still a subjective evaluation and a memory of past events, as they remember them. Objective measures of physical activity and sedentary behaviour are warranted for future studies. Also, the cross-sectional design of the study could represent a limitation due to the inability to track changes in physical activity and sedentary behaviour, as well as their interaction, or to investigate potential facilitators and barriers that affect physical activity and/or sedentary behaviour. Of course, we must take into consideration the limitation of use of IPAQ. IPAQ is a questionnaire that requires participants to record only physical activities (vigorous, moderate and walking) that lasted at least 10 minutes at a time. In our opinion, this is the reason why the results included 0min of walking. This result is not within the 5% of extremes, because all participants who live near the college and walk, e.g., 5min to get to their classes, or those who drive to college by car or bus and do not walk around for more than 10min do not record this brief amount of time that they spent walking. On the other hand, some students work while studying and they spend a great amount of time walking to their workplace.

All presented results lead to the conclusion that the majority of students are sufficiently active, but they still spend much time in sedentary activities. Our hypothesis was partially disproved, because we found no significant difference in physical activity between physiotherapy students and students of law and economics. On the other hand, physiotherapy students reported more time spent sitting, while students of social sciences reported more time spent in sedentary behaviour during weekdays. This could lead to the conclusion that, in this

case, a major affects what kind of lifestyle the students adopt and in which leisure activities they engage in. Students with different preferences also differ in terms of how they spend their leisure time.

In short, the student population should be provided a better education regarding the effects of sedentary behaviour on their health and wellbeing.

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