https://doi.org/10.7251/SSH2002108A
Original scientific paper

UDC: 616.98:578.834]:378.18
Originalni naučni rad

Physical Activity of Students During the Pandemic of the Disease Covid-19

Tjelesna aktivnost studenata u vrijeme pandemije bolesti Covid-19

Josipa Antekolović[1], Grgur Kovačić[2]

[1]Faculty of Mining, Geology and Petroleum Engineering, University of Zagreb, Croatia,
[2]Proprio centar, Zadar, Croatia

Correspondence:
Josipa Antekolovic
Faculty of Mining, Geology and Petroleum Engineering, University of Zagreb, Croatia
jantekolovic@rgn.hr

[1]Rudarsko-geološko-naftni fakultet, Sveučilište u Zagrebu, Hrvatska,
[2]Proprio centar, Zadar, Hrvatska

Korespondencija:
Josipa Antekolović
Rudarsko-geološko-naftni fakultet, Sveučilište u Zagrebu, Hrvatska
jantekolovic@rgn.hr

Abstract: *In mid-March of 2020, contact teaching at universities was interrupted due to the global pandemic of the disease COVID-19. While the teaching of Physical education took place online students were offered several assignments to fulfil their obligation to the course and try to stay physically active. The research was conducted on 166 participants from the student population of the University of Zagreb who, during the seventh week of online classes, filled out an online questionnaire related to physical activity and online teaching of physical education. The aim of the research was to determine whether there was a difference in the level of physical activity of students before and during the COVID-19 pandemic and whether there was a difference in the level of physical activity according to the gender of the research participants. Furthermore, to determine whether students had the desire to be physically active during the COVID-19 pandemic, whether they were satisfied with online teaching of physical education, and whether online teaching of physical education helped them stay physically active, and whether or not gender differences relevant to the research existed. Wilcoxon rank test demonstrated increased activity of research participants during the COVID-19 pandemic (z=-4.61, p=0.00) with no gender difference. As many as 94,6% of the research participants expressed a desire for physical activity during the pandemic, and 80,1% of them believed that online learning of physical education courses helped them in that goal. A significant difference between male and female students, in favour of female students, was obtained by the χ2 independence test, precisely for the question whether they believed that online teaching of physical education helped them remain physically active. A total of 85,5% of research participants stated they liked online learning. Digital technology in teaching physical education is welcome, but is in no way a substitute for contact teaching. It could be considered as a sort of an intervention which could occasionally be used to refer students towards online assignments during the course of the academic year to*

Sažetak: *Sredinom ožujka 2020. godine kontakt nastava na fakultetima je prekinuta uslijed globalne pandemije bolesti COVID-19. Dok se nastava Tjelesne i zdravstvene kulture (TZK) odvijala na daljinu, studentima je bilo ponuđeno nekoliko zadataka kako bi ispunjavali svoju obvezu prema kolegiju te pokušali ostati tjelesno aktivni. Istraživanje je provedeno na 166 ispitanika iz populacije studenata Sveučilišta u Zagrebu koji su tijekom sedmog tjedna nastave na daljinu ispunili on-line anketni upitnik vezan za tjelesnu aktivnost i nastavu TZK na daljinu. Cilj istraživanja bio je utvrditi postoji li razlika u razini tjelesne aktivnosti studenata prije i u vrijeme pandemije bolesti COVID-19 te postoji li razlika u razini tjelesne aktivnosti obzirom na spol. Zatim, utvrditi imaju li studenti želju biti tjelesno aktivni u vrijeme pandemije bolesti COVID-19, jesu li zadovoljni nastavom TZK na daljinu i pomaže li im nastava TZK na daljinu da ostanu tjelesno aktivni te postoje li razlike obzirom na spol. Wilcoxonovim testom ranga dokazana je povećana aktivnost ispitanika u vrijeme pandemije bolesti COVID-19 (z=-4,61, p=0,00) dok razlika prema spolu nije postojala. Čak 94,6% ispitanika izrazilo je želju za tjelesnom aktivnošću tijekom pandemije te ih 80,1% smatra kako im nastava na daljinu iz kolegija TZK u tome i pomaže. Značajna razlika između studentica i studenata, u korist studentica, dobivena je χ2-testom nezavisnosti upravo u pitanju smatraju li da im nastava TZK na daljinu pomaže da ostanu tjelesno aktivni. Ukupno 85,5% ispitanika izjasnilo se da im se nastava na daljinu sviđa. Digitalna tehnologija u nastavi TZK dobro je došla, ali nikako nije zamjena za kontakt nastavu. Mogla bi biti jedna od intervencija koja bi se koristila za povremeno upućivanje studenata na on-line zadatke tijekom akademske godine koji bi se dodatno bodovali i tako potaknuli studente na dodatnu tjelesnu aktivnost.*

Ključne riječi: *nastava na daljinu; studenti; tjelesna aktivnost; tjelesna i zdravstvena kultura.*

enable them to gather additional points and thus, encourage them to take on additional physical activity.

Keywords: *online teaching, physical activity, physical education, students.*

Introduction

According to the World Health Organisation (WHO), physical activity is defined as a term that encompasses each movement, that is, all movements in everyday life, including physical activity at work or in school, recreation and sports activity. Physical inactivity is a serious health problem which affects people of all ages and is the fourth leading risk factor for mortality in the world (WHO, 2009). The World Health Organisation's recommendations for people over the age of 18 are 150 minutes of moderate-intensity aerobic activity or 75 minutes of high-intensity activity per week. Moderate and high-intensity physical activities can be combined with one another, while strength exercises for large muscle groups should be performed at least twice a week in combination with stretching exercises (WHO, 2010). During the day, the recommended or desired level of physical activity can be achieved over several periods, but no shorter than 10 minutes each, while additional health effects can be achieved by increasing moderate physical activity to 300 minutes per week or high-intensity activity to 150 minutes per week (WHO, 2010).

Organised teaching of Physical education (PE) at universities and institutions of higher education is mandatory during the first two years of study and marks the final stage of systematic exercise during school education which aims to turn physical exercise into a permanent routine and daily need for every student. It is performed in the form of exercises which amount to 30 hours per semester. Students can acquire knowledge about maintaining and improving health as well as the importance of a daily physical exercise within the curriculum of PE (Caput-Jogunica et al., 2008), and they will be able to apply the acquired knowledge in the future (Gošnik et al., 2002). International recommendations indicate that students attending PE courses should spend a minimum of 50% of their hours in moderate to high-intensity physical activity in order to achieve the health effects of the PE course (Costigan et al., 2015).

In the time of the global crises caused by coronavirus, the Republic of Croatia, as well as a large number of countries in Europe and the world, found itself in a situation where it had to take certain anti-epidemic measures. In line with global efforts, between 19 March and 11 May, 2020, the Croatian Government adopted measures to re-

Uvod

Tjelesna aktivnost je prema Svjetskoj zdravstvenoj organizaciji (WHO), definirana kao pojam koji obuhvaća sve pokrete, odnosno kretanja u svakodnevnom životu, uključujući tjelesnu aktivnost na poslu ili školi, rekreaciju i sportsku aktivnost (WHO, 2018). Tjelesna neaktivnost ozbiljan je zdravstveni problem koji obuhvaća ljude svih dobnih skupina i danas je četvrti vodeći faktor rizika smrtnosti u svijetu (WHO, 2009). Preporuke Svjetske zdravstvene organizacije za osobe starije od 18 godina su 150 minuta aerobne aktivnosti umjerenog intenziteta ili 75 minuta aktivnosti visokog intenziteta tjedno. Tjelesne aktivnosti umjerenog i visokog intenziteta mogu se međusobno kombinirati, a vježbe snage za velike mišićne skupine treba provoditi barem dva puta tjedno u kombinaciji s vježbama istezanja (WHO, 2010). Tijekom dana preporučena ili željena razina tjelesne aktivnosti može se postići kroz nekoliko perioda, ali ne kraćih od 10 minuta, a dodatni zdravstveni učinci mogu se postići povećanjem umjerene tjelesne aktivnosti na 300 minuta tjedno ili aktivnosti visokog intenziteta na 150 minuta tjedno (WHO, 2010).

Organizirana nastava Tjelesne i zdravstvene kulture (TZK) na visokim učilištima obvezna je na prvoj i drugoj godini studija te je zadnja stepenica sustavnog vježbanja za vrijeme školovanja koja ima za cilj da tjelesno vježbanje postane i ostane studentima trajna svojina i svakodnevna potreba. Izvodi se u obliku vježbi u fondu od 30 sati u semestru. Studenti u okviru nastavnog plana i programa TZK mogu usvojiti znanja o čuvanju i unapređenju zdravlja i značaju svakodnevnog tjelesnog vježbanja (Caput-Jogunica i sur., 2008), a usvojena znanja moći će primjenjivati u budućnosti (Gošnik i sur., 2002). Međunarodne preporuke ukazuju kako bi studenti na nastavi TZK trebali provesti minimalno 50% sata u umjereno do visokoj razini intenziteta tjelesne aktivnosti, kako bi se ostvarili zdravstveni učinci sata TZK (Costigan i sur., 2015).

U trenutku globalne krize uzrokovane koronavirusom Republika Hrvatska se kao i veliki broj zemalja Europe i svijeta našla u situaciji kada je morala poduzeti određene protuepidemijske mjere. U skladu s globalnim kretanjima, između 19. ožujka i 11. svibnja, 2020., Vlada Republike Hrvatske usvojila je mjere za ograničavanje okupljanja na javnim mjestima i u parkovima, obustavu javnog prijevoza i zatvaranja institucija. Kontakt nastava na fakultetima je prekinuta. Pored svih društvenih okupljanja, rada ugostiteljskih objekata i uslužnih djelatnosti, i sportske aktivnosti bile su zabranjene. Stanovnici urbanih sredina posebno su bili pogođeni ovakvim mjera-

strict gathering in public places and parks, suspend public transportation, and close numerous institutions. Contact teaching at universities was interrupted. Besides all social gatherings, work in retail and services including sports activities were also prohibited. People living in cities and urban areas seem to be the most affected by these measures, as they were obligated to stay at home and likely reduce their common activities (Karuc et al., 2020). Reducing the physical activity level could have a negative health impact, even among healthy, uninfected people (Hall et al., 2020).

A number of comments, recommendations, and theoretical reviews have been written on the pandemic's possible negative consequences on health (Hall et al., 2020; Zhu, W. Should, 2020; Lippii et al., 2020; Laddu et al., 2020). Experts, scientists and world health institutions warn of the potential negative impact on health due to physical inactivity as an indirect consequence of quarantine due to COVID-19 disease (Hall et al., 2020; Zhu, W. Should, 2020; Lippi et al., 2020; Laddu et al., 2020). The potential consequences of inactivity and pandemic-induced sedentarism on cardiovascular, metabolic, and neuromuscular health are highlighted (Naricci et al., 2020). Dwyer et al. (2020) recommend physical activity during COVID-19 pandemic because it has been shown that physical activity can contribute to reducing the severity of COVID-19 illness and improving the quality of life before and after infection. Special attention is paid to the fact that staying at home can lead to increased stress, anxiety and depression, and in times when it is not possible to spend time outdoors, it is advisable to focus on practical instructions related to at-home exercises, such as strength and dance exercises and aerobic exercises on stationary bikes or rowing ergometers (Hammami et al., 2020). Tailored home physical activity programs can help combat the physiological and psychological side effects caused by restrictions associated with the COVID-19 pandemic (Chen et al., 2020; Halabchi et al., 2020; Jiménez-Pavón et al., 2020).

The aim of this paper is to determine whether there is a difference in the level of physical activity of students before and during the COVID-19 pandemic and whether there is any difference in the level of physical activity with respect to gender.

Sample of Research Participants

The research included 166 participants from the student population of the University of Zagreb at the age of 20.31 ± 0.99 years. Research participants filled out an anonymous questionnaire voluntarily during the seventh week of online learning. Students who are not in the system of training and sports competitions participated in the research.

ma jer su bili primorani ostati kod kuće i smanjiti razinu uobičajene aktivnosti. Smanjenje razine tjelesne aktivnosti može imati negativan utjecaj na zdravlje, čak i među zdravim, nezaraženim ljudima (Hall i sur., 2020).

Napisano je niz komentara, preporuka i teoretskih pregleda o mogućim negativnim posljedicama pandemije na zdravlje (Hall i sur., 2020; Zhu,W. Should, 2020; Lippii sur., 2020; Laddu i sur., 2020). Stručnjaci, znanstvenici i svjetske zdravstvene ustanove upozoravaju na potencijalni negativni utjecaj na zdravlje zbog tjelesne neaktivnosti kao neizravne posljedice karantene uslijed bolesti COVID-19 (Hall i sur., 2020; Zhu,W. Should, 2020; Lippi i sur., 2020; Laddu i sur., 2020). Ističu se potencijalne posljedice neaktivnosti i sedentarizma zbog pandemije na kardiovaskularno, metaboličko i neuromuskularno zdravlje (Naricci i sur., 2020). Dwyer i sur. (2020) preporučaju tjelesnu aktivnost tijekom pandemije bolesti COVID-19 jer je dokazano da tjelesna aktivnost može doprinijeti smanjenju težine bolesti COVID-19 i poboljšanju kvalitete života prije i nakon infekcije. Posebnu pozornost usmjerava se na činjenicu kako boravak kod kuće može dovesti do povećanja stresa, tjeskobe i depresije te u vremenu kad nije moguće vrijeme provoditi na otvorenom poželjno je fokusirati su se na praktične upute vezane za tjelovježbu u vlastitim domovima, poput vježbi snage i plesa te aerobnih vježbi na sobnom biciklu ili veslačkom ergometru (Hammami i sur., 2020). Prilagođeni programi tjelesne aktivnosti u domu mogu pomoći u suzbijanju fizioloških i psiholoških nuspojava izazvanih restrikcijama vezanim za pandemiju bolesti COVID-19 (Chen i sur., 2020; Halabchi i sur., 2020; Jiménez-Pavón i sur., 2020).

Cilj ovog rada je utvrditi postoji li razlika u razini tjelesne aktivnosti studenata prije i u vrijeme pandemije bolesti COVID-19 te postoji li razlika u razini tjelesne aktivnosti obzirom na spol.

Uzorak ispitanika

Uzorak je obuhvatio 166 ispitanika iz populacije studenata Sveučilišta u Zagrebu starosti 20,31 ± 0,99 godina. Ispitanici su anonimni upitnik ispunjavali dobrovoljno tijekom sedmog tjedna nastave na daljinu. U istraživanju su sudjelovali studenti koji nisu u sustavu treninga i sportskih natjecanja.

Uzorak varijabli

Vodeći se preporukama WHO, te preporukama Hrvatskog zavoda za javno zdravstvo (HZJZ, 2020) koje navode da je dozvoljen boravak na zraku, hodanje i upo-

Sample Variables

Following the WHO's recommendations, as well as the recommendations of the Croatian Institute of Public Health (HZJZ, 2020) which stated that it was allowed to stay in open air, walk and cycle, while PE classes were carried out online, students offered to fulfil their obligations to the course and try to stay physically active. In addition to the recommended walking, cycling and rollerblading, it was also possible to exercise independently in the privacy of your home. Examples of exercises were available to everyone and the database was updated regularly.

Research variables are an integral part of an anonymous online survey questionnaire. Given the unique situation in which both students and professors found themselves in for the first time (online teaching, self-exercise, independently choosing activity…) a questionnaire was made for the purposes of this paper. Research participants answered questions about online teaching of PE and physical activity before and during the COVID-19 pandemic. Two questions (Physical activity at the time of the pandemic and Physical activity before the pandemic) were used from the international IPAQ questionnaire (IPAQ 2005) and the Likert scale for assessing physical activity was applied to them. Separate part of the questionnaire identified the variables such as gender, age and year of study on the basis of which the grouping and analysis of the results of the questionnaire was performed.

Data Processing Methods

Data processing was carried out by the use of the *Statistical Package for the Social Sciences* (SPSS, Version 14.0; SPSS Inc, Chi-Cago, IL). Basic descriptive indicators were calculated and the Wilcoxon's rank test, Mann-Whitney U test and $\chi 2$-test for independent samples were used. Response frequencies were determined for all variables.

Results

The questionnaire was filled out by 166 research participants (84 female students and 82 male students) with an average age of 20.31 ± 0,99 years. The largest share of research participants at the time of the survey was in the first year of undergraduate study (55%), then in the second (43%) and the smallest in the third year (2%).

treba bicikla studentima je dok se nastava TZK odvijala na daljinu bilo ponuđeno nekoliko zadataka kako bi ispunjavali svoju obvezu prema kolegiju te pokušali ostati tjelesno aktivni. Uz preporučeno hodanje, vožnju bicikla i rolanje moguće je bilo i samostalno vježbati u svom domu. Primjeri vježbi su svima bili dostupni te je baza često bila nadopunjavana.

Varijable istraživanja sastavni su dio anonimnog online anketnog upitnika. Obzirom na jedinstvenu situaciju u kojoj su se prvi puta našli i studenti i profesori (nastava na daljinu, samostalno odrađivanje zadataka, samostalan odabir aktivnosti…) upitnik je napravljen za potrebe ovog istraživanja. Ispitanici su odgovarali na postavljena pitanja o nastavi TZK na daljinu te tjelesnoj aktivnosti prije i u vrijeme pandemije bolesti COVID-19. Dva pitanja (tjelesna aktivnost prije i u vrijeme pandemije) korištena su iz međunarodnog IPAQ upitnika (IPAQ 2005) te se za njih primjenjuje Likertova ljestvica za procjenu tjelesne aktivnosti. Zasebnim dijelom upitnika utvrđene su varijable spol, godine i godina studija na temelju kojih je izvršeno grupiranje i analiza rezultata upitnika.

Metode obrade podataka

Obrada podataka je provedena programom *Statistical Package for the Social Sciences* (SPSS, Version 14.0; SPSS Inc, Chi- cago, IL). Izračunati su osnovni deskriptivni pokazatelji te korišteni Wilcoxon-ov test ranga, Mann-Whitney U test i $\chi 2$-test za nezavisne uzorke. Za sve varijable određene su frekvencije odgovora.

Rezultati

Upitnik je ispunilo 166 ispitanika (84 studentice i 82 studenta) prosječne dobi 20,31 ± 0,99 godina. Najveći udio ispitanika u vrijeme anketiranja bio je na prvoj godini preddiplomskog studija (55 %), zatim na drugoj (43 %) i najmanji na trećoj godini (2 %).

Table 1. *Differences in physical activity of the subjects before and during the pandemic*

***Wilcoxon rank test* / Wilcoxonov test ranga**	
	Physical activity at the time of the pandemic / Tjelesna aktivnost u vrijeme pandemije - *Physical activity before the pandemic* / Tjelesna aktivnost prije pandemije
Z	*-4.61*
p	*.00*

Wilcoxon rank test revealed a statistically significant increase in physical activity of research participants at the time of the COVID-19 disease pandemic, z=-4,61, p<0,00 with small to medium impact (Table 1).

Tablica 1. *Razlike u tjelesnoj aktivnosti ispitanika prije i u vrijeme pandemije*

Wilcoxonov test ranga otkrio je statistički značajno povećanje tjelesne aktivnosti ispitanika u vrijeme pandemije bolesti COVID-19, z=-4,61, p<0,00 s malim do srednjim utjecajem (Tablica 1).

Table 2. *Gender differences with respect to physical activity before and during the COVID-19 pandemic*

Tablica 2. *Razlike u spolu obzirom na tjelesnu aktivnost prije i za vrijeme pandemije bolesti COVID-19*

***Mann-Whitney U test* / Mann-Whitney U test**						
	***Gender* / Spol**	***N***	***Sumrank***	***U***	***Z***	***p***
Physical activity before the pandemic / Tjelesna aktivnost prije pandemije	Ž	84	6547	2977.0	-1.55	0.12
	M	82	7314			
Physical activity at the time of the pandemic / Tjelesna aktivnost u vrijeme pandemije	Ž	84	7567	2891.0	-1.84	0.07
	M	82	6294			

As can be seen form Table 2, the Mann-Whitney U test did not register a statistically significant difference (p = 0.12) in the variable Physical activity before the pandemic nor Physical activity at the time of the pandemic (p = 0.07) between subjects of female (n = 84) and male (n = 82) gender.

Kako je vidljivo iz Tablice 2, Mann-Whitney U test nije registrirao statistički značajnu razliku (p=0,12) u varijabli Tjelesna aktivnost prije pandemije niti Tjelesna aktivnost u vrijeme pandemije (p=0,07) između ispitanika ženskog (n=84) i muškog (n=82) spola.

Table 3. *Distribution of attitudes of female (N=84) and male students (N=82) about the desire for physical activity during the pandemic*

Tablica 3. *Razdioba stavova studentica (N=84) i studenata (N=82) o želji za tjelesnom aktivnošću u vrijeme pandemije*

***At the time of the pandemic, I want to be physically active* / U vrijeme pandemije želim biti tjelesno aktivan/na**	***Gender* / Spol**		***Total* / Ukupno**
	***Female* / Ženski**	***Male* / Muški**	
	N (%)	***N (%)***	***N (%)***
Yes / Da	80 (95.2)	77 (93.9)	157 (94.6)
No / Ne	4 (4.8)	5 (6.1)	9 (5.4)
Total / Ukupno	84 (100)	82 (100)	166 (100)

The $\chi 2$ independence test (with Yates's continuity correction) did not register a statistically significant correlation between gender and desire for physical activity, $c^2(1, n=166) = 0,00$, p=0,97, phi=-0,03 (Table 3).

$\chi 2$-test nezavisnosti (uz korekciju neprekidnosti prema Yates-u) nije pokazao statistički značajnu povezanost spola i želje za tjelesnom aktivnošću, $c^2(1, n=166) = 0,00$, p=0,97, phi=-0,03 (Tablica 3).

Table 4. *Distribution of attitudes of female (N=84) and male students (N=82) towards online learning of PE.*

For me online learning of PE is: / **Nastava TZK na daljinu mi se:**	***Gender /*** **Spol**		***Total /*** **Ukupno**
	Female / **Ženski** ***N (%)***	***Male /*** **Muški** ***N (%)***	***Total /*** **Ukupno** ***N (%)***
Appealing / Sviđa	74 (88.1)	68 (82.9)	142 (85.5)
Not appealing / Ne sviđa	10 (11.9)	14 (17.1)	24 (14.5)
Total / Ukupno	84 (100)	82 (100)	166 (100)

The $\chi 2$ independence test (with Yates's continuity correction) did not register a statistically significant relationship between gender and attitudes about whether the online learning of PE for research participants was appealing or not, c^2 (1, n=166) = 0,53, p=0,47, phi=-0,07 (Table 4).

Tablica 4. *Razdioba stavova studentica (N=84) i studenata (N=82) prema nastavi TZK na daljinu*

$\chi 2$-test nezavisnosti (uz Yates-ovu korekciju neprekidnosti) nije pokazao statistički značajnu povezanost spola i stava o tome sviđa li im se nastava TZK na daljinu ili ne, c^2 (1, n=166) = 0,53, p=0,47, phi=-0,07 (Tablica 4).

Table 5. *Distribution of attitudes of female (N=84) and male students (N=82) on the impact of online teaching of PE on the level of physical activity.*

Online teaching of PE helps me to be physically active during the pandemic / **Nastava TZK na daljinu mi pomaže da budem tjelesno aktivan/na u vrijeme pandemije**	***Gender /*** **Spol**		***Total /*** **Ukupno**
	Female / **Ženski** ***N (%)***	***Male /*** **Muški** ***N (%)***	***Total /*** **Ukupno** ***N (%)***
Yes	77 (91.7)	56 (68.3)	133 (80.1)
No	7 (8.3)	26 (31.7)	33 (19.9)
Total	84 (100)	82 (100)	166 (100)

The $\chi 2$ independence test (with Yates's continuity correction) registered a statistically significant correlation between gender and student's attitudes regarding the impact of online teaching of PE on the level of physical activity, c^2 (1, n=166) = 12,80, p=0,00, phi=-0,29 (Table 5).

Tablica 5. *Razdioba stavova studentica (N=84) i studenata (N=82) o utjecaju nastave TZK na daljinu na razinu tjelesne aktivnosti*

$\chi 2$-test nezavisnosti (uz Yates-ovu korekciju neprekidnosti) pokazao je statistički značajnu povezanost spola i stava studenata o utjecaju nastave TZK na daljinu na razinu tjelesne aktivnosti, c^2 (1, n=166) = 12,80, p=0,00, phi=-0,29 (Tablica 5).

Discussion

The main objective of this study was to determine whether there was any difference in the level of physical activity of students before and during the COVID-19 pandemic. Since many healthy behaviors are adopted during adolescence and early adulthood (Both, 2002.) and that research shows that physical activity habits adopted during study contribute significantly to physical activity in adulthood (Fish and Nies,1996; Sparling and Snow, 2002; Keating et al., 2005) it is important to encourage students to engage in regular physical activity during the obligation to attend PE classes but also afterwards in their free time.

Recalling their physical activity before the pandemic, 16% of the research participants said they spent most of their free time doing things that did not involve physical activity, 28% had some kind of physical activity 1-2 times a week, 29% engaged in physical activity 3-4 times a week, 17% of them were physically active 5-6

Rasprava

Osnovni cilj ovog istraživanja bio je utvrditi postoji li razlika u razini tjelesne aktivnosti studenata prije i za vrijeme pandemije bolesti COVID-19. Obzirom da se mnoga zdrava ponašanja usvajaju tijekom adolescencije i rane odrasle dobi (Both,2002.) te da istraživanja pokazuju da navike bavljenja tjelesnom aktivnošću usvojene u vrijeme studija značajno pridonose tjelesnoj aktivnosti u odrasloj dobi (Fish i Nies,1996; Sparling i Snow, 2002; Keating i sur., 2005), važno je studente poticati na redovitu tjelesnu aktivnost tijekom obaveze pohađanja nastave TZK ali i nakon toga u slobodnom vremenu.

Prisjećajući se tjelesne aktivnosti prije pandemije 16 % ispitanika izjasnilo se da su većinu slobodnog vremena provodili radeći stvari koje ne uključuju tjelesnu aktivnost, 28 % ih je imalo 1-2 puta tjedno tjelesnu aktivnost, 29 % se tjelesnom aktivnošću bavilo 3-4 puta tjedno, njih 17 % često je, 5-6 puta tjedno imalo tjelesnu aktivnost, dok je njih 10 % svakodnevno bilo tjelesno aktivno.

times a week, while 10% of them were physically active on a daily basis.

The results of physical activity at the time of the COVID-19 pandemic indicated increased activity among the research participants. 11% of subjects stated that they were not physically active in their free time, 16% were somewhat physically active, 1-2 times a week, 28% engaged in physical activity 3-4 times a week during their free time. 31% of subjects were physically active rather often, 5-6 times a week, while 14% of them were physically active very often. Wilcoxon rank test proved increased activity of subjects during the COVID-19 pandemic (z=-4,61, p=0,00) with no registered differences between genders.

Similar results can be seen in some other studies. In their study, Lesser et al. (2020) found that 22% of participants (n = 1098, <19 age) who were active before the pandemic reduced their physical activity and 37% did not change their physical activity level at all. However, among those who were not active before the pandemic, 33% became more active and 26% did not change their level of physical activity. Giustino et al. (2020) investigated levels of physical activity before and during the last seven days of quarantine of physically active subjects in Sicily (n = 802, 32,27 ± 12,81 age). They found that the number of highly active participants dropped (26%, n = 193), and the number of low and moderately active subjects increased (19%, n = 200; and 7%, n = 409). In the same study, both females and males decreased their total weekly energy expenditure, where males showed more reduction (Giustino et al., 2020). Results of Karuc et al. (2020) research suggest that 30-days of restrictions equally affect females and males where the evident drop in moderate-to-vigorous physical activity (MVPA) is seen in both genders (n = 91, 20-21 age). However, previously active subjects reduced their level of physical activity during quarantine while a different pattern is seen in previously inactive subjects (Karuc et al., 2020). Since lack of time is one of the most frequently reported barriers to exercise (Rasbash et al., 2019), the increase in MVPA in inactive participants might be driven by the fact that, due to movement restrictions, people had more time for other activities (e.g., exercise) (Karuc et al. 2020). A recent study by Sekulić et al. (2020) examined the trends of changes in PA levels among adolescents in southern Croatia (n=388, 16,4 ± 1,9 age) during restrictions. This study found a significant drop in PA overall and a much larger decrease in physical activity was found in boys than in girls.

Although the mentioned results are difficult to compare with the results of our research due to the difference

Rezultati tjelesne aktivnosti u vrijeme pandemije bolesti COVID-19 ukazuju na povećanu aktivnost ispitanika. 11 % ispitanika izjasnilo se da u slobodno vrijeme nije tjelesno aktivno, 16% ponekad je, 1-2 puta tjedno tjelesno aktivno, njih 28 % 3-4 puta tjedno bavi se tjelesnom aktivnošću u svom slobodnom vremenu. Često, 5-6 puta tjedno, tjelesno je aktivno 31 % ispitanika dok je njih 14 % jako često tjelesno aktivno. Wilcoxonovim testom ranga dokazana je povećana aktivnost ispitanika u vrijeme pandemije bolesti COVID-19 (z=-4,61, p=0,00) dok razlika prema spolu nije registrirana.

Slični rezultati mogu se vidjeti u još nekim istraživanjima. Lesser i sur. (2020) u svom istraživanju otkrili su da je 22 % sudionika (n = 1098, < 19 god.) koji su prije pandemije bili aktivni, smanjilo tjelesnu aktivnost a 37 % uopće nije promijenilo razinu tjelesne aktivnosti. Međutim, među onima koji nisu bili aktivni prije pandemije, njih 33 % postaje aktivnije, a 26 % nije promijenilo razinu tjelesne aktivnosti. Giustino i sur. (2020) istraživali su razinu tjelesne aktivnosti prije i tijekom posljednjih sedam dana karantene tjelesno aktivnih ispitanika na Siciliji (n = 802, 32,27 ± 12,81 god.). Otkrili su da je broj visoko aktivnih ispitanika smanjio razinu tjelesne aktivnosti (26 %, n = 193), a razina tjelesne aktivnosti kod nisko i umjereno aktivnih ispitanika se povećala (19 %, n = 200; i 7 %, n = 409). U istoj su studiji i žene i muškarci smanjili svoju ukupnu tjednu potrošnju energije koja je izraženija kod muškaraca (Giustino i sur., 2020). Rezultati istraživanja Karuc i sur. (2020) sugeriraju da 30-dnevne mjere karantene jednako utječu na žene i muškarce gdje je evidentan pad umjerene do visoko intenzivne tjelesne aktivnosti (MVPA) vidljiv kod oba spola (n = 91, 20-21 god). Međutim, prethodno aktivni ispitanici smanjili su razinu tjelesne aktivnosti tijekom karantene dok se drugačiji obrazac vidi kod prethodno neaktivnih ispitanika (Karuc i sur., 2020). Budući je nedostatak vremena jedna od najčešće prijavljenih prepreka za vježbanje (Rasbash i sur., 2019), porast razine MVPA kod neaktivnih ispitanika mogao bi biti vođen činjenicom da su zbog karantene ljudi imali više vremena za druge aktivnosti (npr. vježbanje) (Karuc i sur. 2020). Nedavnim istraživanjem Sekulić i sur. (2020) ispitani su trendovi promjena razine tjelesne aktivnosti među adolescentima iz južne Hrvatske (n = 388, 16,4 ± 1,9 god.) tijekom pandemije bolesti COVID-19. Ista studija utvrdila je značajan pad ukupne razine tjelesne aktivnosti ispitanika te je primijećen puno veći pad tjelesne aktivnosti kod dječaka nego kod djevojčica.

Iako je spomenute rezultate teško usporediti s rezultatima našeg istraživanja zbog razlike u metodologiji

in methodology and instruments for assessing physical activity a decrease in the level of physical activity among subjects who were physically active before the pandemic and an increase in physical activity among subjects who were not active before the pandemic can be observed. In addition, the difference in populations that were studied can also potentially contribute to the difference in reported results (16 y.o. adolescents vs. 20-y.o. young adults vs. and 32 y.o. adults). It should be noted that the subjects of this study were motivated to physical activity with tasks that they had to perform as an obligation to the P.E. course and how daily communication with them was maintained, which was not the case in the aforementioned research projects.

As many as 94.6% of research participants expressed a desire for physical activity during the pandemic, while 80.1% of them believed that online PE courses helped them in that aspect. A significant difference between male and female students was obtained by the $\chi 2$ independence test, precisely in the question whether they believed that online learning of PE helped them remain physically active. This type of teaching encouraged female students to engage in physical activity.

During online learning of PE, students independently chose their weekly activity to fulfil their obligation to the course. A total of 85,5% of subjects stated they liked that form of teaching. A study conducted in 2016 determined the effectiveness of using smartphone apps in promoting physical activity (Coughlin et al., 2016), which proved to be effective here as well. 89% of them preferred the possibility of independent choice of exercises while 11% preferred when the exercises were chosen by the course leader.

Conclusion

At the time of the global crisis caused by the coronavirus, many countries have taken a number of epidemiological measures to protect their population from the spread of the infection. Educational institutions closed their doors and all classes were moved to a virtual environment. Following the instructions of the Ministry of Science and Education (MZO 2020) and HZJZ the teaching of PE at universities was carried out online.

Physical activity during the COVID-19 pandemic, in a sample of 166 subjects, increased compared to physical activity before the pandemic. A large part of research participants (85.5%) stated they liked online teaching of PE, while 80.1% stated that online teaching helped them stay physically active. The obtained results show that students are satisfied with this model of online teaching and react positively to it.

i instrumentima za procjenu tjelesne aktivnosti, možemo primijetiti pad razine tjelesne aktivnosti među ispitanicima koji su bili tjelesno aktivni prije pandemije, te porast tjelesne aktivnosti među ispitanicima koji nisu bili aktivni prije pandemije. Razlike u populacijama koje su proučavane također doprinose razlici u iznesenim podacima (16 god. adolescenti, 20 god. mladi, 32 god. odrasli). Valja napomenuti da su ispitanici u ovom istraživanju bili potaknuti na tjelesnu aktivnost zadacima koje su morali izvršavati kao obvezu prema kolegiju TZK, te kako je s njima bila ostvarena svakodnevna komunikacija što u spomenutim istraživanjima nije bio slučaj.

U našem istraživanju, 94,6% ispitanika izrazilo je želju za tjelesnom aktivnošću tijekom pandemije, te ih 80,1 % smatra kako im nastava na daljinu iz kolegija TZK u tome i pomaže. Značajna razlika između studentica i studenata dobivena je $\chi 2$-testom nezavisnosti upravo u pitanju smatraju li da im nastava TZK na daljinu pomaže da ostanu tjelesno aktivni. Studentice je ovakav model nastave potaknuo na tjelesnu aktivnost.

Tijekom nastave TZK na daljinu studenti su samostalno birali tjednu aktivnost kako bi ispunili svoju obavezu prema kolegiju. Ukupno 85,5 % ispitanika izjasnilo se da im se nastava na daljinu sviđa. U istraživanju provedenom 2016. godine utvrđena je učinkovitost korištenja aplikacija za pametne telefone u promicanju tjelesne aktivnosti (Coughlin i sur., 2016), što se i ovdje pokazalo učinkovito. Mogućnost samostalnog odabira vježbi preferira 89 % ispitanika, a 11 % više voli kada nositelj kolegija odabire vježbe.

Zaključak

U trenutku globalne krize uzrokovane koronavirusom, mnoge države poduzele su brojne epidemiološke mjere kako bi stanovništvo zaštitile od širenja zaraze. Zatvorene su obrazovne ustanove, a sva nastava preselila se u virtualno okruženje. Vodeći se važećim uputama Ministarstva znanosti i obrazovanja (MZO 2020) i HZJZ nastava TZK na fakultetima provodila se na daljinu.

Tjelesna aktivnost tijekom pandemije bolesti COVID-19, na uzorku od 166 ispitanika, povećala se u odnosu na tjelesnu aktivnost prije pandemije. Veliki dio ispitanika (85,5%) izjasnilo se da im se nastava TZK na daljinu sviđa dok njih 80,1%, smatra kako im nastava TZK na daljinu pomaže da budu tjelesno aktivni. Dobiveni rezultati govore da su studenti zadovoljni ovakvim modelom nastave na daljinu i pozitivno reagiraju na nju.

Digitalna tehnologija u nastavi TZK dobro je došla, ali nikako ne smije biti zamjena za kontakt nastavu.

Digital technology in teaching of PE is welcome, but it is by no means a substitute for contact teaching. As previous research in Croatia states the worrying fact of a large share of insufficiently active young people in the age group of 15 to 24 (Jurakić et al., 2009), one of the possible interventions could be the occasional referral of students to online assignments during the academic year, which would provide them with the opportunity to score additional points and thus encourage them to additional physical activity.

Budući se u dosadašnjim istraživanjima na području Hrvatske navodi da zabrinjava činjenica velikog udjela nedovoljno aktivnih u dobnoj skupini od 15 do 24 godine (Jurakić i sur., 2009), jedna od intervencija mogla bi biti i povremeno upućivanje studenata na online zadatke tijekom akademske godine koji bi se dodatno bodovali i tako ih potaknuli na dodatnu tjelesnu aktivnost.

Announcemet
We announce that the authors have equally contributed to this paper.

Izjava
Izjavljujemo da su autori podjednako doprineli radu.

Conflict of interests
There is no conflict of interests among the authors themselves.

Konflikt interesa
Između autora ne postoji interesni konflikt.

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Primljen: 26. novembar 2020. / Received: November 26, 2020
Prihvaćen: 12. decembar 2020. / Accepted: December 12, 2020