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ANALYSIS OF CHANGES IN PHYSICAL ACTIVITY IN THE ADOLESCENT POPULATION DURING THE CORONAVIRUS DISEASE 2019 PANDEMIC

ANALIZA PROMENA U FIZIČKOJ AKTIVNOSTI U POPULACIJI ADOLESCENATA U TOKU PANDEMIJE COVID-19

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Summary

Introduction. Physical activity affects all three domains of adolescent health. It affects physical, psychological and social functioning. During the period of the coronavirus disease 2019 pandemic, physical activity has changed significantly, which may affect the health potential of this population. **Material and Methods.** The research was conducted as a cross-sectional study. A questionnaire was designed as a research instrument in order to examine the personal experiences of adolescents in regard to physical activity during the coronavirus pandemic. The study included a sample of 120 students attending the Secondary Medical School "Dr Miša Pantić" in Valjevo. Participation in the study was voluntary and anonymous. **Results.** The largest number of respondents in the observed sample (N = 120) recognized that physical inactivity is one of the most significant risk factors for the health potential of adolescents. There is a statistically significant difference in the responses of the respondents from the aspect of engaging in physical activities during the coronavirus disease 2019 pandemic ($p = 0.001$). Respondents of both genders understand the importance of regular physical activity and its impact on mental health, sleep and rest, nutrition and other predictors that have a dominant influence on health. **Conclusion.** The commendable result is that adolescents recognize that physical inactivity is one of the greatest health risks. In preventive medicine, it is necessary to intensify health education programs that encourage the importance of physical activity in the period of adolescence.

Key words: Exercise; Habits; Adolescent; COVID-19; Pandemics; Risk Factors

Introduction

The coronavirus disease 2019 (COVID-19) pandemic has caused disruptions in the global social system. Adolescents faced social role changes, the schools were closed, activities that can be carried out

Sažetak

Uvod. Fizička aktivnost utiče na sve tri determinante zdravlja adolescenata. Utiče na fizičko, psihičko i socijalno funkcionisanje. Tokom perioda pandemije COVID-19 fizička aktivnost je značajno izmenjena, što može uticati na zdravstveni potencijal ove populacije. **Materijal i metode.** Istraživanje je sprovedeno u formi studije preseka. Kao istraživački instrument konstruisan je upitnik koji ispituje lična iskustva adolescenata u vezi sa fizičkom aktivnošću tokom pandemije virusa korona. Istraživanjem je obuhvaćen uzorak od 120 učenika, koje je sprovedeno u Medicinskoj školi „Dr Miša Pantić“ u Valjevu. Učešće u istraživanju bilo je dobrovoljno i anonimno. **Rezultati.** Najveći broj ispitanika u posmatranom uzorku (N = 120), prepoznaje da je fizička neaktivnost jedan od najznačajnijih faktora rizika po zdravstveni potencijal adolescenata. Postoji statistički značajna razlika u odgovorima ispitanika sa aspekta bavljenja fizičkim aktivnostima u toku pandemije COVID-19 ($p = 0,001$), ispitanici oba pola shvataju važnost kontinuirane fizičke aktivnosti i njenog uticaja na mentalno zdravlje, san i odmor, ishranu i druge prediktoare koji dominantno utiču na zdravlje. **Zaključak.** Treba pohvaliti to što adolescenti prepoznaju da je fizička neaktivnost jedan od najvećih zdravstvenih rizika. U preventivnoj medicini potrebno je intenzivirati zdravstveno-vaspitne programe koji podstiču značaj fizičke aktivnosti u periodu adolescencije.

Ključne reči: fizička aktivnost; navike; adolescenti; COVID-19; pandemije; faktori rizika

outside the home were restricted, and many contacts with peers in the free time were reduced [1]. Numerous studies have found that physical activity affects all three domains of health. It has a great impact on the mental health of adolescents during the pandemic. The impact of psychologically stressful situations

Abbreviations

COVID-19 – coronavirus disease 2019

ANOVA – analysis of variance

such as the COVID-19 pandemic on adolescents is a health risk that may lead young people to serious health problems. The consequences of physical inactivity and interrupted social pattern of behavior can be very unfavorable for adolescents [1, 2]. Numerous scientific studies testify to the decline in sports activities among adolescents during the corona virus pandemic. Physical activity in a large number of cases requires social interaction and collective sports were not always available; this resulted in an increase in the number of hours that adolescents spent in front of a computer or phone screen [3]. The negative impact of physical inactivity has also led to an increased number of obese children. Although obesity was a big problem among adolescents before the pandemic as well, physical inactivity has worsened this problem, but there are still no final results on how nutrition and physical inactivity affected adolescents. Obesity is something that accompanies physically inactive people and it causes numerous metabolic, cardiovascular and other health disorders and diseases [4, 5]. Physical inactivity negatively affects the circadian rhythm, sleep and rest [6]. Numerous studies showed that inadequate sleep, altered activities of daily life, online teaching from home during the COVID-19 pandemic negatively affected health-related habits in adolescents. During this period, young people were much less physically active, stayed in front of the screen longer in the evening and had an irregular sleep/wake rhythm [7]. A great number of scientific studies that have dealt with the physical inactivity of adolescents during the COVID-19 pandemic have proven the connection between this health risk and many physical and psychological health problems. Physical exercises at home, training with a specific program and social interaction are associated with better health outcomes during the coronavirus pandemic [8]. The physical inactivity of adolescents during the quaran-

tine and state of emergency may lead to the adoption of negative behavior patterns, which will continue even after the conditions imposed by the pandemic change. Physical activity is also influenced by the habits that young people had before the pandemic [9]. Physical activity, moderate and dosed, during the pandemic enabled a lower impact of numerous stressors faced by adolescents in this period [10]. Isolation and restriction of people's movement is a public health measure that has saved many lives, yet it leaves consequences in terms of reduced physical activity of adolescents, so strategies are needed to help the implementation of preventive measures to alleviate negative lifestyle habits in adolescents [11]. A large number of scientific studies point to the decline of physical activity, primarily in the population of men compared to women, dominantly reduced intense physical activities and training, followed by walks and moderate physical activities aimed at relaxation [12]. Long COVID-19 measures can lead to long-term barriers in engaging in physical activities, the feeling of exhaustion and numerous health problems can negatively affect proper physical activity and the health potential of an individual. These problems are rarer in the adolescent population, but they are not impossible, thus additional health education support is needed by experts in the field of preventive medicine [13]. The reduction of physical activity during the pandemic resulted in the development of other health risks, such as the consumption of alcohol, cigarettes and psychoactive substances, which can permanently damage the health potential of adolescents [14]. Physical activity is effective in overcoming mental problems, anxiety and depression, prevention of obesity and other health risks; it should be applied daily and adapted to the life situation [15, 16].

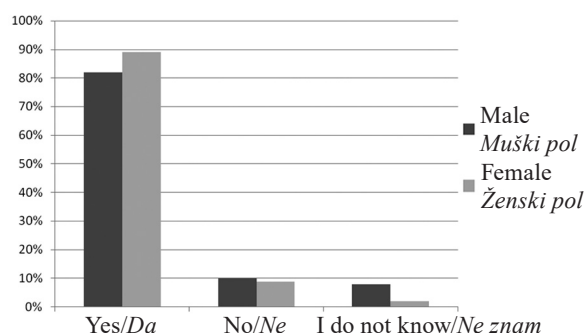
Material and Methods

The research was conducted as a cross-sectional study. A questionnaire was designed as a research instrument to assess the habits of adolescents regard-

Table 1. Sociodemographic characteristics of respondents

Tabela 1. Sociodemografske karakteristike ispitanika

Distribution criteria <i>Kriterijum distribucije</i>	Variables <i>Varijable</i>	No <i>Apsolutni broj</i>	% <i>Procenat</i>
Gender <i>Pol</i>	Male/Muški	43	36%
	Female/Ženski	77	64%
Place of living <i>Mesto stanovanja</i>	Urban environment/ <i>Urbana sredina</i>	65	54%
	Suburban settlements/ <i>Prigradska sredina</i>	12	10%
	Rural areas/ <i>Ruralna sredina</i>	43	36%
Maternal education <i>Obrazovanje majke</i>	Primary school/ <i>Osnovna škola</i>	9	8%
	High School/ <i>Srednja škola</i>	84	69%
	University education/ <i>Univerzitetsko obrazovanje</i>	27	23%
Paternal education <i>Obrazovanje oca</i>	Primary school/ <i>Osnovna škola</i>	8	7%
	High School/ <i>Srednja škola</i>	81	68%
	University education/ <i>Univerzitetsko obrazovanje</i>	31	25%



Graph 1. Is physical inactivity one of the most serious risk factors for health?

Grafikon 1. Da li je fizička neaktivnost jedan od najozbiljnijih rizika po naše zdravlje?

ing their physical activities during the COVID-19 pandemic. It included a sample of 120 adolescents attending the Secondary Medical School “Dr. Miša Pantić” in Valjevo, in the period from March to May 2021. The sample was intentional, including students of the final grades of medical profiles. Participation in the study was voluntary and anonymous and the

research was approved by the competent authorities of the Secondary Medical School “Dr. Miša Pantić” Valjevo. Before the beginning of the research, the respondents received necessary information on the study orally and in writing and they submitted their written consent for the survey. The students were given instructions on how to complete the questionnaire. The researchers personally distributed the questionnaires and collected the data. Statistical data processing included methods of descriptive and inferential statistics using the analysis of variance (ANOVA) test. Data were analyzed using the Statistical Package for the Social Sciences for Windows. The obtained results are presented in tables and graphs.

Results

The most important sociodemographic characteristics of the respondents in the observed sample are shown in **Table 1**.

The largest number of respondents of both sexes believes that physical inactivity is one of the greatest risk factors for the health potential of adolescents (**Graph 1**).

Table 2. Personal experiences of adolescents related to physical activities during the COVID-19 pandemic
Tabela 2. Lična iskustva adolescenata u vezi sa fizičkim aktivnostima u toku pandemije COVID-19

Variables Varijable	Likert scale - mean value Likertova skala – srednja vrednost		ANOVA	p/p
	Mean - Male Sr. vred. Muški pol	Mean - Female Sr. vred. Ženski pol		
Physical activity longer than 60 minutes per day Fizička aktivnost duža od 60 minuta na dan	2.42	2.11	10.253	0.001
Do you do sports regularly?/Da li se redovno bavite sportom?	1.10	1.09	25.241	0.001
Moderate physical activity during the day Umerena fizička aktivnosti u toku dana	1.10	1.09	25.241	0.002
Did you exercise at home during the COVID-19 pandemic? Da li ste se bavili fizičkim aktivnostima u svom domu tokom pandemije COVID-19?	2.11	1.60	25.120	0.002
Has the COVID-19 pandemic affected your physical activity habits?/Da li je pandemija COVID-19 uticala na Vaše navike u vezi sa fizičkim aktivnostima?	3.14	2.39	94.578	0.001
Do physical activities have a positive effect on your mental and physical health?/Da li fizička aktivnost ima pozitivan efekat na Vaše mentalno i fizičko zdravlje?	3.62	3.83	7.354	0.004
Did physical activity help you overcome feelings of anxiety and depression during the corona virus pandemic? Da li vam je fizička aktivnost pomogla u prevazilaženju osećaja anksioznosti i depresije u toku pandemije korona virusa?	3.07	3.41	17.981	0.001
Is physical activity beneficial for sleep and rest? Da li fizička aktivnost korisna za san i odmor?	2.92	3.65	29.189	0.001
Is your diet healthy and balanced in relation to your physical activities?/Da li se trudite da se hranite zdravo i balansirano u odnosu na fizičku aktivnost?	3.52	2.68	42.623	0.004
Is it necessary for adolescents to engage in physical activities and sports even during the pandemic?/Da li je neophodno da se adolescenti bave fizičkim aktivnostima i sportom i tokom pandemije?	2.60	1.65	45.692	0.002
Is moderate physical activity recommended for everyone? Da li se umerena fizička aktivnost preporučuje svima?	1.64	2.24	0.344	0.228

Discussion

A total of 120 respondents participated in the research related to the physical activity of adolescents during the COVID-19 pandemic (**Table 2**). The sample included 77 (64%) female and 43 (36%) male respondents. Most respondents in the study were from urban areas (54%), rural areas (43%) and the smallest number of respondents was from suburban settlements (12%). Regarding the parental education, the dominant educational level was high school (69% of mothers and 68% of fathers). Most respondents engaged in physical activities every day, even during the pandemic ($p = 0.001$). There was a statistically significant difference between respondents in regard to regular physical activity; sports were more dominantly played by male respondents ($p = 0.001$). Subjects of both sexes had moderate physical activity during daily activities. There was a statistically significant difference in regard to physical activities and sports during the COVID-19 pandemic at home; these were also more dominant in male respondents ($p = 0.002$). Male respondents also confirmed that the COVID-19 pandemic affected their physical activity habits ($p = 0.001$). There was a statistically significant difference regarding positive effects of physical activity on the mental health; positive responses predominantly came from female respondents ($p = 0.004$). In the observed sample of respondents, female adolescent claimed that physical activity during the coronavirus pandemic helped them a lot in overcoming feelings of depression, stress and anxiety. Respondents of both sexes agreed that physical activity helps regulate sleep and rest (0.001). When it comes to proper nutrition and physical activities, male respondents took more care about proper nutrition ($p = 0.004$). There was a statistically significant difference between respondents regarding the necessity to maintain habits related to physical activity even during the pandemic ($p = 0.002$). A small number of adolescents recognized

that everyone needs moderate physical activity during the day (0.228). The largest number of respondents in the observed sample claimed that physical inactivity is one of the most dangerous health risks for adolescent health; 82% of male respondents and 89% of female respondents. The results of our study match the results of other researchers in eminent databases. Researchers from the University of Edinburgh also obtained results that indicate the impact of physical activity on body image, nutrition and mental status [17]. Researchers from China also reported that social conditions caused by the pandemic affected the health potential of adolescents through social distancing, closing schools, restricting group sports activities that negatively affected the physical activity of adolescents, which coincides with our results [18]. The results of researchers from the Ludwig-Maximilians-University Hospital, Munich, Germany, are in agreement with our results; diet and physical activity are important predictors of health in both pandemic and emergency situations. All this affects the physical and psychological health of adolescents [19]. Researchers from Austria agree that the COVID-19 pandemic had a particularly stressful effect on younger people, people with low incomes and adolescents [20].

Conclusion

Physical activity affects all three domains of adolescent health. It affects physical, psychological and social functioning. During the period of the coronavirus disease 2019 pandemic, physical activity has changed significantly, which may affect the health potential of the adolescent population. Physical inactivity may cause irreversible damage to health and development of comorbidities in adolescents. Preventive interventions by healthcare workers should be more intensive in regular circumstances but also in situations such as a pandemic.

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