Physical education and sport through the centuries
2024, 11(2), 109-118
ISSN 2335-0598

Original research article

DOI: 10.5937/spes2402109D

TREND IN PHYSICAL ACTIVITY LEVELS AMONG CHILDREN AGED 11 TO 14

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ABSTRACT

The research assessed the level of physical activity (PA) of boys and girls aged 11-14, as well as trends in PA levels. The sample included a total of 433 children aged 11-14, comprising 238 boys and 195 girls. PA was assessed using the FELS questionnaire, which included questions about the frequency of PA in sports, PA during leisure time, PA at home, and overall PA. To determine the trend in PA levels across specific domains and overall, trend analysis was applied, followed by comparisons using the LSD Post Hoc Test. Data were processed using the SPSS statistical package ($p < .05$).

The results showed that boys had significantly higher levels of PA across all periods compared to girls. Significant changes in PA levels among boys were observed in the domain of PA in sports (Sig. = < .001) and overall PA (Sig. = .008). A significant decline in PA in sports among boys was noted between the ages of 11 and 13, as well as between 11 and 14 years, while the decline in overall PA was observed between the ages of 11 and 13. Among girls, a decline in PA in the domain of household chores was identified between the ages of 11 and 14. In the domain of overall PA, significant decreases were observed between the ages of 11 and 13, 11 and 14, 12 and 13, and 12 and 14.

It was found that PA among children aged 11-14 significantly decreases around the ages of 12 and 13. Efforts should focus on promoting PA within this population group and identifying appropriate strategies to increase or at least maintain PA levels during this critical period.

Key words: physical activity, trend, children, benefits

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INTRODUCTION

The health benefits of physical activity for school-aged children are significant. Regular physical activity has been proven to enhance strength, endurance, and other fitness abilities, support the development of healthy and functional muscles and bones, boost self-confidence, promote social interaction, improve academic achievements, and contribute to overall well-being (Bull et al., 2020). It also reduces the risk of developing chronic communicable and non-communicable diseases, such as overweight and diabetes, while positively impacting children's mental health by lowering stress levels and alleviating symptoms of anxiety and depression (Archer, 2014). Data also show that higher levels of physical activity during childhood have a positive impact on health-related quality of life (Wu et al., 2017).

On the other hand, a decrease in physical activity among children and adolescents has negative effects on the cardiovascular and metabolic systems, leading to increased body weight and obesity. This results in a decline in fitness levels, physical efficiency, and the ability to perform daily activities with full engagement (Huang et al., 2019).

Despite the numerous health benefits of physical activity for children and adolescents, this population does not meet the guidelines set by the WHO, namely, children and adolescents are not engaging in at least 60 minutes of moderate to vigorous physical activity daily (Bull et al., 2020).

The first global analysis found that adolescents aged 11-17 do not meet the aforementioned WHO guidelines (WHO, 2019), highlighting a global prevalence of 78.4% among boys and 84.4% among girls (Sallis et al., 2016).

Recent studies have also confirmed that children and adolescents still do not meet the aforementioned guidelines (Guthold et al., 2020). Research has shown that in 2016, more than 80% of school-attending adolescents aged 11–17 did not meet the recommended levels of daily physical activity, which negatively affected their current and future health.

Studies indicate that children in the Czech Republic demonstrate sedentary behavior (Gába et al., 2022). A similar study in Canada found that only 28% of children aged 5-17 regularly participate in physical activity (Ávalos-Ramos et al., 2024).

In most of the mentioned studies, it was proven that girls were less physically active than boys in all analyzed regions.

In addition to the aforementioned differences in physical activity levels between boys and girls, a trend of decreasing frequency of physical activity is observed on one hand, as well as an increase in the number of inactive students on the other (Farooq et al., 2018; Guthold et al., 2020). Farooq et al. have found that the decrease in physical activity levels occurs around the age of 7, with a further decline during adolescence (Kemp et al., 2019). However, a recent systematic review concluded that most changes in physical activity likely happen before adolescence, particularly in relation to changes in unstructured forms of physical exercise (Radulović et al., 2022. A trend of decreasing physical activity among children and adolescents has also been observed in Serbia. A significant decrease in the percentage of children engaging in

sports and recreational physical activities at least once a week has been recorded, from 82.3% to 71.5% (Radulović et al., 2022).

Continuous monitoring of physical activity levels is crucial for the early detection of negative trends, allowing for timely intervention to prevent further negative consequences (Faul et al., 2007).

Therefore, the aim of the study was to determine the trend in physical activity levels among boys and girls aged 11 to 14, to assess whether physical activity levels change during this period, and to identify significant periods in which a decrease in physical activity levels occurs.

METHODS

Study Design and Procedures

The study included completing a physical activity questionnaire by children aged 11 to 14. Prior to participating in the study, parents and/or guardians were asked for consent for their child to participate. After providing consent, the participants were informed about the testing procedure and the method of data collection. All participants were provided with additional explanations and instructions regarding the questionnaires and how to complete them. They were also informed about the study, and its purpose and objectives were explained. Participants entered their responses directly into the questionnaire, and the obtained values were then entered into the computer by the study administrators. There was no time limit for completing the questionnaire. Participation in the study was voluntary, and each participant could withdraw from the study at any time during the survey. To ensure honesty and impartiality in completing the questionnaires, participants were informed that their responses would remain anonymous and that the obtained results would only be used for research purposes. Incomplete questionnaires were not included in further analysis. All activities were conducted in accordance with the Helsinki Declaration and the recommendations for research involving human subjects.

Sample of participants

A total of 433 participants aged 11 to 14 years were included in the study, of which 238 were boys and 195 were girls (**Table 1**). The sample size was determined using the G*power 3.1 (Kang, 2021), so the estimated total sample size for each group was a minimum of 158 participants. The criteria for inclusion in the study and selection of participants for one of the groups were as follows: they were aged 11 to 14 years; prior to the start of the study, the parent and/or guardian had given consent for voluntary participation in the research; they did not have any current health problems or suffer from chronic illnesses; and they had not had any physical injuries in the past 6 months.

The exclusion criteria for the study were as follows: 1) participants with respiratory and cardiovascular diseases; 2) participants undergoing recovery from injuries or illnesses. The inclusion and exclusion criteria were collected using a specifically designed questionnaire.

Sample of measurement instruments

The level of physical activity was determined using a self-assessment physical activity questionnaire - FELS PAQ for children.17 FELS Physical Activity Questionnaire for Children (The Fels PAQ for children is a standardized questionnaire used to assess the level of physical activity among children and adolescents aged 7 to 19 years. Based on the questions, physical activity can be categorized into three areas: 1) physical activity in sports; 2) physical activity during leisure time; and 3) physical activity in household chores, as well as total physical activity (calculated by summing the results of each individual area: sports + leisure time + household chores). The reliability and validity of the questionnaire have been confirmed in various studies (Treuth et al., 2005; Abreu et al., 2015).

Statistical data analysis

For each physical activity variable, the basic descriptive statistics parameters were calculated: Mean and Standard Deviation (Mean±SD). The trend of physical activity levels among groups of boys and girls was determined using trend analysis, and post hoc comparisons were conducted using the LSD Post Hoc test. All data were analyzed using the statistical package SPSS 20.0 (SPSS Inc., Chicago, IL, USA). The significance level was set at 0.05.

RESULTS

The basic descriptive statistical parameters for the participants included in the study are presented in **Table 1**. Boys of all ages have higher numerical values, meaning they are more physically active in the domain of Sports index (5th grade 4,43 vs 3,66; 6th grade 4,37 vs 3,58; 7th grade 3,60 vs 3,55; 8th grade 4,01 vs 3,55) and Total score (5th grade 11,59 vs 11,41; 6th grade 11,53 vs 11,39; 7th grade 11,11 vs 10,80; 8th grade 11,03 vs 10,71) in relation to girls. In the domain of Work (chore) index, girls are more engaged compared to boys (5th grade 4,02 vs 3,39; 6th grade 3,94 vs 3,43; 8th grade 3,56 vs 3,52).

Table 1. *Descriptive statistics*

		11 years	12 years	13 years	14 years	Total
		Mean ± SD				
		(n=59)	(n=63)	(n=53)	(n=63)	(n=238)
Boys	Sports index	4,43 ± ,44	4,37 ± ,46	3,60 ± ,70	3,59 ± ,61	4,01 ± ,68
	Leisure index	3,76 ± ,64	3,73 ± ,53	3,73 ± ,68	3,88 ± 0,63	3,78 ± 0,62
	Work (chore) index	3,39 ± ,63	3,43 ± ,96	3,53 ± ,63	3,52 ± 0,57	3,47 ± 0,72
	Total score	11,59 ± 1,04	11,53 ± 1,02	11,11 ± 1,21	11,03 ± 1,15	11,32 ± 1,13
		Mean ± SD				
		(n=27)	(n=54)	(n=58)	(n=56)	(n=195)

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Girls	Sports index	3,66 ± ,72	3,58 ± ,57	3,55 ± ,64	3,45 ± ,66	3,55 ± ,64
	Leisure index	4,03 ± ,86	3,87 ± ,65	3,72 ± ,66	3,70 ± ,59	3,80 ± ,68
	Work (chore) index	4,02 ± ,74	3,94 ± ,56	3,53 ± ,72	3,56 ± ,51	3,72 ± ,65
	Total score	11,41 ± 1,29	11,39 ± ,94	10,80 ± 1,19	10,71 ± 1,06	11,02 ± 1,14
				Mean ± SD		
		(n=86)	(n=117)	(n=111)	(n=119)	(n=433)
Total	Sports index	4,19 ± ,65	4,01 ± ,65	3,58 ± ,67	3,53 ± ,64	3,80 ± ,70
	Leisure index	3,85 ± ,72	3,79 ± ,59	3,72 ± ,67	3,79 ± ,62	3,79 ± ,64
	Work (chore) index	3,59 ± ,72	3,67 ± ,84	3,54 ± ,68	3,54 ± ,54	3,58 ± ,70
	Total score	11,53 ± 1,12	11,47 ± ,98	10,95 ± 1,21	10,88 ± 1,12	11,19 ± 1,14

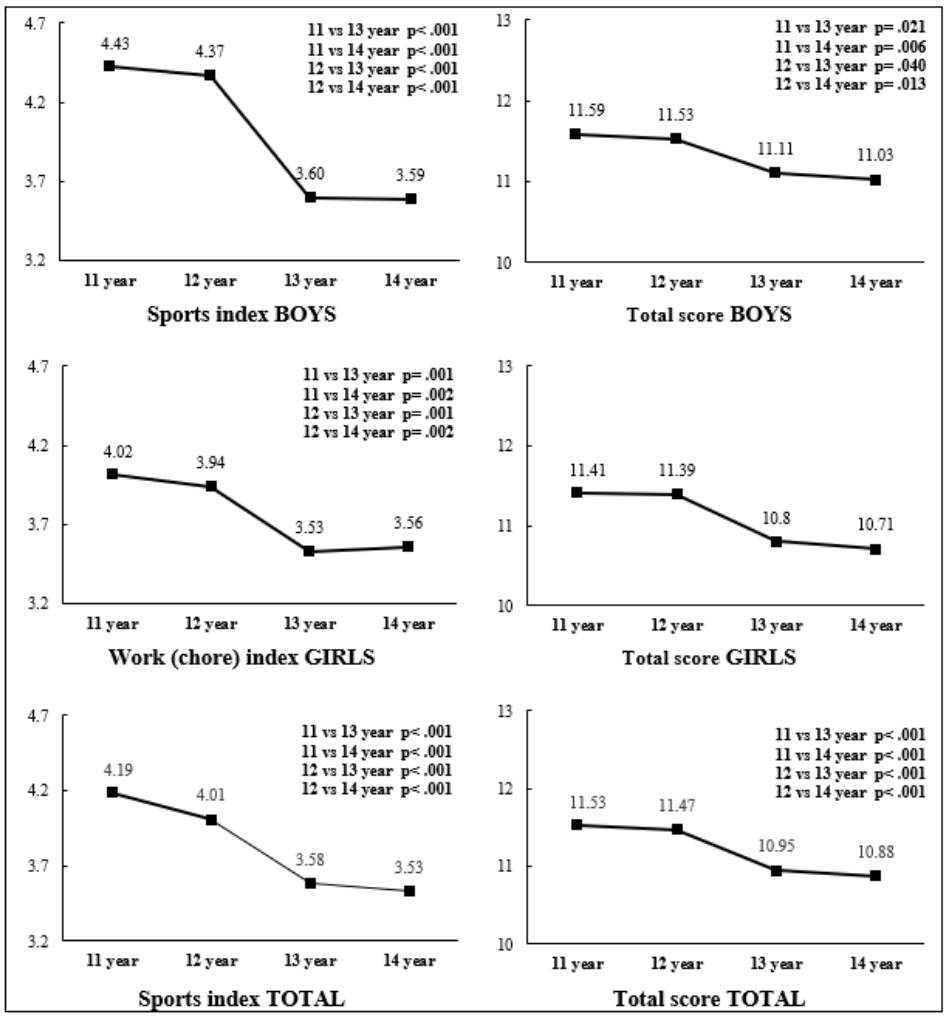
Legend: PA – Physical Activity (vrednosti prikazane kao indeksi FELS PAQ); Mean - Mean value; SD – Standard Deviation;

Determining the trend of physical activity levels in specific domains and whether there are significant differences between groups of boys and girls, as well as in the overall sample, was conducted through trend analysis (**Table 2**). It can be stated that there is a statistically significant change in the trend of physical activity levels in the group of boys in the domains of Sports index and Total score (Sig. = < .001 and Sig. = .008), respectively). The domains in which a significant trend of change was identified among girls are Work (chore) index and Total score (Sig.=< .001 i Sig.= .001, respectively). A significant trend of change was identified in the overall sample for Sports index (Sig. = < .001) and Total score (Sig. = < .001).

Table 2. *Trend Analysis*

		Sum of Squares	df	Mean Square	F	Sig.
BOYS	**Sports index**	38,23	3	12,74	40,45	<. 001**
	Leisure index	,905	3	,302	,789	NS
	Work (chore) index	,860	3	,287	,555	NS
	Total score	14,633	3	4,878	3,996	.008**
GIRLS	**Sports index**	,905	3	,302	,734	NS
	Leisure index	2,603	3	,868	1,927	NS
	Work (chore) index	8,510	3	2,837	7,269	<. 001**
	Total score	19,742	3	6,581	5,392	.001**
TOTAL PA	**Sports index**	32,339	3	10,780	25,367	<. 001**
	Leisure index	,761	3	,254	,610	NS
	Work (chore) index	1,308	3	,436	,888	NS
	Total score	36,932	3	12,311	10,051	<. 001**

Individual trend analysis of physical activity levels among boys and girls, as well as in the overall sample by grade levels and domains, was conducted using the LSD PostHoc Test.



Graph 1. *LSD PosHoc Test*

Graph 1 presents the results of post-hoc comparisons in the groups of boys, girls, and the overall sample. Significant differences in the domain of Sports index among boys, in terms of reduction, were found between ages 11 and 13 (Sig. = < .001), 11 and 14 (Sig. = < .001), as well as between ages 12 and 13 (Sig. = < .001) and 12 and 14 (Sig. = < .001). Differences at the p < .01 level in the domain of Total score among boys were found between ages 11 and 14 (Sig. = .006), while differences at the p < .05 level were found between ages 11 and 13 (Sig. = .021), 12 and 13 (Sig. = .040), and 12 and 14 (Sig. = .013).

In the group of girls (**Graph 1**), significant differences in the domain of Work (chore) index were found between ages 11 and 13 (Sig. = .001), 11 and 14 (Sig. = .002), 12 and 13 (Sig. = .001), and 12 and 14 (Sig. = .002). In the domain of Total score, significant

differences in terms of reduction were observed between ages 11 and 13 (Sig. = .018), 11 and 14 (Sig. = .007), 12 and 13 (Sig. = .005), and 12 and 14 (Sig. = .002).

Differences in the domain of Sports index are found between ages 11 and 13, 11 and 14, 12 and 13, and 12 and 14 (all Sig. = < .001), when considering the entire sample included in the study (**Graph 1**). Similarly, in the domain of Total score for the entire sample, significant differences exist between ages 11 and 13, 11 and 14, 12 and 13, and 12 and 14 (all Sig. = < .001)

DISCUSSION

The aim of the study was to determine the trend of physical activity levels in boys and girls aged 11 to 14, to assess whether physical activity levels change during this period, and to identify significant periods when a reduction in physical activity occurs.

It was first determined that boys are more physically active than girls in the domains of Sports index and Total score. This result aligns with findings from previous studies that suggest boys generally achieve higher levels of physical activity, especially in structured activities such as sports (Bucksch et al., 2016; Telford et al., 2016; Guthold et al., 2020). Previous research identifies a combination of biological, psychological, social, and cultural factors as reasons for these differences. Biological differences in strength and physical endurance, along with psychological differences in interest in competition and physical challenges, favor higher physical activity levels in boys. Additionally, social norms that encourage boys to engage in sports, while girls are often suggested to participate in less physically demanding activities, further deepen these differences (Biddle et al., 2011; Ávalos-Ramos et al., 2024).

Our study provided significant insights into changes in physical activity levels across different domains, taking into account differences between boys, girls, and the overall sample. Through trend analysis and comparisons of physical activity across different age groups, several key findings were revealed, indicating how physical activity declines over time and how it differs between genders. Physical activity declined year by year, with the most pronounced period being between ages 12 and 13. These data align with more recent studies (Guthold et al., 2020; Ávalos-Ramos et al., 2024).

Secondly, it was found that there is a significant change in the level of physical activity in boys in the domains of Sport index and Total score. These changes are statistically significant and indicate a decrease in physical activity levels in these domains over time, particularly in the age groups between 11 and 13, as well as between 12 and 14. A similar result was found in the study by Steene-Johannessenet al. (2021). One possible reason for these changes in physical activity levels could be the increased time spent at school and less free time, as well as the increased time spent in front of screens (computers, mobile phones, televisions). Previous research confirms this connection (Martín & Mayo, 2019; Simon et al., 2019). For example, the study Bucksch et al., (2016) shows that between the ages of 11 and 13, particularly among boys, there is a significant increase in time spent in front of

screens engaging in sedentary activities, which can negatively impact physical activity levels.[20] Similar trends were observed among girls, although significant changes for them were related to Work (chore) index and Total score. Among girls, a significant decline in physical activity was recorded across all analyzed ages, with particularly pronounced reductions between ages 11 and 14 and ages 12 and 14. The decline in physical activity levels among girls during this period (ages 11–14) may result from several factors. First, physiological changes during this age, such as pubertal changes in body composition and shifts in self-confidence, can influence interest in physical activity. Research suggests that during adolescence, girls increasingly withdraw from traditional forms of physical activity, such as sports, due to a heightened focus on social norms and expectations related to appearance and behavior (Katzmarzyk et al., 2015). Additionally, factors such as a lack of time, reduced interest in sports activities, and a preference for sedentary activities, such as using social media, along with cultural and social norms and interests, can further contribute to the decline in physical activity levels among girls, which becomes particularly evident during adolescence (Janssen & LeBlanc, 2010).

When analyzing differences between boys and girls, the results show that boys experienced a more significant decline in physical activity in the domains of sports and total physical activity (where they are more active than girls, but the decline is more pronounced). For girls, however, household physical activity (Work (chore) index) remains more relevant, although a decreasing trend is also observed in this domain. These results support previous findings indicating that girls often engage in less intensive physical activities that are not always included in standard measures of physical activity, such as sports (Vella et al., 2014).

Given the significant changes in physical activity levels in the domains of sports and total physical activity, our research highlights the need for strategies that could encourage children aged 11 to 14 to engage in physical activities

CONCLUSION

The study provides insights into differences in physical activity between boys and girls, as well as changes in physical activity levels at this age in specific domains. The results showed that boys are more physically active in the domain of Sport index and in total PA, while girls had higher levels of engagement in the domain of household chores. These differences may be associated with cultural, social, and gender norms that shape the behaviors of children and adolescents regarding physical activity.

The trend in physical activity indicates a decline in activity levels for both genders between the ages of 11 and 14 (with the most pronounced drop occurring between ages 12 and 13), a period marked by significant changes in lifestyle, interests, and social circumstances. Boys exhibit a decline in sport-related PA and total PA, while girls experience reductions in household chores and total PA. These trends highlight the need to promote physical activity for this population group.

It is important to implement programs that encourage sustained levels of physical activity among children, especially before and during adolescence, when interest in physical activities tends to decline. The development of educational initiatives that integrate sports activities as an integral part of the school curriculum is recommended, along with the promotion of alternative, enjoyable, and inclusive sports and recreational activities that can attract both boys and girls. Additionally, future research should delve deeper into the causes of these changes in physical activity, including the impact of social media, educational systems, and family values on children's engagement in physical activities.

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Received on 06.12.2024.
Accepted on 15.12.2024.