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Original study
Originalni naučni rad
UDK 796-057.875:[616.98:578.834]-036.21
<https://doi.org/10.2298/MPNS2202031M>

ASSESSMENT OF THE LEVEL OF PHYSICAL ACTIVITY IN THE FINAL YEAR STUDENTS OF THE FACULTY OF MEDICINE IN RELATION TO THE STUDENTS OF THE FACULTY OF AGRICULTURE DURING THE COVID-19 EPIDEMIC

PROCENA STEPENA FIZIČKE AKTIVNOSTI STUDENATA ZAVRŠNE GODINE MEDICINSKOG FAKULTETA U ODNOSU NA STUDENTE POLJOPRIVREDNOG FAKULTETA TOKOM COVID-19 EPIDEMIJE

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Summary

Introduction. The coronavirus pandemic has affected various aspects of human life around the world and, among other things, the quality and level of physical activity, which is one of the main preventive mechanisms for many chronic diseases, for both young and adults. It has been shown that physical activity improves mental health and quality of life. Due to the strict measures during the pandemic, people spent more time at home, inactive, sitting or lying for long periods of time. The aim of this study is to assess the level of physical activity of students during the coronavirus disease 2019 epidemic and to determine the impact of these measures on its level. **Material and Methods.** The study was conducted as a retrospective study including a total of 60 students, aged 22 to 30 years, of which 30 students were final year students of the Faculty of Medicine in Novi Sad and 30 students of the Faculty of Agriculture in Novi Sad. The International Physical Activity Questionnaire was used to assess the level of physical activity. **Results.** The strictest epidemiological measures affected the level of physical activity of students, mostly reducing the level of light-intensity physical activity. Students of the Faculty of Agriculture were more physically active during the quarantine, especially regarding moderate physical activities. There is no statistically significant association between gender, body mass index, and length of study with the level of physical activity during the epidemic. **Conclusion.** Students of the Faculty of Medicine showed a lower level of physical activity during the strict epidemiological measures compared to the following period. Students of the Faculty of Agriculture were more physically active during the quarantine compared to the following period and compared to the students of the Faculty of Medicine; they were more active both during and after the strict measures during the coronavirus disease 2019 epidemic.

Key words: COVID-19; Pandemics; Quarantine; Students; Exercise; Leisure Activities; Sedentary Behavior; Body Mass Index; Surveys and Questionnaires

Sažetak. Pandemija koronavirusa uticala je na različite sfere ljudskih života širom sveta, između ostalog i na kvalitet i nivo fizičke aktivnosti koja predstavlja jedan od glavnih preventivnih mehanizama za brojne hronične bolesti, kako mladih, tako i odraslih. Dokazano je da fizička aktivnost utiče na poboljšanje mentalnog zdravlja i kvaliteta života. Najstrože mere tokom pandemije dovele su do češćeg boravka u kući, pasiviziranja, dužeg sedenja i boravka u ležećem položaju. Cilj ove studije je da proceni stepen fizičke aktivnosti studenata tokom COVID-19 epidemije i utvrdi uticaj najstrožih epidemioloških mera na njen nivo. **Materijal i metode.** Studija je sprovedena u vidu retrospektivne studije na uzorku od 60 studenata, starosti od 22 do 30 godina, od kojih su 30 ispitanika studenti završne godine studija Medicinskog fakulteta Novi Sad, a 30 studenata Poljoprivrednog fakulteta Univerziteta u Novom Sadu. Za procenu nivoa fizičke aktivnosti, korišćen je Međunarodni upitnik za fizičke aktivnosti. **Rezultati.** Najstrože epidemiološke mere uticale su na stepen fizičke aktivnosti studenata, najviše se odrazivši na pad nivoa fizičke aktivnosti lakog intenziteta. Studenti Poljoprivrednog fakulteta su bili u većem stepenu fizički aktivni za vreme karantina, posebno pri obavljanju umerenih fizičkih aktivnosti. Ne postoji statistički značajna povezanost pola, indeksa telesne mase i dužine studiranja sa nivoom fizičke aktivnosti za vreme epidemije. **Zaključak.** Studenti Medicinskog fakulteta pokazali su niži stepen fizičke aktivnosti tokom najstrožih epidemioloških mera u odnosu na kasniji period. Studenti Poljoprivrednog fakulteta su bili fizički aktivniji tokom karantina u odnosu na kasniji period i u poređenju sa studentima Medicinskog fakulteta bili su aktivniji i tokom i nakon najstrožeg perioda COVID-19 epidemije.

Ključne reči: COVID-19; pandemija; karantin; studenti; fizička aktivnost; slobodne aktivnosti; sedeće aktivnosti; indeks telesne mase; ankete i upitnici

Abbreviations

IPAQ	– International Physical Activity Questionnaire
CVD	– cardiovascular disease
COVID-19	– coronavirus disease 2019
BMI	– body mass index
MET	– metabolic equivalent of task

Introduction

Physical activity is defined as any movement of the body produced by skeletal muscles that results in energy expenditure. Exercise is considered a subset of physical activity that is planned, structured and repetitive and its ultimate goal is to improve or maintain physical fitness [1].

Physical activity has an essential role in the prevention and treatment of many chronic diseases, both in young people and adults. Increasing physical activity is a key component to reducing morbidity and mortality [2].

There is ample evidence from clinical studies that moderate exercise has a protective effect on the development of cardiovascular disease, atherosclerosis and many other chronic diseases [3–4]. Cardiovascular disease (CVD) is the leading cause of morbidity and mortality worldwide [5] and risk factors for CVD include obesity, smoking, low levels of high-density lipoprotein, high total cholesterol, triglycerides, and high blood pressure [6].

It was found that the symptoms of depression in adolescents are inversely proportional to the level of physical activity.

Numerous studies have shown that people who maintain good physical fitness, among other benefits, have a longer life expectancy, their mortality rate is three times lower, especially between the ages of 50 and 70 [7]. A major obstacle for the development of effective methods for promotion of physical activity among all sections of the population is the lack of knowledge about the benefits of regular physical activity [8].

The World Health Organization declared a pandemic of the coronavirus disease 2019 (COVID-19) on March 11, 2020 [9]. The Director-General of the World Health Organization, Tedros Adhanom Ghebreyesus, called on all countries to activate and improve emergency response systems. Due to the crisis in countries around the world, measures were introduced to combat the pandemic of this contagious disease.

With enforcement of the anti-epidemic measures (temporary suspension of educational institutions, limited work hours, and recommendations for working from home, temporary measure of staying at home for people aged 65 and over, as well as closing sports facilities and open spaces for training) routine outdoor activities became limited, including regular physical activity.

Combating the spread of the virus was an urgent priority for public health, but there were not enough public health guidelines on what people could or should do to maintain their daily exercise or physi-

cal activity habits. It was necessary to prevent increase in sedentary behavior due to extended stay at home, i.e. spending a lot of time sitting or lying for long periods of time (watching TV, using mobile devices, playing games) and reducing regular physical activity. Such behavior over a long period of time may lead to muscle relaxation, loss of fitness, decreased circulation, anxiety, sleep disorders, depression, weight gain, increase in blood pressure and blood sugar, and potential worsening of chronic diseases.

There is a strong health dimension for physical activity at home. Carrying out regular physical activities and routine exercise in a safe home environment is an important strategy for maintaining healthy life during a coronavirus crisis.

Material and Methods

The retrospective study included a total of 60 students, male and female, aged 22 to 30 years. The examinees were divided into two groups. The first group included final year students of the Faculty of Medicine, while the second included final year students of the Faculty of Agriculture in Novi Sad. In both groups, male and female students were equally distributed, i.e. included 15 students of both sexes. Participation in the study was voluntary.

The study used a standardized questionnaire: the International Physical Activity Questionnaire (IPAQ) as well as a modified physical activity questionnaire in which the questions referred to a seven-day period at a time when the most stringent anti-epidemic measures were in force. All examinees, along with completed surveys, provided data on their height, body weight, age, gender, length of studying, and based on the first two parameters, the body mass index (BMI) was calculated for each subject.

Within the study, examinees independently completed the IPAQ.

International Physical Activity Questionnaire

The IPAQ assesses the level and types of physical activity carried out during everyday life. Within this study, examinees were surveyed through IPAQ 1 and IPAQ 2 questionnaires about the time they spent performing certain physical activities in the previous 7 days (IPAQ 1), and during 7 days at the time of the most severe epidemiological measures (IPAQ 2). The IPAQ has been widely used to assess the degree of physical activity in adult patients aged 15 to 69 years. The questionnaire can be used within clinical trials as well as in population surveys that compare levels of physical activity among populations internationally [11].

There are two versions of this questionnaire. The first is a short version, consisting of 7 questions, while the second is a longer version with 27 questions on physical activity. The short version collects data on all three levels of physical activity - vigorous (e.g. lifting loads, fast cycling ...), moderate (e.g. carrying less loads ...), light (light walking), but also about the time spent in a sitting position.

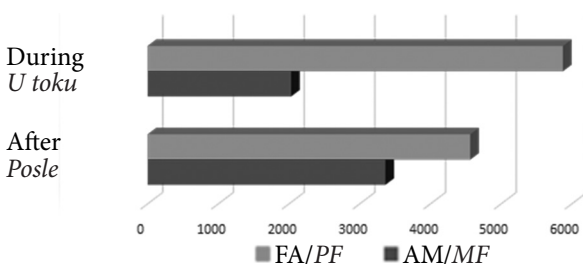
Table 1. Average values and basic characteristics of distribution
Tabela 1. Prosečne vrednosti i osnovne karakteristike distribucije

Questions/Pitanja	Descriptive characteristics/Deskriptivne karakteristike							
	Min Min	Max Maks	Mean/Srednja vrednost	Standar deviation Standarna devijacija	Sk	Ku	T-test/T-test	p/p
Question No 1 After Pitanje broj 1 Posle	0	7	2.25	1.86	0.33	-0.91	0.42	0.67
Question No 2 After Pitanje broj 2 Posle	0	480	71.28	86.26	2.71	9.45	1.02	0.30
Question No 3 After Pitanje broj 3 Posle	0	7	2.63	1.75	0.41	-0.12	1.05	0.29
Question No 4 After Pitanje broj 4 Posle	0	240	68.71	58.70	0.85	0.02	0.88	0.38
Question No 5 After Pitanje broj 5 Posle	1	7	5.90	1.62	-1.48	1.22	6.81	0.00
Question No 6 After Pitanje broj 6 Posle	15	350	81.750	64.64	1.97	1.53	2.00	0.05
Question No 7 After Pitanje broj 7 Posle	1	13	5.51	2.66	0.80	0.50	1.56	0.12
Question No 1 During Pitanje broj 1 Posle	0	7	2.41	2.51	0.68	-0.90	0.42	0.67
Question No 2 During Pitanje broj 2 Posle	0	720	93.70	169.9	2.40	4.94	1.02	0.30
Question No 3 During Pitanje broj 3 Posle	0	7	3.01	2.11	0.54	-0.71	1.05	0.29
Question No 4 During Pitanje broj 4 Posle	0	600	83.33	117.4	2.87	8.81	0.88	0.38
Question No 5 During Pitanje broj 5 Posle	0	7	4.01	2.50	-0.32	-1.18	6.81	0.00
Question No 6 During Pitanje broj 6 Posle	0	500	62.500	90.81	3.07	1.108	2.00	0.05
Question No 7 During Pitanje broj 7 Posle	0	15	6.20	3.69	0.53	-0.27	1.56	0.12

Legend: *Sk (Skjunis) curvature indicator; Ku (Kurtosis) indicator of flatness

Legenda: *Sk (Skjunis) indikator zakrivljenosti; Ku (Kurtoza) Indikator zaravnjenosti

The so-called metabolic equivalent of task (MET) is used to measure each of these levels of physical activity. One MET represents the basal rate of oxygen consumption and the associated caloric expenditure. Each physical activity can be represented as a product of one MET.



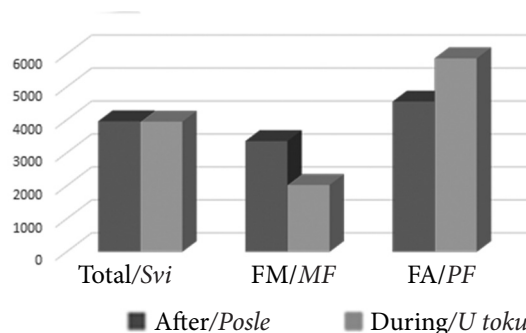
Graph 1. Total score on the scale - during and after the anti-epidemic measures

Grafikon 1. Ukupan skor na skali - tokom i nakon anti-epidemijskih mera

FA – Faculty of Agriculture, FM – Faculty of Medicine
 PF – Poljoprivredni fakultet; MF – Medicinski fakultet

The determined average value of MET in healthy adults is:

– 3.3 - for light physical activity/walking



Graph 2. Total score on the scale - during and after the anti-epidemic measures, differences between faculties

Grafikon 2. Ukupan skor na skali - tokom i nakon anti-epidemijskih mera, razlike između fakulteta

FA – Faculty of Agriculture, FM – Faculty of Medicine
 PF – Poljoprivredni fakultet; MF – Medicinski fakultet

Table 2. Correlation coefficients and significance level
Tabela 2. Koeficijenti korelacije i nivo značajnosti

Physical activity/Fizička aktivnost		BMI/Indeks telesne mase
Total	After/Posle	0.13
Svi	During/Tokom	-0.06
Faculty of Medicine	After/Posle	0.35
Medicinski fakultet	During/Tokom	0.07
Faculty of Agriculture	After/Posle	-0.06
Poljoprivredni fakultet	During/Tokom	-0.24

*** $p < .001$, ** $p < .01$, * $p < .05$

- 4 - for moderate physical activity
- 8 - for intense/vigorous physical activity.

Results in MET-minutes for a certain level of physical activity are obtained by multiplying the average MET value by the duration of physical activity expressed in minutes.

The total MET score, which is the sum of MET-minute scores for the previous 7 days, is used to classify examinees into 3 categories according to the total level of physical activity:

Category 1: Low level of physical activity

The people in this category are considered to be physically inactive or have a low level of physical activity. This category implies the lowest level of physical activity, i.e. persons who do not meet the criteria for the second and third category.

Category 2: Moderate level of physical activity

This category includes examinees who meet one of the following 3 criteria:

- 3 or more days of high-intensity activity, minimum 20 minutes per day, or
- 5 or more days of moderate-intensity physical activity or 30 minutes of walking per day, or
- 5 or more days of any combination of walking, moderate or high-intensity activities accumulating at least 600 MET-minutes per week.

Category 3: High level of physical activity

It is necessary to meet any of the following 2 criteria:

- High-intensity activities at least 3 days a week accumulating at least 1500 MET-minutes a week, or
- 7 or more days of any combination of walking, moderate or high-intensity activities accumulating at least 3000 MET-minutes per week.

Results

There were 60 examinees, of whom 50% were male. The gender distribution was identical in the groups attending the two faculties. The age range was 22 - 30 years, while the median age in the groups was 24.22 years, standard deviation = 1.96.

In regard to body height of the examinees, it ranged from 155 - 200 cm; the median body height was 176.40 cm; the median body height of the students of the Faculty of Medicine was 177.14 cm,

while in the students of the Faculty of Agriculture it was 175.66 cm. The average body weight of the examinees was predominantly in the range of 74 - 75 kg, and the BMI was in the range 23 - 24. It can be concluded that the two groups of students were aligned regarding the parameters taken into account.

The internal consistency of the Physical Activity Scale, at the end and during the anti-epidemic measures, was evaluated by calculating the Cronbach's alpha coefficient.

Based on the gathered data, it was determined that the reliability of the Physical Activity Scale was $\alpha = 0.839$ after the anti-epidemic measures were lifted, and during the anti-epidemic measures it was 0.822, which points to good reliability. Results indicate that physical activity was approximately uniform during anti-epidemic measures, as well as after they were lifted (**Table 1**).

The results of the T-test for dependent samples showed that there were no significant differences between answers regarding the time during and after anti-epidemic measures, except for the question number 5: How many days have you walked for at least 10 minutes? The results show that after the anti-epidemic measures were lifted, there were significantly more days when the students walked for at least 10 minutes.

The differences between answers regarding the period during and after the anti-epidemic measures were calculated using a series of T-tests for dependent samples in students of the Faculty of Medicine and students of the Faculty of Agriculture.

When it comes to the first four questions, the results of the T-test showed that the differences in the average values regarding the same question concerning the period during and after the anti-epidemic measures did not differ significantly among students of the Faculty of Medicine. However, statistically significant differences were noticed in answers to the last three questions, indicating that the students of the Faculty of Medicine walked significantly less during the anti-epidemic measures and were sitting significantly more.

The results of the T-test (**Graph 1**) showed that the differences in the average total scores on the scale of physical activity did not differ significantly when all the students were observed. Analyzing only the students of the Faculty of Medicine, we found that the total score of physical activity was

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE
MEĐUNARODNI UPITNIK ZA FIZIČKE AKTIVNOSTI

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the last 7 days. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the vigorous activities that you did in the last 7 days. Vigorous physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

1. **During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, aerobics, or fast bicycling?**

- days per week

☐ No vigorous physical activities ☐ Skip to question 3

2. **How much time did you usually spend doing vigorous physical activities on one of those days?**

- hours per day

- minutes per day

☐ Don't know/Not sure

Think about all the moderate activities that you did in the last 7 days. Moderate activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

3. **During the last 7 days, on how many days did you do moderate physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.**

- days per week

☐ No moderate physical activities ☐ Skip to question 5

4. **How much time did you usually spend doing moderate physical activities on one of those days?**

- hours per day

- minutes per day

☐ Don't know/Not sure

Think about the time you spent walking in the last 7 days. This includes at work and at home, walking to travel from place to place, and any other walking that you have done solely for recreation, sport, exercise, or leisure.

5. **During the last 7 days, on how many days did you walk for at least 10 minutes at a time?**

- days per week

☐ No walking ☐ Skip to question 7

6. **How much time did you usually spend walking on one of those days?**

- hours per day

- minutes per day

☐ Don't know/Not sure

The last question is about the time you spent sitting on weekdays during the last 7 days. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

7. **During the last 7 days, how much time did you spend sitting on a week day?**

- hours per day

- minutes per day

☐ Don't know/Not sure

significantly higher after the anti-epidemic measures were lifted, compared to the period during the anti-epidemic measures. The total score of physical activity among students of the Faculty of Agriculture was higher during the anti-epidemic measures, but the difference between the two scores was not statistically significant.

Differences in the in the overall score on the Scale of Physical Activities during and after the anti-epi-

demic measures in the students of the Faculty of Medicine and the Faculty of Agriculture, were examined with the help of a series of T-tests for independent samples. The results of the T-test (**Graph 2**) showed that the students of the Faculty of Agriculture had a higher level of physical activity during and after the anti-epidemic measures than students of the Faculty of Medicine. After the measures were lifted, this difference was small and not statistically sig-

nificant, while it was evident that students of the Faculty of Agriculture had much higher physical activity during anti-pandemic measures.

No gender differences were found in students' physical activity before and during the anti-epidemic measures. When the students of the Faculty of Medicine and the students of the Faculty of Agriculture were studied separately, it was also found that there were no statistically significant gender differences in physical activity during and after the anti-epidemic measures.

In order to determine whether there was a correlation between BMI and the overall score of the Physical Activity Scale during and after anti-epidemic measures, Pearson's correlation coefficient was applied. When it comes to the correlation between BMI of examinees and the Physical Activity Scale score (Table 2), the results showed that there was no significant correlation during and after the anti-epidemic measures. The analysis was conducted on individual samples in relation to the faculty and the same findings were obtained in both groups.

Discussion

From the very beginning, the new coronavirus pandemic has posed an important health challenge for populations around the world, taking into account specific anti-epidemic measures. In addition to morbidity and mortality directly related to COVID-19 disease, many states have adopted measures that have also had important physical and psychological effects on individuals [12, 13]. In order to control the spread of the disease, social interactions were restricted and stay at home was recommended.

A large part of the population was forced to stay indoors for weeks, which was accompanied by a decrease in physical activity and adoption of sedentary behavior, staying longer in a sitting or lying position that requires energy expenditure ≤ 1.5 MET [14].

With the shutdown of sports facilities, gyms and parks, the recommendations of the World Health Organization regarding the level of physical activity (at least 150 minutes of moderate to strong or 75 minutes of intense physical activity per week, or a combination of them in adults), [15] became difficult to achieve. In this situation, the use of exercise programs at home has proved useful as a mean of combating the harmful effects of increased physical inactivity. A large number of international and national institutions have published a series of recommendations emphasizing the importance of remaining physically active during the quarantine period, including numerous recommendations for exercise at home [16].

This research included 60 examinees, of which 30 were students of the Faculty of Medicine and the other 30 were students of the Faculty of Agriculture. Out of the total number, male and female students were evenly distributed - 30 examinees of each.

A study including 214 male and 295 female biomedical students of the University of Queensland, assessed the impact of quarantine measures on diet

and physical activity, yielded the following results: 30% fewer examinees of both sexes achieved a "sufficient" level of physical activity, defined by at least 150 minutes during at least five sessions, compared to the previous two years. Over the next six to eight weeks compared to the first study, despite mitigating measures, there was a higher food intake in females and reduced levels of physical activity in both sexes [17]. Our research also proves that there is no gender difference in the level of physical activity during and after anti-epidemic measures.

A study conducted at three Italian universities showed that, among other parameters, female gender is associated with achieving recommended levels of physical activity, even during the anti-epidemic measures [18]. A study of 3.800 healthy adults in Spain found that during the anti-epidemic measures, men were more likely to reduce physical activity than women (21% vs. 9%) [19]. The average BMI in the total sample was 23.50, and individually - 23.04 in medical students and 23.95 in agricultural students.

The research we conducted showed that there were no statistically significant differences in the levels of physical activity between students with different values of BMI, neither during nor after the anti-epidemic measures were lifted.

When analyzing the answers of the examinees related to 7 questions about the physical activity during the most severe anti-epidemic measures, as well as 7 questions related to the previous 7 days, in the total sample of 60 students, no significant differences were found in the level of physical activity during and after anti-epidemic measures, except for the question related to light physical activity (walking longer than 10 minutes). Students from both faculties claimed that they spent significantly fewer days walking during anti-epidemic measures.

When comparing the level of physical activity among medical students, during and after the COVID-19 anti-epidemic measures, especially in light of all three levels of activity, a significantly lower level of physical activity of lighter intensity was registered (walking longer than 10 minutes), as well as much longer time spent sitting during anti-epidemic measures. Similar results were obtained in a survey of students in Italy, where it was observed that all sedentary behaviors were significantly increased, and that all physical activities were significantly reduced during the "lockdown" [18]. The same results were recorded among students of the Faculty of Agriculture in the segment of issues related to light physical activity, with the difference that during anti-epidemic measures this group of examinees spent significantly longer time performing physical activities of moderate intensity.

The results of this study showed that the total score of students of the Faculty of Medicine indicates that their level of physical activity was significantly lower during the anti-epidemic measures than after they were suspended. Among the students of the Faculty of Agriculture, we noticed that the total score of physical activity during the anti-epidemic measures was

higher, but with a statistically negligible difference between the two periods. The results indicate that students of the Faculty of Agriculture both during and after the anti-epidemic measures had a higher level of physical activity than students of the Faculty of Medicine, which is especially pronounced in the period of the most severe anti-epidemic measures.

The obtained results are supported by the answers to the last question in the survey, in which students of both faculties were given the freedom to state what activities they practiced and how they spent their free time during the curfew and quarantine. The largest number of medical students answered that they spent that period studying (50%), while watching movies/series/playing games was present in the same percentage as performing any form of physical activity on a daily basis (40%), among which physical activities outside the home, such as cycling and walking and exercising at home, were evenly represented.

Among the students of the Faculty of Agriculture, statistical data indicate that 13.3% spent their time studying, 46.6% of them spent part of their time in front of the TV, and as many as 70% of examinees spent the quarantine period doing some physical activities, most often mentioning various household chores, field work, growing fruits and vegetables.

Conclusion

Students of both the Faculty of Medicine and the Faculty of Agriculture had a lower level of physical activity during the most severe coronavirus disease 2019 anti-epidemic measures, especially when performing activities of light intensity.

There is a difference in the level of physical activity of medical and agricultural students during the strict coronavirus disease 2019 anti-epidemic measures, because it was proven that agricultural students were significantly more physically active during the anti-epidemic measures, especially when performing moderate-intensity physical activities.

There are no significant gender differences in the results related to the level of physical activity during the coronavirus disease 2019 epidemic.

There are no statistically significant differences in the level of physical activity of students during the coronavirus disease 2019 epidemic in relation to the length of study.

There are no statistically significant differences in the body mass index and the results related to the level of physical activity during the coronavirus disease 2019 epidemic.

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Rad je primljen 8. V 2022.

Recenziran 15. V 2022.

Prihvaćen za štampu 16. V 2022.

BIBLID.0025-8105:(2022):LXXV:1-2:31-38.

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