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Professional paper

THE IMPACT OF PHYSICAL ACTIVITY ON THE OCCURRENCE OF OBESITY AND UNDERNUTRITION IN THE ADOLESCENT POPULATION

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Abstract

Adolescence is a period of intense physical, emotional, and social changes. It is the stage of the most rapid growth in height and body mass, as well as increased energy needs. Unsatisfied with their appearance, adolescents may experience significant emotional lows that can affect them later in life.
The occurrence of obesity among adolescents is considered one of the most serious public health problems of the 21st century and the second leading preventable cause of death.
The main aim of this research is to determine how often adolescents engage in physical activity, for how long, and how this affects the occurrence of obesity and undernutrition.
The study was conducted on a sample of 409 high school students, of which 214 were girls and 195 were boys. In order to fulfill the main objective, participants completed an anonymous questionnaire. The collected data were statistically analyzed using the SPSS 20 statistical program and the EXCEL software ($p<0.05$).
From the conducted research, we can conclude that adolescents who are at a significantly higher risk of obesity do not engage in daily physical activity, while the risk of developing undernutrition is present among adolescents who engage in daily physical activity for 90 minutes or more. Based on the summarized results, recommendations are made for the application of physical activity as a primary goal in improving health and physical condition.

Keywords: adolescence, obesity, undernutrition, obesity prevention

1. Introduction

Today, influenced by overall development, progress, and globalization, people are preoccupied with work and obligations, neglecting a healthy lifestyle, physical activity, and healthy eating. All of these factors contribute to an increase in risk factors such as obesity, elevated blood cholesterol and glucose levels, and high blood pressure, which further elevate the likelihood of developing cardiovascular diseases, diabetes mellitus, and malignant neoplasms (Николовски, 2014).This neglect contributes to the onset of various diseases and disorders. The WHO defines physical activity as movement that should be practiced daily, encompassing work, recreation, and various sports activities (WHO, 2010). Regular physical activity has both direct and indirect significance for the health of adolescents. The health benefits of physical activity include weight loss or maintenance of a desired body weight, improvement in glycemia, improvement in serum cholesterol and other lipid profile factors, reduction in blood pressure, etc. (Kelley & Kelley, 2013).

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Physical activity improves metabolism, stimulates bone growth and strengthening, and enhances mental health. Exercise stimulates the secretion of endorphins, also known as "feel-good hormones," which influence the development of good mental health in children (Panova et al., 2014). Adolescence, the subject of this research, is a period of intense physical, emotional, and social changes (Rožek Mitrović & Petrović, 2018). According to the findings of the Global Matrix 3.0, which includes data from 49 countries, levels of physical activity among children and adolescents are low, while screen time is considerably high. Only 27% to 33% of youth meet the recommended levels of physical activity, and just 34% to 39% comply with the guidelines for screen time (Aubert S. et., al 2018).The main objective of this research is to investigate the influence of physical activity on the prevalence of obesity in the adolescent population. This is crucial because adolescents undergo dramatic physical growth and development during puberty, experiencing a bodily transformation from child to adult in a relatively short period (Telebak et al., 2013; Sawyer et al., 2018). The study aims to assess the frequency and duration of physical activity among adolescents and to examine its association with the prevalence of obesity within this age group.

2. Materials and methods

This research included 409 high school students from secondary schools within the city of Bar, Montenegro. To cover the entire period of adolescence, the study was conducted among high school students from all four years, aged 14 to 19 years. A specially structured closed-type questionnaire was used as the research instrument, developed based on a thorough literature review and validated questionnaires (Lupi, 2015). The questionnaire was anonymous, and parental consent was obtained for its implementation.

3. Results and discussion

From the conducted research on the adolescent population, Table 1 presents the demographic characteristics of the respondents. The analysis included 409 (94.67%) questionnaires.

Table 1. Demographic Characteristics of Respondents

Variable	**N**	**%**
Sex		
Male	195	47.7
Female	214	52.3
Age (years)		
14	2	0.5
15	79	19.3
16	141	34.5
17	92	22.5
18	92	22.5
19	3	0.7
Grade Level		
First Year	72	17.6
Second Year	154	37.7
Third Year	83	20.3
Fourth Year	100	24.4

N - Number of respondents

Regarding gender, the study included 195 (47.7%) male and 214 (52.3%) female respondents. The youngest respondent was 14 and the oldest was 19 years old, while the average age of the respondents was 16.00 ± 1.078 years. The majority of respondents were 16 years old (141, 34.5%).

According to the World Health Organization (WHO), obesity has been classified as an epidemic and is most prevalent in the world's most developed countries (Krivokapic, 2015). Fleming et al., (2014) reported that in 2010, overweight and obesity were responsible for 3.4 million deaths. WHO data indicate that approximately 2.1 billion people suffer from excess body weight. Research has confirmed that as much as 65% of the global population lives in countries where overweight and obesity present a significantly greater problem than hunger (Despotović et al., 2013).

Table 2 presents the Body Mass Index (BMI) among the adolescent population.

Table 2. Body Mass Index by Gender

Body Mass Index (BMI) Nutrition Category (kg/m²)	**Gender**				**Pearson Chi square**	
	Male		**Female**			
	N	**%**	**N**	**%**	χ^2	**P**
Severe Underweight	1	0.5	0	0.0		
Underweight	0	0.0	3	1.4		
Mild Underweight	5	2.6	23	10.8		
Normal Weight	127	65.1	170	80.2	49.061	0.000***
Overweight	58	29.7	14	6.6		
Obesity, Grade I	1	0.5	1	0.5		
Obesity, Grade II	3	1.5	1	0.5		
Total	195	100.0	212	100.0		

***Large statistical difference, **Medium statistical difference, *Small statistical difference

From Table 2**,** it can be concluded that 170 (80.2%) female respondents have normal body weight**.** This is slightly higher compared to the research by Švonja Parezanović et al. (2014) from Novi Sad, where 76% had normal body weight. Overweight was observed in 14 (6.6%) female, whereas the research by Švonja Parezanović et al. (2014) noted 8% overweight among their peers in Novi Sad, with only 1% being obese.

During adolescence, physical activity plays a crucial role in the physical, social, and mental development of young people.

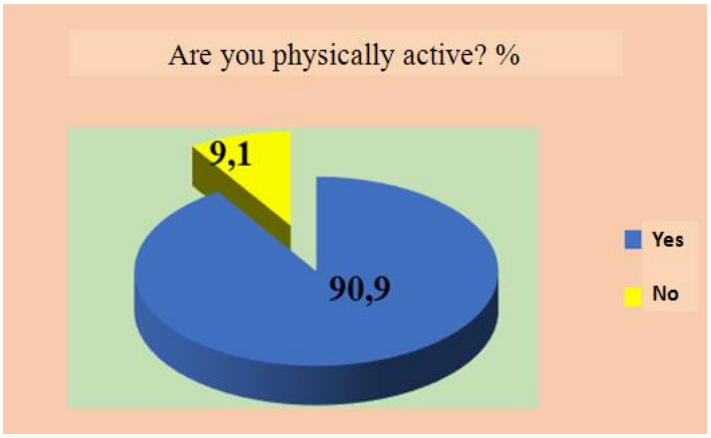

Chart 1. Physical activity of respondents (%)

From Chart 1, we can conclude that out of 408 respondents, 371 (90.9%) stated they are physically active**,** while only 37 (9.1%) are not physically active**.**
In research conducted by Sekulić (2017), 41.4% of students in Serbia engaged in at least one hour of daily physical activity, which is a significantly higher percentage compared to our study. Table 3 presents the frequency of physical activity among the adolescent population.

Table 3. Comparison of physical activity frequency by gender

Frequency of Physical Activity	**Gender**						$\chi 2$	P
	Male		**Female**		**Total**			
	N	%	N	%	N	%		
Daily	50	52.1	46	47.9	96	100.0	9.223	0.026*
3-5 times a week	78	50.0	78	50.0	156	100.0		
1-2 times a week	58	49.2	61	50.8	118	100.0		
Never	9	24.3	28	75.7	37	100.0		
Total	195	47.8	213	52.2	408	100.0		

. ***Large statistical difference, **Medium statistical difference, *Small statistical difference

Based on the statistically processed data, a highly significant statistical difference can be observed concerning gender ($\chi 2$=9.223, df=3, p=0.026). Specifically, male are more active during the week than female**.**
Chart 2 illustrates the type of sports activity adolescents engage in.

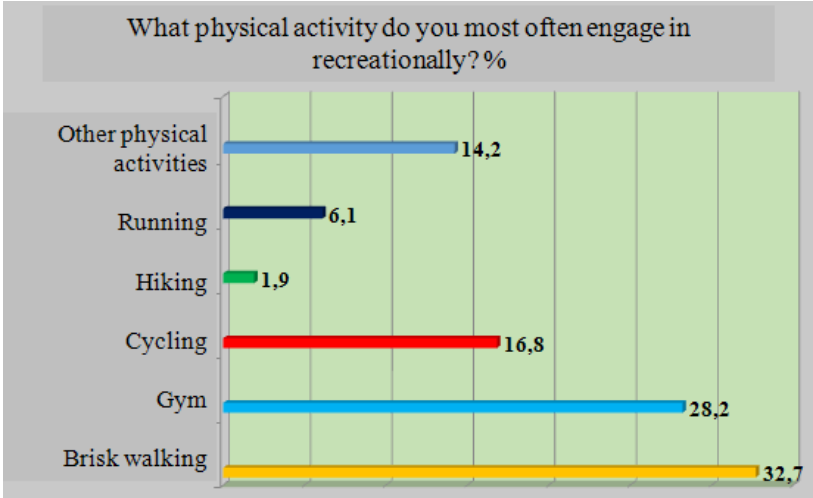

Chart 2. Sports activity practiced by high school students (%)

309 respondents engage in recreational sports. The most common activity is brisk walking, with 101 (32.7%) respondents**.** Following that, 87 (28.2%) respondents go to the gym**,** 52 (16.8%) cycle, and 44 (14.2%) engage in other physical activities**.** Running is practiced by 19 (6.1%)**,** while 6 (1.9%) respondents participate in hiking**.** Slightly more than half of the respondents (53.9%) who recreationally engage in sports have a habit of regular physical activity, while 38.6% exercise occasionally (Graovac, 2014).

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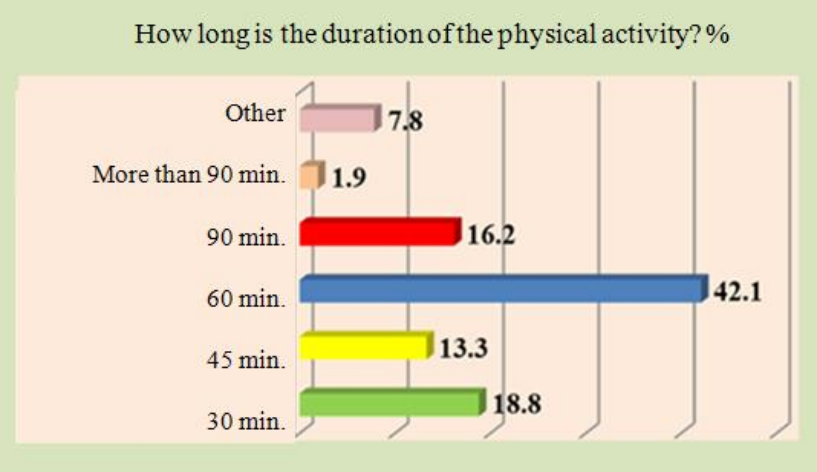

Chart 3. Duration of recreational physical activity (%)

Among the respondents who engage in recreational sports, the majority (130, or 42.1%) reported their physical activity lasts 60 minutes. This is followed by those active for 30 minutes (58, 18.8%), and 50 (16.2%) respondents are active for 90 minutes. 41 (13.3%) respondents engage in physical activity for 45 minutes, while 24 (7.8%) are physically active for other durations. Only 6 (1.9%) respondents are physically active for over 90 minutes (Chart 3). The American College of Sports Medicine and the American Diabetes Association assert that adherence to recommended levels of physical activity can contribute to weight reduction. Nevertheless, when exercise is the sole method employed for weight loss, up to 60 minutes of daily physical activity may be required (Colberg et al., 2020). Furthermore, the U.S. Department of Health and Human Services, in its guidelines for the prevention of weight gain, advocates for a minimum of 30 minutes of moderate-intensity physical activity on at least five days per week (Hankinson et al., 2010). In the 2019 study, among young people aged 7 to 14, there was a noticeable decrease in the percentage of those engaging in physical activity once a week, from 82.3% in 2013 to 71.5% (Studija o Istraživanju zdravlja stanovništva Srbije, 2019). In a study conducted in Croatia, 72% of young people engage in physical activity for more than 10 hours per week (Radman, 2020). Table 4 presents the amount of time high school students spend in a sedentary position in front of various devices.

Table 4. Time high school students spend in front of various devices by gender

Time spent in front of devices	**Gender**						$\chi 2$	P
	Male		**Female**		**Total**			
	N	%	N	%	N	%		
30 minutes	7	38.9	11	61.1	18	100.0	26,511	0,000***
45 minutes	3	25.0	9	75.0	12	100.0		
60 minutes	11	33.3	22	66.7	33	100.0		
90 minutes	22	29.3	53	70.7	75	100.0		
more than 90 minutes	13	33.3	26	66.7	39	100.0		
Other	120	57.4	89	42.6	209	100.0		
Total	176	45.6	210	54.4	386	100.0		

***Large statistical difference, **Medium statistical difference, *Small statistical difference

From Table 4, a highly significant statistical difference regarding gender can be observed ($\chi 2$=26.511, df=5, p=0.000). Girls spend significantly more time in front of devices than boys.

The fact that school-aged children increasingly prefer a sedentary lifestyle is particularly concerning. Every fifth respondent (21.5%) spends 4 hours in front of a device, and another fifth (20.6%) spends 5 hours**.** Other reported durations include 3 hours (15.8%)**,** 2 hours (13.4%)**,** 6 hours (12.9%)**,** 8 hours (7.7%)**,** and 10 hours (5.7%)**.** Only one respondent (0.5%) spends 12 hours in front of devices. In Serbia (2018), almost every third high school student (29.7%) spends more than two hours daily watching television, using mobile phones, computers, or other entertainment devices (Institute for Public Health of Serbia, 2018). According to the study by Puharić et al. (2015), conducted in Zadar, 12.7% of respondents spend less than 1 hour watching television, 24.6% spend 2 hours, 31.9% spend 3 hours, and 30.8% spend more than 3 hours.

4. Conclusions

Based on the obtained results, the following conclusions can be drawn:

- The largest percentage of young people are normally nourished, specifically 73.0%. A higher percentage of girls (80.2%) have a recommended body weight compared to boys (65.1%).
- Although young people report engaging in some form of physical activity, they tend to spend their leisure time in sedentary ways. On average, they spend about six hours in front of the TV and computer. Girls spend significantly more time in front of devices than boys. Overweight and obesity are more prevalent among young people who are physically active for 30 to 45 minutes.

As a general conclusion, it can be emphasized that physical inactivity is not the sole factor but one of the contributing factors responsible for the occurrence of overweight.

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