

The assessment of the physical activity of Romanian university students in relation to nutritional status and academic performance

Estimarea activității fizice la un lot de studenți din România în relație cu starea de nutriție și performanța universitară

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Abstract

Background. Regular physical activity may help improve the students' academic performance, including academic achievement and grades, academic behavior such as time on task, factors that influence academic achievement such as concentration and attentiveness in the classrooms. Long term benefits of physical activity help to reduce the incidence of overweight and obesity and chronic disease such as diabetes, cardiovascular disease and cancer. Also, regular physical activity may reduce anxiety and depression and promote positive mental health.

Aims. To estimate the physical activity level among students and to correlate it with academic performance, such as grades in the previous semester and hours of individual study, and the body mass index.

Methods. The study was a cross-sectional survey analysis of 315 university medical students. Physical activity was assessed using the International Physical Activity Questionnaire, the short self-administered form. Academic performance was estimated using additional questions, such as hours of individual study and average grades in the previous semester. Nutritional status was assessed by computing the body mass index. Descriptive statistical tests and multivariate analyses (Games-Howell test, Pearson correlation) using SPSS version 20 were performed.

Results. Males performed more physical activity than females ($p=0.002$). Physical activity was correlated with the body mass index and body weight ($p=0.02$). The results of the study showed the correlation between total physical activity and the grades in the previous semester.

Conclusion. The findings of this study underline the need to increase the level of physical activity among students in order to promote a healthy lifestyle and to improve academic performance. Secondly, the study highlights problems of public health; medical students could have a higher level of physical activity than the general population, being more informed.

Key words: physical activity, students, academic performance, nutritional status.

Rezumat

Premize. Activitatea fizică regulată poate augmenta performanța academică a studenților, prin îmbunătățirea rezultatelor obținute, a creșterii randamentului școlar, a puterii de concentrare și a atenției în timpul orelor. Beneficiile pe termen lung ale activității fizice regulate sunt de a preveni incidența supraponderiei și obezității, și a bolilor cronice, ca și diabetul, bolile cardiovasculare și unele localizări ale cancerelor. De asemenea, efortul fizic regulat poate reduce anxietatea și depresia și promovează o sănătate mintală pozitivă.

Obiective. Scopul studiului este de a estima nivelul activității fizice la un lot de studenți și de a o corela cu performanța academică, precum și cu statusul nutrițional al studenților.

Metode. S-a efectuat un studiu transversal pe un lot de 315 studenți medici. Nivelul activității fizice s-a estimat cu ajutorul unui chestionar validat, autoadministrat. Performanța academică s-a evaluat pe baza unor întrebări adiționale incluse în chestionar: ore studiu individual pe săptămână și media notelor obținute în semestrul anterior. Statusul nutrițional a fost apreciat prin calcularea indicelui de masă corporală. Datele au fost analizate în programul SPSS 20. S-a folosit testul Games-Howell pentru analiza multivariată și coeficientul de corelație Pearson.

Rezultate. Băieții au efectuat semnificativ mai mult efort fizic decât fetele ($p=0.002$). Nivelul activității fizice s-a corelat cu indicele de masă corporală și greutatea studenților ($p=0,02$). Studiul a evidențiat corelația dintre activitatea fizică totală și media semestrului anterior.

Concluzii. Rezultatele studiului de față subliniază necesitatea creșterii nivelului activității fizice la studenți pentru promovarea stării de sănătate și îmbunătățirea performanțelor școlare. Totodată, studiul nostru ridică probleme de sănătate publică referitoare la activitatea fizică efectuată de populație, studenții medici fiind mai informați despre stilul de viață sănătos ar putea presta mai mult efort fizic decât populația generală.

Cuvinte cheie: activitate fizică, studenți, performanța academică, status nutrițional.

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Introduction

Regular physical activity may help improve the students' academic performance, including academic achievement and grades, academic behavior such as time on task, factors that influence academic achievement such as concentration and attentiveness in the classrooms. Long term benefits of physical activity help to reduce the incidence of overweight and obesity and chronic disease such as diabetes, cardiovascular disease and cancer (***, 2014). These diseases have been strongly associated with unhealthy lifestyle habits such as inappropriate nutrition, lack of exercise, smoking, alcohol consumption, caffeine overuse and improper sleeping habits. Healthy active living benefits both individuals and society in many ways, by increasing productivity, improving morale, decreasing absenteeism, and reducing health care costs. Other benefits include improved psychological well-being, physical capacity, self-esteem and the ability to cope with stress. Also, regular physical activity may reduce anxiety and depression and promote positive mental health (***, 2014). University life is also a period during which individuals are mostly exposed to stress and lack of time, which poses a barrier to the adoption of healthy practices (Kim et al., 2005). Physical activity among students is consistently related to higher levels of self-esteem and self-concept and lower levels of anxiety and stress. Although student behaviors are considered a temporary part of university life, the unhealthy habits picked up during this time period generally persist in adult life. Among this student population, it is assumed that medical students have a greater knowledge about a healthy lifestyle and dietary habits when compared to other students.

Healthy habits among medical students are even more important as they are future physicians and students who personally ignore adopting a healthy lifestyle are more likely to fail to establish health promotion opportunities for their patients (Rao et al., 2012).

According to the World Health Organization, the recommended levels of physical activities for adults aged between 18-64 are: at least 150 minutes of moderate-intensity aerobic physical activity throughout the week or at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week or an equivalent combination of moderate- and vigorous-intensity activity. Aerobic activity should be performed in bouts of at least 10 minutes duration. For additional health benefits, adults should increase their moderate-intensity aerobic physical activity to 300 minutes per week, or engage in 150 minutes of vigorous-intensity aerobic physical activity per week, or an equivalent combination of moderate- and vigorous-intensity activity. Muscle-strengthening activities involving major muscle groups should be performed on 2 or more days a week (***, 2009). Participation in physical activity declines as young people age. Personal, social, and environmental factors all play a role in determining physical activity levels among youths. Physical activity researchers have identified some of the principal factors found to be positively associated with physical activity among youths, which include parental education, male gender, participation in physical education classes and school sports, belief in the ability to be active (self-

efficacy), personal goals, enjoyment of physical activity, support of friends and family, and supportive environments (e.g., presence of sidewalks, access to neighborhood or school play areas, and access to recreational equipment) (Lowry et al., 2013).

Objectives

To estimate the physical activity level among students and to correlate it with academic performance, such as grades in the previous semester and hours of individual study, and the body mass index.

Hypothesis

Both physical activity and the body mass index have been shown to impact academic performance in students, but data for university students are limited.

Material and methods

Research protocol

We mention that according to the Helsinki Declaration, the Amsterdam Protocol and Directive 86/609/EEC, the approval of the Ethical Commission of "Iuliu Hațieganu" University of Medicine and Pharmacy Cluj-Napoca was obtained. The informed consent of the participants in this research was given.

a) *Period and place of research.*

A cross-sectional survey analysis was conducted on 315 university medical students from the "Iuliu Hațieganu" University of Medicine and Pharmacy Cluj-Napoca. Data were collected during the second semester (February- May 2013) of the academic year 2012-2013.

b) *Subjects and groups.*

The sample consisted of 103 male students and 212 female students. 45.72% were first year students and 54.28% were third year students. The mean age of the subjects in the selected group was 20.76 ± 1.91 years. Participation in the study was voluntary and anonymous. All students agreed to participate in this study.

c) *Tests applied*

Physical activity was assessed using the International Physical Activity Questionnaire, the short self-administered form (Craig et al., 2013). The questionnaires were administered during the classes to encourage participation. This questionnaire estimates the time spent being physically active in the last 7 days. The questions assess the duration ("how much time did you usually spend...") and frequency ("how many days/week") of vigorous, moderate physical activities and walking. Vigorous physical activity refers to activities that require heavy physical effort and make someone breathe much harder than normal. Moderate physical activities refer to activities that make someone breathe somewhat harder than normal. Academic performance was estimated using additional questions, such as hours of individual study and average grades in the previous semester. Self-reported height and weight were also included in the questionnaire. Nutritional status was assessed by computing the body mass index (or the Quetelet index) using the formula $\text{weight}/\text{height}^2$ (kg/m^2). We divided the study group in four categories depending on the body mass index: underweight with $\text{BMI} < 18.5$; normal weight with $\text{BMI} = 18.5-24.9$; overweight with $\text{BMI} = 25-29.9$ and obese with $\text{BMI} > 30$.

d) *Statistical processing*

Descriptive statistical tests and multivariate analyses (Games-Howell test, Pearson correlation) using SPSS version 20 were performed.

The results were statistically significant at $p < 0.05$.

Results

The results of the study showed that 57.8% of the students were engaged in vigorous physical activity and 50.2% in moderate physical activity. For all students, walking was the main physical activity performed (Table I).

Table I
Type of physical activity and prevalence among students.

Type of physical activity	Total number (percent)	Males (number, percent)	Females (number, percent)
Vigorous	182 (57.8%)	73 (70.87%)	111 (52.35%)
Moderate	158 (50.2%)	61 (70.87%)	99 (46.69%)
Walking	302 (95.9%)	94 (91.26%)	207(97.64%)

Table II
Studied variables depending on gender.

Studied variables	Males	Females
	(mean \pm standard deviation)	(mean \pm standard deviation)
Grade point average in the previous semester ¹	8.13 \pm 0.95	8.88 \pm 7.47
Hours of individual study/ week ²	19.51 \pm 13.04	22.99 \pm 12.35
Vigorous physical activity min/ day ³	36.10 \pm 28.38	30.48 \pm 23.16
Moderate physical activity min/day ⁴	34.80 \pm 29.97	31.21 \pm 37.61
Walking min/day ⁵	84.08 \pm 70.69	72.58 \pm 50.79
Total physical activity min/day ⁶	123.42 \pm 90.83	100.97 \pm 69.46

¹ $p > 0.05$; ² $p = 0.02$; ³ $p > 0.05$; ⁴Anova $F = 22.46$ $p < 0.001$;

⁵Anova $F = 4.78$ $p = 0.003$; ⁶Anova $F = 5.11$ $p = 0.002$

Male students had a higher level of physical activity than female students. They were involved for a longer time in all physical activities. Female students spent more time studying than male students and had better grades in the previous semester than male students (Table II).

The results of the study showed that the mean value of the body mass index for both girls and boys was within the normal weight category (Table III).

Table III
Assessment of nutritional status.

Variable	Males (mean \pm standard deviation)	Females (mean \pm standard deviation)	p value
Weight (kg)	71.17 \pm 14.25	58.80 \pm 9.64	< 0.001
Height (cm)	176.62 \pm 9.63	168.05 \pm 6.82	< 0.001
Body mass index (kg/m ²)	22.66 \pm 3.06	20.74 \pm 2.51	< 0.001

The majority of the students (74.8%) had a normal BMI. More male students were overweight than female students, but more girls (17.5%) were included in the underweight category than boys (Chi-square=23.099, $p < 0.001$). Only a small percent (1.5%) of these students were obese (Table IV).

Table IV
Categories of body mass index in the studied groups.

Body mass index	Total (number, %)	Males (number, %)	Females (number, %)
Underweight < 18.5	43 (13.7%)	6 (5.9%)	37 (17.5%)
Normal weight 18.5-24.9	234 (74.8%)	73 (71.6%)	161(76.3%)
Overweight 25-29.9	31 (9.9%)	20 (19.6%)	11 (5.2%)
Obesity > 30	5 (1.6%)	3 (2.9%)	2 (0.9%)

The results showed the presence of a correlation between the total level of physical activity and the body mass index. On the other hand, the average grades in the previous semester were correlated with the amount of physical activity. The body mass index was positively correlated with the grades in the previous semester (Table V).

We calculated the level of physical activity depending on the categories of BMI. Apparently, obese students performed more effort than other students. On the other hand, normal weight students were more physically active than overweight and underweight participants (Table VI).

Table V
Correlation between physical activity, academic performance and the body mass index.

Variable	Vigorous physical activity	Moderate physical activity	Walking	Total physical activity	Body mass index	Hours of individual study/week	Grade point average
Vigorous physical activity	1						
Moderate physical activity	.153	1					
Walking	-.046	.240**	1				
Total physical activity	.356**	.625**	.823**	1			
Body mass index	-.046	-.616**	.103	-.284**	1		
Hours of individual study/week	-.107	.001	.007	.008**	.031	1	
Grade point average	.022	-.027	-.054**	.023**	.015**	-.034	1

Table VI
Levels of physical activity depending on nutritional status.

BMI (kg/m ²)	Vigorous physical activity (min/day)	Moderate physical activity (min/day)	Walking (min/day)	Total physical activity (min/day)
Underweight BMI < 18.5	29.50 \pm 24.43	23.26 \pm 23.12	76.16 \pm 45.77	104.38 \pm 53.26
Normal weight BMI=18.5-24.9	33.26 \pm 25.74	32.25 \pm 27.88	78.07 \pm 60.74	110.26 \pm 78.56
Overweight BMI=25-29.9	34.03 \pm 27.58	26.21 \pm 20.03	54.75 \pm 35.26	84.26 \pm 44.88
Obese BMI > 30	28.57 \pm 19.79	168.57 \pm 113.82	180 \pm 60	226.28 \pm 209.39

Discussion

Physical inactivity is the fourth leading risk factor for global mortality (5.5%), after high blood pressure (12.8%), tobacco use (8.7%), high blood glucose (5.8%) (***, 2014). The long-term consequences of physical inactivity and a poor diet, overweight and obesity can increase one's risk for diabetes, high blood pressure, high cholesterol, asthma, arthritis, and poor health status. Increasing levels of physical inactivity are seen worldwide, in high-income countries as well as in low- and middle-income countries. In addition to this, different studies have demonstrated that, in general, the engagement in physical activities in the spare time decreases as we get older, and that women devote less time to the practice of moderate and vigorous physical activities (Irwin, 2007). Urban and environmental policies can have huge potential to increase physical activity levels in the population. It is well known that the practice of physical exercise can have important benefits in terms of preventive and therapeutic effects on health (Norwood et al., 2013). A number of studies conducted to evaluate the physical activity, diet, and fitness status of university students have revealed that the physical condition and nutritional habits of students are very much associated with their own attitudes toward health promotion and illness prevention (Haase et al., 2004). Positive attitudes in these regards are vital for our future health professionals.

A positive finding revealed by our study was that nearly 75% of the medical students had a normal BMI. The results of the study show that students met the WHO recommendations regarding physical activity guidelines for health. Normal weight students had a higher level of physical exercise than overweight students and this result highlights the importance of effort in preventing weight gain. Like other studies, the present study showed that males were more physically active than females (Nițescu et al., 2013). Only 50% of the girls performed moderate and vigorous physical activity. Both male and female students were engaged in over an hour of walking daily. It is possible that in the general population, the general level of physical activity might be lower; medical students, being more informed about the benefits of regular physical activity in conjunction with a healthy lifestyle, could have a better attitude regarding this practice. Even in adolescence (Kim et al., 2005) and during the transition period to university, and more specifically during the university study period, there is a rise in the disregard of a healthy lifestyle and a decrease in the practice of moderate to vigorous physical activity. This becomes a critical moment for the promotion of physical activity, mainly among women (Vilhjalmsson & Kristjansdottir, 2003), who start to reduce their level of physical-sport practice from 11/12 years old. It is important that the necessary steps are taken in order to deal with this problem. Research has revealed many influential determinants of physical activity, with specific attitudes and beliefs being associated with a lack of physical activity. Several studies have concluded that "not having enough time" is the most important barrier for not participating in physical activity (Gómez-López et al., 2010).

Research suggests that physical activity may increase the students' cognitive control - or ability to pay attention

- and also results in better performance on academic achievement tests (Shepard, 1997; Dwyer et al., 2001). A lot of studies suggest a positive correlation between physical activity and the academic performance of students (Booth et al., 2013).

This link could be caused by many factors: increased blood and oxygen flow to the brain, boosts in hormones such as norepinephrine and endorphins which help improve mood, and increased growth factors that help create new nerve cells and support synaptic plasticity. The present study found a positive correlation between total physical activity and grades in the previous semester. Grades in the previous semester were positively correlated with the body mass index.

One major limitation of this study was the small sample size, diminishing the power to detect differences among groups. Secondly, as with any cross-sectional study, the reported values may be a snapshot and not represent the full experience of this population. Caution should be taken when interpreting our findings, since it is well established that individuals tend to over-report their height and under-report their weight, causing misclassification of BMI status. Additionally, individuals tend to over-report their physical activity (Franz & Feresu, 2013). This tendency is most prevalent in overweight persons, and this could have affected our results.

The study supports public health policies to increase physical activity in communities. Tobacco use, together with physical inactivity, unhealthy dietary habits and an excessive energy intake are the most modifiable risks factors for non-communicable diseases.

Conclusions

1. Male students performed higher levels of physical activity than female students.
2. The study highlights the importance of physical activity in improving academic performance among medical university students.
3. The results show that adopting a healthy lifestyle, which includes physical activity, can prevent overweight and obesity among university medical students that spend a lot of time studying.
4. It is possible that medical students had a better attitude and practice of physical activity than general population students, being more informed about the benefits of regular exercise in improving good health.

Conflicts of interests

There are no conflicts of interests.

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