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DIFFERENCES IN PHYSICAL ACTIVITY OF ADOLESCENTS OF DIFFERENT SEXES BETWEEN 12 AND 15 YEARS OLD ON DIFFERENT DAYS OF WEEK [1] [2]

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Abstract: Achieving the recommended daily level of physical activity (PA) in adolescent boys and girls helps improve their cardiovascular health, maintain a healthy body weight, and promote mental health. The purpose of our study was to determine whether there were statistically significant differences between boys and girls aged 12 to 15 years with respect to age and amount of PA on different days of the week. The sample included 606 7th, 8th, and 9th grade students from four Slovenian elementary schools who participated in the study by completing a questionnaire (IPAQ; International Physical Activity Questionnaire, 2006). We used a quantitative research approach and the method was causal-non-experimental. The Shapiro-Wilk test was used to determine whether the data were normally distributed at a statistically significant level of risk ($p > 0.05$). Because of the non-normal distribution of the variables ($p < 0.001$), the non-parametric Mann-Whitney test was used to determine statistically significant differences between genders, and the Kruskal-Wallis test was used to determine statistically significant differences between age groups. Boys were statistically significantly more active than girls on all days of the week except Wednesday (Mon.: $p=0.018$; Tues.: $p=0.001$; Thurs.: $p=0.020$; Fri.: $p=0.015$, Sat.: $p=0.012$; Sun.: $p=0.001$). Significant differences in PA levels between seventh-, eighth-, and ninth- graders occurred only on Sundays ($p<0.001$), with PA levels changing with student age. The study's findings that adolescent boys are statistically significantly more active than girls raise concerns about gender differences in PA participation during this critical developmental period. Such differences may contribute to long-term health consequences and perpetuate gender inequalities in overall fitness and well-being. The observed differences in PA between boys and girls during adolescence highlight the need for targeted interventions and strategies to promote and improve PA among girls. Addressing the underlying factors that contribute to lower activity levels among girls is essential to promoting a more equitable and inclusive approach to PA promotion.

Keywords: *boys, girls, physical activity, sport*

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INTRODUCTION

Regular physical activity (PA) is of paramount importance for the overall health and well-being of adolescents aged 12 to 15 (Lang et al., 2023). Participation in PA on different days throughout the week provides a variety of benefits, ranging from improved physical and mental health to social benefits and the development of healthy habits (Tapia-Serrano et al., 2023). PA on any day of the week has significant physical health benefits, including maintenance of a healthy weight, improved cardiovascular health, and reduced risk of developing chronic diseases such as diabetes, hypertension, and obesity (Agbaje, 2023; García-Hermoso et al., 2022; Sudikno et al., 2023). PA also has a positive effect on psychological well-being by effectively reducing stress and anxiety (Förster et al., 2023; Smout et al., 2023; Yman et al., 2023). It also enhances cognitive function, improving academic performance (Gallardo et al., 2023; Haverkamp et al., 2021). Regular engagement in PA throughout the week provides adolescents with valuable opportunities to socialize and promotes a sense of belonging and social connection (Schirmer et al., 2023). Regular PA during adolescence helps establish healthy habits that can persist into adulthood and lead to lifelong improvements in health and overall well-being (Cachón-Zagalaz et al., 2023). Playing different sports allows adolescents to improve their physical fitness in different ways (Ługowska et al., 2023). Football improves cardiovascular fitness, endurance, and coordination (Nobari et al., 2023); basketball improves cardiovascular health, strength, endurance, and hand-eye coordination (Soares et al., 2023); tennis improves agility, hand-eye coordination, balance, strength, mental focus, concentration, and strategic thinking (Parpa et al., 2022); swimming is a low-impact sport that promotes cardiovascular health, builds strength and endurance, and improves overall flexibility (Wirth et al., 2022). Because adolescence is a critical period for bone development, PA, especially weight-bearing exercise, plays a critical role in building strong bones and reducing the risk of osteoporosis later in life (Christofaro et al., 2022; Geng et al., 2023). Combating sedentary behaviours such as excessive screen time and prolonged sitting is critical to promote PA and avoid negative health outcomes (Longobucco et al., 2023; Wilhite et al., 2023). Regular PA is associated with improved cognitive function and attention span in adolescents (Gilbert et al., 2023), whereas physical inactivity can lead to difficulties with concentration and decreased cognitive abilities (Pastor et al., 2022). Encouraging adolescents to try different sports that match their interests can facilitate the improvement of their physical fitness while helping them discover passions and develop new skills (Nery et al., 2023). Incorporating PA into their daily lives is critical to promoting their holistic well-being at this crucial stage of their development.

The positive effects of daily PA in adolescents have already been researched (Agbaje, 2023; Cachón-Zagalaz et al., 2023; Fu et al., 2023; Guimarães et al., 2023). However, our interest lies in exploring whether boys and girls of different ages make different decisions regarding the choice and amount of PA. The aim of the study was to determine whether statistically significant differences exist between boys and girls aged 12 to 15 with respect to the age and amount of PA on different days of the week and whether the frequency of activity changes with age.

The purpose of this study holds importance for the field of science and practitioners working with adolescents in this area because it provides valuable insight into gender differences, age-related patterns, and potential decreases in activity frequency among adolescents. The findings can serve as the basis for targeted interventions that promote equality in PA promotion and contribute to the existing knowledge base to ultimately promote healthier behaviours and well-being among young individuals.

METHOD

We used a quantitative research approach and a cause-and-effect, non-experimental method in conducting the research.

Sample of subjects

The study sample was random and included 606 7th, 8th, and 9th grade students from four elementary schools in Slovenia. 33.4% of the students included in the study were in the 7th grade, 32.7% were in the 8th grade, and 33.9% were in the 9th grade.

Sample of variables

The questionnaire that was used, IPAQ (International Physical Activity Questionnaire) (Hagströmer et al., 2006), included 10 questions, of which 2 were closed-ended, 7 were on a 5-point Likart frequency scale, and 1 was open-ended. First, the participants were asked about the amount and choice of PA in the past seven days: PA during free time, during physical education classes (PE), during breaks, in the afternoon and evening, on weekends, and according to the day of the week.

Research protocol

Data collection took place over 10 days in March 2023. The students received the questionnaire from their PE teachers during the PE class, filled it out immediately, and returned it to their teacher.

Data processing methods

The collected data were processed using the program IBM SPSS Statistics 22. First, the basic statistics were calculated and then the Shapiro-Wilk test was used to check whether the data were normally distributed at a statistically significant risk level ($p > 0.05$). Due to the non-normal distribution of the variables ($p < 0.001$), the nonparametric Mann-Whitney test was used to determine statistically significant differences between genders, and the Kruskal-Wallis test was used to determine statistically significant differences between age groups.

Statistical significance between gender and age was set at $p \leq 0.05$.

RESULTS

Table 1 shows the number of girls and boys participating in the study, their age, and the grade they attend.

Table 1. *Data on the number, gender, and age of students included in the study*

Grade	Uzrast (godine)	Boys		Girls		Missing		Total	
		Frequency (N)	Percent (%)	Frequency (N)	Percent (%)	Frequency (N)	Percent (%)	Frequency (N)	Percent (%)
7.	12.4 ± 0.5	101	**50.0**	93	46.0	8	4.0	202	100
8.	13.4 ± 0.5	90	**45.5**	90	**45.5**	18	9.1	198	100
9.	14.3 ± 0.5	105	**51.2**	95	46.3	5	2.4	205	100
Total	13.3 ± 0.9	296	**40.5**	278	38.2	31	5.1	605	100

Table 1 shows that boys (50.0%) outnumbered girls (46.0%) in the study from the 7th grade onward (average age 12.4 ± 0.5 years). In the 8th grade (average age 13.4 ± 0.5 years), the percentage of boys and girls was equal (45.5%), while in the 9th grade (average age 14.3 ± 0.5 years), boys (51.2%) again outnumbered girls (46.3%).

Next, we were interested in whether there were statistically significant differences between gender and age groups in the frequency of PA on different days of the week. We used the nonparametric Mann-Whitney test (gender) or the Kruskal-Wallis test (age). The results are presented in Table 2 and in Table 3.

Table 2. *Statistically significant differences in activity on different days of the week according to the gender of students*

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Gender differences	**Man-Vitni U**	35302.500	32955.000	35770.500	34822.000	34616.000	34768.500	32968.500
	Wilkokson W	73252,500	70905,000	73445,500	71950,000	71472,000	72718,500	70369,500
	Z	-2.358	-3.475	-1.827	-2.335	-2.442	-2.500	-3.251
	Asimp. znač. (2-strana)	**.018**	**.001**	.068	**.020**	**.015**	**.012**	**.001**

Table 2 shows that boys were more active than girls in the last seven days before the survey (highlighted in gray and bold). Girls, on the other hand, were not statistically significantly more active than boys in any case.

Table 2 shows significant differences in activity frequency between boys and girls on most days of the week (Monday: p=0.018; Tuesday: p=0.001; Thursday: p=0.020; Friday: p=0.015; Saturday: p=0.012; Sunday: p=0.001). However, no significant difference was found on Wednesday (p=0.68). On all other days, boys were more active than girls.

Table 3. *Statistically significant differences in activity on different days of the week according to the age of students*

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Age differences	**Kruskal-Wallis**	.659	1.738	4.495	1.562	1.249	5.452	15.760
	Df	2	2	2	2	2	2	2
	Asymp. Sig.	.719	.419	.106	.458	.536	.065	**.000**

We also examined how student activity differs by age on different days of the week (*Table 3*). Statistically significant differences by the students' age appear only on Sunday (p<0.001), with the frequency of their activity changing with age (the seventh graders were the most active, followed by the eighth graders; the ninth graders were the least active).

DISCUSSION

The aim of the study was to determine whether statistically significant differences exist between boys and girls aged 12 to 15 with respect to the age and amount of PA on different days of the week and whether the frequency of activity changes with age. Adolescents aged 12 to 15 years, regardless of their gender and age, should achieve the recommended daily level of PA, as this has numerous positive effects on their overall health, which is also confirmed by Nery et al. (2023), Smout et al. (2023), Sudikno et al. (2023), Tapia-Serrano et al. (2023) and Yman et al. (2023). The results of our study showed that boys are statistically significantly more active than girls on every day of the week except Wednesday, which raises concerns about gender differences in PA participation during this critical developmental period. Such differences may contribute to long-term health consequences and perpetuate gender inequalities in overall fitness and well-being (Barth Vedøy et al., 2021; Biadgilign et al., 2022; Brazo-Sayavera et al., 2021; Li et al., 2022; Ostermeier et al., 2021; Telford et al., 2016; True et al., 2021). Similar findings were also obtained by Mello et al (2023), who divided children and adolescents aged 0 to 19 years into groups based on the results, with boys mostly assigned to groups with high PA, whereas girls were assigned to groups with low PA. However, boys with higher PA also spent statistically significantly more time watching TV and playing video games, while girls spent more time doing housework and other paid activities. For boys, such a result is also a problem, because too much time in front of the screen has a negative impact on the development of important cognitive skills such as attention, memory and critical thinking (Taylor et al., 2023; Wang et al., 2023). The observed differences in PA between boys and girls during adolescence highlight the need for targeted interventions and strategies to promote and improve PA among girls. Addressing the underlying factors that contribute to lower activity levels among girls is essential to promoting a more equitable and inclusive approach to PA promotion. Understanding the factors that influence gender differences in adolescent PA is critical to developing effective interventions. Factors such as social norms, cultural influences, perceptions of body image, and access to sports and recreational facilities need to be explored and addressed in order to create an environment that promotes and supports boys' and girls' equal participation in physical activities. In addition, adolescents aged 12 to 15 who spend more time in front of screens are at a higher risk of engaging in inappropriate behaviours, such as inadequate communication with parents and peers (including bullying) and gambling (Hökby et al., 2023). It is very important for adolescents to find a healthy balance between screen time, PA, social contact with peers, and engaging in various hobbies that interest them. Parents can help them limit television, video games, computers, and phones and encourage the development of healthy habits (Przybylski et al., 2020). The results of our study also showed us that there were no statistically significant differences in the amount of PA between the seventh, eighth, and ninth graders during the week, which was not surpris-

ing because adolescence is a time of rapid growth and development and PA patterns should not differ significantly within the relatively close age groups of seventh, eighth, and ninth graders. These age groups have similar activity patterns and interests, resulting in comparable levels of PA.

A limitation of the study was mainly that the actual daily PA on different days of the week was not measured with accelerometers, because the data were collected only based on the students' answers in a questionnaire. Nevertheless, the study provided insight into higher activity levels in boys than in girls aged 12 to 15 on almost all days of the week.

CONCLUSIONS

The results show that boys are statistically significantly more active than girls, which is an important finding because understanding gender differences in PA patterns during adolescence is critical for developing targeted interventions and promoting healthy behaviours. By examining whether there are significant differences between boys and girls in terms of their age and amount of PA on different days of the week, the study provided insights into inequalities in activity levels and strategies to bridge these gaps. This information is valuable for educators, parents, and policymakers seeking to develop effective programs tailored to the specific needs of boys and girls to promote a more inclusive and equitable approach to PA promotion. On the other hand, examining the potential decline in PA frequency among adolescents as they age is crucial to identifying critical periods when interventions and support are most needed. Adolescence is a transitional period characterized by various physiological, psychological, and social changes that may influence PA patterns. By examining whether activity frequency declines with age, this study provided insight into potential barriers or factors that influence declining activity levels. These findings may aid in the development of targeted interventions and strategies to maintain or increase adolescent PA during this critical developmental period.

Based on the data collected, we can advise that parents and teachers in elementary schools should raise awareness of the importance of an active lifestyle as students get older and implement various interventions to encourage students to engage in active leisure activities while increasing the level and amount of their daily PA.

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