

**LEVEL OF MOVEMENT ACTIVITY DURING PANDEMIC PERIOD
– ANALYSIS OF THE IMPACT OF EDUCATION
ÚROVEŇ POHYBOVEJ AKTIVITY POČAS PANDÉMIE
– ANALÝZA VPLYVU VZDELÁVANIA**

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ABSTRACT

Objectives: Study was focused to find out how the limitation of social and sports opportunities during the lockdown affected the performance of physical activity (PA) of young people, with a study focus on the preference and implementation of a healthy lifestyle.

Method: 192 physiotherapy students (n: 192, mean age 21.26 ± 1.98) were assessed for PA levels and the possibility of applying alternative PA modalities to compensate for lost forms of sport activity. This is a retrospective study where the level of physical activity was assessed using data collected from the International Physical Activity Questionnaire (IPAQ) long form questionnaire. We supplemented the questionnaire with the questions about preferred sport activities and subjective assessment on the impact of the pandemic on the students' training program, their mental and physical health.

Results: Total physical activity before and during the lockdown was not significantly altered (p = 0.394). PA within work decreased significantly (p = 0.000) and conversely, we observed an increase in PA within housework (p = 0.011). There was a significant increase in PA in nature and more so in females 237.40 ± 308.02 MET min/week. Comparing PA by mode of living, we found that students living in rural areas had higher PA (p = 0.014). Women (n:50; 26.04%) were more likely than men (n:19; 11.4 %) to report the impact of the pandemic on psychological status.

Conclusion: Preference of a healthy lifestyle, regular sporting activity, and education in a health-related field predict maintenance of physical activity levels during pandemic isolation.

Key words: Education. Physical activity. Public health

ABSTRAKT

Ciele: Štúdia bola zameraná na zistenie, ako obmedzenie spoločenských a športových možností počas pandémie ovplyvňuje výkon pohybovej aktivity (PA) mládeže, so zameraním štúdie na preferenciu a implementáciu zdravého životného štýlu.

Metóda: U 192 študentov fyzioterapie (n: 192, priemerný vek 21,26 ± 1,98) bola hodnotená úroveň PA a možnosť aplikácie alternatívnych modalít PA na kompenzáciu stratených foriem športovej aktivity. Ide o retrospektívnu štúdiu, v ktorej bola úroveň fyzickej aktivity hodnotená pomocou údajov zozbieraných z dlhodobého dotazníka International Physical Activity Questionnaire (IPAQ). Dotazník sme doplnili otázkami o preferovaných športových aktivitách a subjektívnom hodnotení vplyvu pandémie na tréningový program študentov, ich duševné a fyzické zdravie.

Výsledky: Celková fyzická aktivita pred a počas pandémie sa významne nezmenila (p = 0,394). PA v rámci práce sa signifikantne znížila (p = 0,000) a naopak, zaznamenali sme nárast PA v rámci domácich prác (p = 0,011). Bol zaznamenaný významný nárast PA u žien v prírode 237,40 ± 308,02 MET min/týždeň. Porovnaním PA podľa spôsobu života sme zistili, že študenti žijúci vo vidieckych oblastiach mali vyššiu PA (p = 0,014). Ženy (n: 50; 26,04 %) častejšie ako muži (n: 19; 11,4 %) hlásili vplyv pandémie na psychický stav.

Záver: Preferencia zdravého životného štýlu, pravidelnej športovej aktivity a vzdelávania v oblasti zdravia predpokladá udržanie úrovne fyzickej aktivity počas pandemickej izolácie.

Kľúčové slová: Vzdelávanie. Pohybová aktivita. Verejné zdravie

INTRODUCTION

WHO and other sources have made several recommendations on how to maintain a standard level of PA despite isolation: 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity (or a combination) PA per week (World Health Organisation [WHO], 2020), considering age, clinical conditions, and fitness level (Dwyer et al., 2020). Adequate PA also has mental health benefits (Maher et al., 2021; Physical Activity Guidelines Advisory Committee, 2018). Education is a very important factor influencing the state of health - more educated people have better attitudes toward healthy lifestyles, including exercise (Žejglicová et al., 2016). The study in the field of physiotherapy represents the acquisition of knowledge and practical skills in the prevention and therapy of diseases of the musculoskeletal system. The graduate in this field can compile a motoric program with respect to the physical and mental limits of the client so the goal of the therapy can be achieved. This may mean maintaining or improving fitness, strength, endurance or coordination skills. In case of physical limitations, they look for suitable alternatives to physical activity that will help to achieve the goal.

Restrictions in mobility, changes in learning modalities as well as personal isolation led to negative changes in all aspects of young people's mental and physical health (Kapasias et al., 2020). Long-term isolation leads to changes in movement behavior and provides conditions for the development of physical inactivity and sedentary lifestyle (Zheng et al., 2020; Castañeda-Babarro et al. 2020). Muscle inactivity results in anabolic resistance and muscle atrophy – studies show that step dose reduction alone demonstrates up to 4 % muscle atrophic changes after 14 days (Bowden Davies et al., 2019).

Based on these starting points we decided to examine how the knowledge aimed at applying the principles of a healthy lifestyle in students of physiotherapy affects the maintenance of the level of physical activity limited by the lockdown.

MATERIALS AND METHODS

A retrospective study monitors the exercise habits of college students after the implementation of restrictive measures during the metalloid pandemic and during the first lockdown in the spring of 2020. All the measuring has been in the study involved 192 students from the Faculty of Health Professions who had not got infected with Covid-19 during the first wave of the pandemic and had no limited physical activity due to health reasons. The mean age of the students was 21.26 ± 1.98 years. The number of females was 132 (68.75 %) and males 60 (31.25 %). The mean BMI was 22.38 ± 3.27 .

The level of physical activity was assessed using the International Physical Activity Questionnaire (IPAQ) long form (Craig et al., 2003). According to the instructions of the questionnaire, the only PA that was relevant for us was PA performed without a break, for at least 10 min.

Demographic data prefers physical activity. Subjective ratings of the impact of PA limitations on mental and physical health were obtained using a self-constructed questionnaire that included closed (Likert Scale) and open-ended questions.

STATISTICAL ANALYSIS

Descriptive statistics were used to process the data. Baseline differences between pre- and post-intervention physical activity were assessed by paired t-test, the difference between students living in an apartment or house was assessed by Mann Whitney U test. Effect size calculated as Cohen's d categorized for small effect size (< 0.20) medium effect

size ($0.20 - 0.50$) and large effect size (> 0.50). Data are presented as mean \pm 1 SD or as % percentages. The level of statistical significance was set at $p < 0.05$.

RESULTS

Comparing the total IPAQ scores during and after the lockdown, we found no statistically significant difference ($p = 0.394$). Analyzing the individual domains (sections), we found: decreased physical activity in the Physical Activity at Work/School domain for low and moderate PA and total activity ($p < 0.05$) and a medium effect size ($0.20 - 0.50$); in the Physical Activity for Transportation domain, increased physical activity for bicycling ($p < 0.05$); in the Housework, Home Maintenance and Family Care domain, MET increased in high and total activity ($p < 0.05$); in the Physical Activity for Recreation, Sport and Leisure domain, MET decreased in high activity ($p < 0.05$) and MET decreased in low activity ($p < 0.05$). There was no difference in the other observed parameters of physical activity ($p > 0.05$) (Table 1).

Table 2 highlights alternative options for implementing PA with a link to the environment. Comparing the genders, we found a statistically significant difference in PA (min/week) in the pool and gym environments in the time before the pandemic, both $p \leq 0.05$. During the lockdown, women maintained their level of outdoor exercise, men significantly increased their PA: during the lockdown 233.11 ± 259.89 , post-pandemic 172.13 ± 195.72 minutes/week. 18 students (9.375 %) did not engage in any physical activity during the lockdown.

There were 133 students in our sample, living and staying in the city during the lockdown and 59 students from rural areas. We found a significant difference in PA performance between students living in urban and rural areas ($p \leq 0.014$) – students from rural areas performed on average 2285 MET min/week more. We observed a significant difference in PA related to maintenance and housework: rural 3727.54 ± 3132.80 METs min/week; urban 2197.29 ± 2468.36 METs min/week and at medium and high levels of PA ($p \leq 0.05$).

Students did not experience significant weight change during the pandemic (during lockdown 22.33 ± 3.12 ; post-pandemic BMI 22.28 ± 3.27).

Table 4 provides an overview on the subjective assessment of the impact of lockdown on students' fitness, physical and mental state (Likert scale-

rating) in a comparison between the two genders. We report response rates in real numbers and percentages. More than half of the men (n: 32; 53.33 %) were satisfied with their level of exercise during the lockdown and had less difficulty returning to training once the restrictive measures were

lifted (n: 47; 24.48%). Women were less satisfied with the level of exercise (n: 93; 48.44 %) and reported more difficulty returning to exercise. We similarly observed a greater impact on physical (n: 35; 18.23 %) and mental health (n: 50; 26.04 %) in women.

Table 1 Movement activity before pandemic and after lockdown

IPAQ METs min/week	During Mean \pm SD (n = 192)	After Mean \pm SD (n = 192)	Effect Size	t	p
Physical activity at work/school					
low	454.27 \pm 1510.62	1264.85 \pm 1491.87	0.540 ^c	6.22	0.000
medium	507.50 \pm 1701.55	947.50 \pm 1573.08	0.393 ^b	2.98	0.003
high	448.33 \pm 1898.66	383.75 \pm 1085.07	0.042 ^a	-0.44	0.658
Total	1410.10 \pm 3952.45	2596.10 \pm 2416.39	0.362 ^b	4.32	0.000
Physical activity during transport					
walking	911.276 \pm 1371.74	950.21 \pm 1088.14	0.031 ^a	0.347	0.729
bicycle	508.313 \pm 913.73	223.28 \pm 647.07	0.360 ^b	-3.98	0.000
Total	1419.59 \pm 1783.38	1173.49 \pm 1386.96	0.154 ^a	-1.74	0.083
Housework, home maintenance and family care					
low	969.45 \pm 1146.10	879.00 \pm 1101.23	0.080 ^a	-0.97	0.332
medium	1186.35 \pm 1229.32	1012.30 \pm 1263.12	0.140 ^a	-1.69	0.093
high	1101.50 \pm 1828.81	794.40 \pm 1463.37	0.185 ^a	-2.27	0.025
Total	3257.30 \pm 3022.25	2685.68 \pm 2735.12	0.198 ^a	-2.56	0.011
Physical activity during recreation, sport and leisure					
low	1366.75 \pm 2370.17	1078.31 \pm 1225.87	0.153 ^a	-1.64	0.102
medium	814.46 \pm 933.99	706.67 \pm 723.15	0.129 ^a	-1.88	0.061
high	1176.30 \pm 1688.57	1614.58 \pm 2194.92	0.224 ^b	3.07	0.002
Total	3357.51 \pm 3458.78	3399.56 \pm 2731.87	0.013 ^a	0.16	0.869
Activity					
Total	9444.50 \pm 7388.67	9854.82 \pm 5724.29	0.062 ^a	0.85	0.394
Time spent sitting					
Total	353.57 \pm 152.75	369.00 \pm 121.53	0.112 ^a	1.54	0.126
MET					
low	2732.29 \pm 3293.30	3293.36 \pm 2596.44	0.189 ^a	2.25	0.026
medium	3986.08 \pm 3306.03	3768.72 \pm 2962.23	0.069 ^a	-0.92	0.357
high	2726.13 \pm 3374.98	2792.73 \pm 3114.47	0.021 ^a	0.26	0.793
Score					
Total	2.75 \pm 0.50	2.80 \pm 0.42	0.108 ^a	1.36	0.174

Legend: IPAQ – International Physical Activity Questionnaire, MET – Metabolic Equivalent, SD – Standard deviation, n – frequency, p – p-value (significance); Effect size calculated as Cohen's d categorized for small effect size (< 0.20)^a medium effect size (0.20 – 0.50)^b and large effect size (> 0.50)^c

Table 2 Environment influence

PA environment (min/week)	Women Mean \pm SD (n = 131)	Men Mean \pm SD (n = 61)	t	p
After - gym	54.05 \pm 117.81	92.95 \pm 145.61	-1.972	0.049
After - swimming pool	40.53 \pm 125.36	102.79 \pm 133.99	-3.134	0.001
After - fitness	95.72 \pm 128.58	90.49 \pm 148.54	0.250	0.365
After - nature	217.10 \pm 250.39	172.13 \pm 195.72	1.237	0.408
During - home	141.62 \pm 138.60	144.10 \pm 133.13	-0.117	0.570
During - nature	237.40 \pm 308.02	233.11 \pm 259.89	0.094	0.990

Legend: PA – Physical Activity, SD – Standard deviation, n – frequency, p – p-value (significance)

Table 3 PA relating to housing type (Mann Witney U test)

IPAQ - lockdown METs min/week	Home Mean \pm SD (n = 133)	Apartment Mean \pm SD (n = 59)	Z	p
Physical activity at work/school				
low	520.31 \pm 1615.82	305.39 \pm 1241.05	0.641	0.521
medium	507.37 \pm 1669.07	507.80 \pm 1787.28	0.554	0.579
high	452.33 \pm 1518.95	439.32 \pm 2573.00	0.899	0.368
Total	1480.01 \pm 3775.19	1252.50 \pm 4355.70	0.797	0.426
Physical activity during transport				
walking	1007.19 \pm 1563.38	695.05 \pm 751.88	-0.008	0.993
bicycle	572.57 \pm 1020.28	363.46 \pm 591.17	0.795	0.426
Total	1579.77 \pm 2004.37	1058.51 \pm 1067.13	0.524	0.601
Housework, home maintenance and family care				
low	1019.66 \pm 1048.86	856.27 \pm 1342.71	1.934	0.053
medium	1372.18 \pm 1295.27	767.46 \pm 949.02	3.904	0.000
high	1335.69 \pm 2004.62	573.56 \pm 1207.93	2.833	0.004
Total	3727.54 \pm 3132.80	2197.29 \pm 2468.36	3.868	0.000
Physical activity in recreation, sport and leisure				
low	1452.62 \pm 2752.94	1173.17 \pm 1093.92	-0.370	0.711
medium	807.04 \pm 948.86	831.19 \pm 907.32	-0.141	0.888
high	1099.92 \pm 1496.95	1348.47 \pm 2060.60	-0.536	0.591
Total	3359.59 \pm 3693.55	3352.83 \pm 2889.26	-0.507	0.612
Activity				
Total	10146.90 \pm 7436.16	7861.14 \pm 7088.71	2.443	0.014
Time spent sitting				
Total	346.93 \pm 149.66	368.54 \pm 159.77	-0.649	0.516
MET				
low	2980.13 \pm 3686.91	2173.61 \pm 2078.84	0.719	0.472
medium	4278.82 \pm 3145.28	3326.17 \pm 3583.14	3.064	0.002
high	2887.95 \pm 3203.92	2361.36 \pm 3735.33	1.540	0.124
Total	10146.90 \pm 7436.16	7861.14 \pm 7088.71	2.443	0.014

Legend: IPAQ – International Physical Activity Questionnaire, MET – Metabolic Equivalent, SD – Standard deviation, n – frequency, p – p-value (significance), Z – Z-value (Mann-Whitney)

Table 4 The impact of lockdown on training performance and mental and physical health

Question		Men (n=60)	Women (n=132)	Total (n=192)
Do you think that the physical activity you did during the pandemic was sufficient to keep you fit?	Yes	32 (53.33 %)	61 (46.21 %)	93 (48.44 %)
	No	22 (36.66 %)	42 (31.82 %)	64 (33.33 %)
	I don't know	6 (10.00 %)	29 (21.97 %)	35 (18.23 %)
	Total	60 (100 %)	132 (100 %)	192 (100 %)
Did you have trouble getting back into your training program after the lifting of sporting activity measures?	Yes, definitely	2 (3.33 %)	8 (6.06 %)	10 (5.21 %)
	Yes, a little bit	21 (35.00 %)	49 (37.12 %)	70 (36.46 %)
	No	33 (55.00 %)	57 (43.18 %)	90 (46.88 %)
	I don't know	4 (6.66 %)	18 (13.63 %)	22 (11.46 %)
Total	60 (100 %)	132 (100 %)	192 (100 %)	
Has the pandemic had a negative impact on your physical health?	Yes, definitely	1 (1.66 %)	7 (5.30 %)	8 (4.17 %)
	Yes, a little bit	17 (28.33 %)	28 (21.21 %)	45 (23.44 %)
	No	38 (63.33 %)	88 (66.66 %)	126 (65.63 %)
	I don't know	4 (6.66 %)	9 (6.82 %)	13 (6.77 %)
Total	60 (100 %)	132 (100 %)	192 (100 %)	
Has the pandemic had a negative impact on your mental health?	Yes, definitely	4 (6.66 %)	9 (6.82 %)	13 (6.77 %)
	Yes, a little bit	15 (25.00 %)	41 (31.06 %)	56 (29.17 %)
	No	40 (66.66 %)	77 (58.33 %)	117 (60.94 %)
	I don't know	1 (1.66 %)	5 (3.79 %)	6 (3.13 %)
Total	60 (100 %)	132 (100 %)	192 (100 %)	

DISCUSSION

Positive influences towards PA are formed in childhood - children with physically active parents are more likely to have an active lifestyle (Lu et al., 2017), and the influence of friends, childhood role models (Maturo et al., 2013), and school-based exercise programs (Mizdrak et al., 2021) is also not negligible. The focus of educational attainment helps to solve specific problems. During their studies, physiotherapy students are provided with information about different types of exercise, their possibilities and limitations, and possible alternatives (Falvey et al., 2016). At the time of the closure of indoor sports grounds, some specific sports were prevented – swimming, indoor sports, exercises in fitness centers, etc. The acquired knowledge helped the students to apply the alternative types of exercise sufficiently enough that we registered only a minimal loss of total physical activity: The maintenance or even increase in PA has been explained by some studies by the availability of more free time during the quarantine period (Dias et al., 2017). There is a range of alternative physical activities that can be undertaken in the home environment (Hammami et al., 2022) and the fact that physiotherapy students have knowledge of this has helped to maintain PA during lockdown. The environment has an impact on physical activity – while the city provides more opportunities for young people to exercise in winter, rural people are more physically active in summer (Loucaides et al., 2004).

Walking offers the most natural way to achieve the desired goal of PA according to WHO recommendations – in terms of intensity and time. It can be different forms of walking – from planned: sport, to purposeful: transport. The Australian Victoria Walks study (Garrard, 2017) comprehensively assessed the walking of its residents, where the average walking time of young people aged 18 – 20 years was 64 min/day. The walking time of young people during lockdown in New Zealand was 59 min/day (Meiring et al., 2021), another study following active athletes reported 29 min/day (Hermassi et al., 2021). The average daily walk in our study was 135 min/day before the pandemic and 130 min/day during the lockdown. It should be emphasized that this was a total walk – including walking for recreation, sport and transport. These values are also consistent with the preferred type of weekend PA, which was walking and hiking. Some sources cite walking as the most chosen PA, with motiva-

tions being accessibility, low economic cost, freedom from stressors, “clearing the head,” and prevention of anxiety and depression (Garrard, 2017).

The healthy lifestyle to which physiotherapy students are guided influences their exercise behavior even in times of restricted sporting opportunities. The results indicate good adaptive skills within physical activities and an unchanged approach to exercise among physiotherapy students. Long-term reduction in PA levels can cause weight gain and leads to increased health risks (Hallal et al., 2012). We observed a low weight gain – on average 0.05 BMI in our study. Slightly reduced sitting time by 16 min/week.

An important determinant in the comprehensive assessment of changes in PA is the baseline status of the students, which is characterized by a tendency towards a healthy lifestyle and active participation in sport at different levels. The knowledge acquired during the study forms the basis for creating the right behavioral habits with the possibility of application to real life. Minimal or mild reductions in PA levels during lockdown generally occurred in those healthy individuals who were physically active before the pandemic (Castañeda-Babarro et al., 2020). The availability of online movement recommendations, programs, workouts or fitness apps (WHO, Food and nutrition tips during self-quarantine, 2021) is also considered an important factor for maintaining PA in times of students' isolation.

CONCLUSION

The practice of a healthy lifestyle that includes regular exercise, together with adequate knowledge of the application and effects of PA, forms a good basis for the development of alternative forms of exercise programs in times of restrictive constraints such as the Covid-19 pandemic. Achieving education in the medical fields of study favors students in solving problems focused on physical activity and maintaining health. Identifying the impact of promoting healthy lifestyles and regular PA in secondary and tertiary school curricula may be an effective tool for managing pandemic isolation for support of public health.

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