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Associations between adolescents' preference for fitness activities and achieving the recommended weekly level of physical activity

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ABSTRACT

Background/Objective: This study aimed to explore differences in rates of achieving the weekly physical activity (PA) recommendation between adolescents who preferred fitness PA and those who did not. Furthermore, we investigated the types of PA practiced by adolescents.

Methods: In total, 9513 participants from the Czech Republic and Poland, aged 15–18 years took part in the study between 2009 and 2016. Out of this source sample, 4977 self-reported their weekly PA using the IPAQ-Long Form, and 1348 objectively monitored their weekly PA using pedometers and recorded the type of PA.

Results: Boys ranked fitness PA third, after team and individual sports. For girls, the preference for fitness PA grew at the expense of dance and outdoor PA. Among Czech and Polish boys as well as Czech girls, those who preferred fitness PA were more likely to achieve the recommended weekly PA level than those who did not prefer fitness PA. We did not find a significant difference in other types of PA and rates of achieving the recommendation of 11,000 steps/day. Preference for fitness PA was associated with an increased likelihood (OR = 1.30; 95% CI = 1.12–1.52; $p < 0.001$) of achieving the recommendation for PA.

Conclusions: When promoting adolescents' PA, it is necessary to consider preferred PA types. The PA recommendation was met by almost 33% of adolescents who indicated a preference for fitness PA, but only by 22% of those not preferring fitness activities. Organized PA is also important for meeting PA recommendations.

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Introduction

Epidemiological studies have found that the levels of physical activity (PA) and cardiorespiratory fitness are associated with health status as well as mortality rates.¹ These associations are supported by multiple experimental studies as well as controlled interventions.² It has been estimated that 9.5% of all 57 million deaths in the world a decade ago could be attributed to physical inactivity, which equals more than 5 million deaths worldwide.³ Importantly, global recommendations for PA do not take into account individuals' preferences regarding sports and PA, thus failing to identify the unique potential of specific types of activities. This is an important aspect highlighted in several key messages used to promote PA in national and global recommendations.^{4–6} National

and global PA recommendations for children and adolescents recommend 60 min of moderate-to-vigorous intensity aerobic activity per day, plus three additional bouts of resistance exercise.^{7–12}

Most of the research on adolescents' PA levels has concentrated on volume,^{13–16} intensity,^{17–20} duration and frequency,^{21–24} with much less on preferences and engagement in specific types of PA. This can be mainly explained by the large variability and instability of such preferences, potentially affected by factors such as age, health status, education, demographics, socio-economics, media, sport promotion, etc.

The association between school environment and PA has been extensively studied, particularly in terms of cognitive functioning and academic performance in relation to PA.^{25–27} However, these studies are few and do not consider specific PA/sports or context of PA. The identification of preferences for, and trends in, fitness PA might improve the success of PA promotion efforts.

Thus, it is important to investigate differences between fitness PA preferences and actual opportunities for performing such

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activities. To date, associations between fitness PA preferences, achievement of recommended levels of PA, and the performance of different types of PA have been insufficiently explored.^{28–30} We considered these associations to be important factors related to physically active and healthy lifestyles. The aim of this study therefore, was to explore differences in rates of achieving the weekly PA recommendation among adolescents according to their level of preference for fitness PA. Furthermore, we assessed the types of PA performed by adolescents according to gender.

Methods

Participants and settings

In the 2009–16 period, 9513 participants aged 15–18 years (boys: $n = 3,978$, age = 16.7 ± 1.4 years, mass = 69.1 ± 11.7 kg, height = 178.0 ± 8.0 cm, BMI = 21.8 ± 3.0 kg/m²; girls: $n = 5,535$, age = 16.9 ± 1.4 years, mass = 58.2 ± 8.8 kg, height = 167.1 ± 6.3 cm, BMI = 20.8 ± 2.7 kg/m²) from 187 schools (104 Czech and 83 Polish) took part in web-based research on PA preferences (Fig. 1). All participants registered in the International Database for Research and Educational Support (Indares – www.indares.com) and completed a questionnaire on PA preferences. Indares.com is a complex online system that supports PA education and research and aims to increase end-user knowledge by focusing on recording, analyzing, and comparing PA data.

A sub-sample comprising 127 schools (73 Czech and 54 Polish) and 4977 youth (boys: $n = 1,959$, age = 16.8 ± 1.3 years, mass = 69.5 ± 11.8 kg, height = 178.5 ± 7.6 cm, BMI = 21.8 ± 3.1 kg/m²; girls: $n = 3,018$, age = 16.9 ± 1.3 years, mass = 58.6 ± 8.9 kg, height = 167.2 ± 6.4 cm, BMI = 20.9 ± 2.7 kg/m²) completed a self-report questionnaire assessing weekly PA (cluster sampling).

Objective PA monitoring was performed in 55 schools (34 Czech and 21 Polish) and 1348 participants (boys: $n = 501$, age = 16.5 ± 1.1 years, mass = 69.1 ± 11.8 kg, height = 179.0 ± 7.6 cm, BMI = 21.8 ± 3.3 kg/m²; girls: $n = 847$, age = 16.5 ± 1.1 years, mass = 58.8 ± 9.0 kg, height = 167.0 ± 6.3 cm, BMI = 21.1 ± 2.8 kg/m²).

The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Ethics Committee of Faculty of Physical Culture at Palacký University Olomouc (No. MSM6198959221 and No. 37/2013).

Measurements

Preference for fitness PA

Preference for fitness PA was assessed using the Questionnaire on Physical Activity Preferences (QPAP), which was standardised with Czech and Polish samples.^{31–33} Preferences were assessed for eight categories of PA: individual PA, team PA, fitness PA, water-based PA, outdoor PA, martial arts PA, rhythmic/dance PA, and overall PA. In the present study, we analysed preference for fitness PA, which included strictly defined and closely related activities: running (jogging), bodybuilding, Nordic walking, body-styling, health exercises, muscle power exercises, spinning (=stationary cycling), sports aerobics, tae-bo/boxaerobics, tai-chi, and yoga.

From the eight PA categories, the participants selected their “top five” preferred PA types. Preferences for PA types were scored and ranked. Participants could select none to five choices. The unselected PA types received a score corresponding to the average of remaining rankings. The final ranking of preference for fitness PA was determined by summing the ranks. Additional questionnaire items included the time (hours) spent in organized PA activities throughout the previous year. Furthermore, it was possible to have an overview of PA mostly done in summer and winter seasons. The most frequently performed physical activities by boys and girls were analysed separately, with temporal trends in preferences for fitness PA in Czech and Polish adolescents determined in 2-year periods: 2009–10 (boys: $n = 1256$; girls: $n = 1791$), 2011–12 (boys: $n = 954$; girls: $n = 1389$), 2013–14 (boys: $n = 802$; girls: $n = 1227$), and 2015–16 (boys: $n = 966$; girls: $n = 1128$). The sample was split into three categories according to preference for fitness PA: high = fitness PA ranked first or second ($n = 2403$), moderate = fitness PA ranked third or fourth ($n = 1429$), and low = fitness PA ranked fifth or lower ($n = 1145$).

Subjective estimate of weekly PA

To assess self-reported weekly PA, we used on-line Czech and Polish versions of the International Physical Activity Questionnaire—Long Form (IPAQ-LF)³⁴ in the Indares system. The questionnaire was translated in-line with the EORTC (European Organisation for Research and Treatment of Cancer) Quality of Life Group³⁵ and further empirically validated in several studies with Czech and Polish samples.^{32,36,37} The questionnaire assesses PA in the previous 7 days in the following domains: (a) job/school-related PA; (b) transportation PA; (c) housework, house

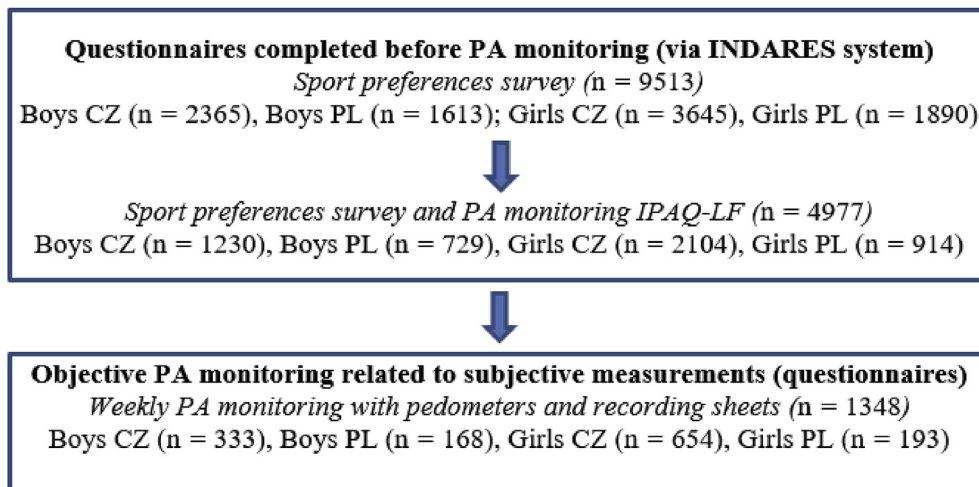


Fig. 1. Design of research on physical activity preferences with Czech (CZ) and Polish (PL) boys and girls.

maintenance, and caring for family; (d) recreation, sport; and (e) leisure-time PA. Moreover, the respondents also estimated the intensity of their PA (vigorous, moderate, or walking) and time spent sitting. To maintain the information on the composition of weekly PA and to eliminate overestimating the time spent in vigorous PA (VPA) and underestimating the time spent sitting,³⁸ we multiplied the time (minutes) spent in VPA by 6 instead of 8 in order to get MET-minutes (metabolic equivalent). The estimate of weekly PA minutes was divided by 7 to obtain the average daily PA time (minutes). The highest possible daily sum of PA time was set at 600 and the highest possible sum of MET-minutes per week was set at 20,000. In total, 221 participants were excluded for not meeting these conditions and 23 participants for not providing any PA data.

Due to the difficulty in distinguishing PA time on specific days of the week from the estimate of weekly PA using the IPAQ-LF questionnaire, we selected a minimum level of weekly PA modified according to Healthy People 2020,⁷ 2008 Physical Activity Guidelines for Americans,⁸ and EU Physical Activity Guidelines.³⁹ This minimum weekly PA recommendation is 60 min on 5 days per week of any type of PA except VPA, and 20 min on 3 days per week for VPA (i.e., 5×60 min of moderate-to-vigorous physical activity [MVPA] + 3×20 min of VPA).

Objective PA monitoring using pedometers

For the objective monitoring of weekly PA, we used the Yamax Digiwalker SW-700 pedometer (Yamax Corporation, Tokyo, Japan). Despite numerous emerging options for PA monitoring, pedometers are suitable for measuring weekly habitual PA expressed as step counts.^{40–42} The values of pedometer-derived data were adjusted in line with published recommendations.⁴³ Data for any single day indicating <1000 steps were removed, and values > 30,000 steps on any single day were truncated to 30,000 steps. The participants with valid data for at least 3 school days and at least 1 weekend day were included in the final sample. Missing days were replaced by values of the closest school or weekend day. Overall, we excluded 111 participants and imputed 147 values of daily step counts. The daily PA recommendation was modified according to Tudor-Locke et al.⁴⁴ and set at 11,000 steps/day for both boys and girls. The eventual effect of reactivity to weekly PA monitoring⁴⁵ was eliminated according to the school timetable by elimination of the first day of monitoring. The participants wore the pedometers for 7 days from the morning (after personal hygiene) throughout day (except for swimming or bathing) until their evening hygiene before going to sleep.

Data analysis

The data were analysed using Statistica version 13 (StatSoft,

Prague, Czech Republic) and SPSS version 22 (IBM Corp., Armonk, NY) programs. We used descriptive characteristics, cross-tabulations, Kruskal-Wallis test, ANOVA, and binary logistic regression analysis. Practical significance was assessed using the effect size coefficients w and η^2 .^{2,46,47}

Results

Preference for fitness PA

Boys in both surveyed countries (throughout the complete study period) most preferred team PA (typical team sports) followed by individual PA (individual sports) and then fitness PA (Table 1). Similarly, girls most preferred team and individual sport activities. However, Czech girls preferred dance PA and outdoor PA to fitness activities, while Polish girls preferred dance PA, outdoor PA, and water-based activities ahead of fitness activities.

Trends in preferences for fitness PA

Over the 8-years monitoring period, boys consistently ranked fitness PA third, after team and individual PA, with preference for all activities consistent over time (Fig. 2). For girls, the preference for fitness PA increased over time from sixth to third position, seemingly at the expense of dance PA (Fig. 2). Dance PA for boys and martial arts for girls were consistently the least preferred type of PA across the study period.

Types of PA performed in relation to preference for fitness PA

Football was boys' favorite organized sport irrespective of the degree of preference (high/moderate/low) for fitness PA (Table 2). 29% of Czech and 30% of Polish boys involved in organized PA participated in football. The most pronounced differences according to preference for fitness PA were shown for bodybuilding, with participation rates decreasing as the preference for fitness PA decreased (Czech boys: high 15.5%, moderate 3.4%, low 2.0%; Polish boys: high 15.0%, moderate 2.3%, low 2.0%).

Similarly for girls, the most pronounced differences according to preference for fitness PA were shown for bodybuilding (Table 3), with participation rates decreasing with decreasing preference for fitness PA (Czech girls: high 12.8%, moderate 3.7%, low 1.6%; Polish girls: high 6.8%, moderate 2.8%, and low 0.9%). Overall, Czech girls were most frequently involved in organized dance PA (18%) and Polish girls in volleyball (21%), with 12% of Polish girls involved in dance PA.

Table 1
Czech and Polish adolescents' preferences for fitness physical activity.

Physical activity	Boys CZ (n = 2365)		Boys PL (n = 1623)		Girls CZ (n = 3645)		Girls PL (n = 1890)	
	Ranking	Average points (based on ranking)	Ranking	Average points (based on ranking)	Ranking	Average points (based on ranking)	Ranking	Average points (based on ranking)
Teams sports	1	2.5	1	2.6	1	3.3	1	3.1
Individual sports	2	2.9	2	2.9	2	3.3	2	3.1
Fitness activities	3	3.9	3	4.1	5	4.2	6	4.4
Outdoor activities	4	4.2	4	4.4	3	3.9	4	4.1
Martial arts	5	4.6	5	4.5	7	5.5	7	5.4
Water activities	6	5.0	6	4.8	6	4.6	5	4.3
Dancing	7	5.6	7	5.5	4	3.9	3	4.0

CZ = Czech Republic, PL = Poland.

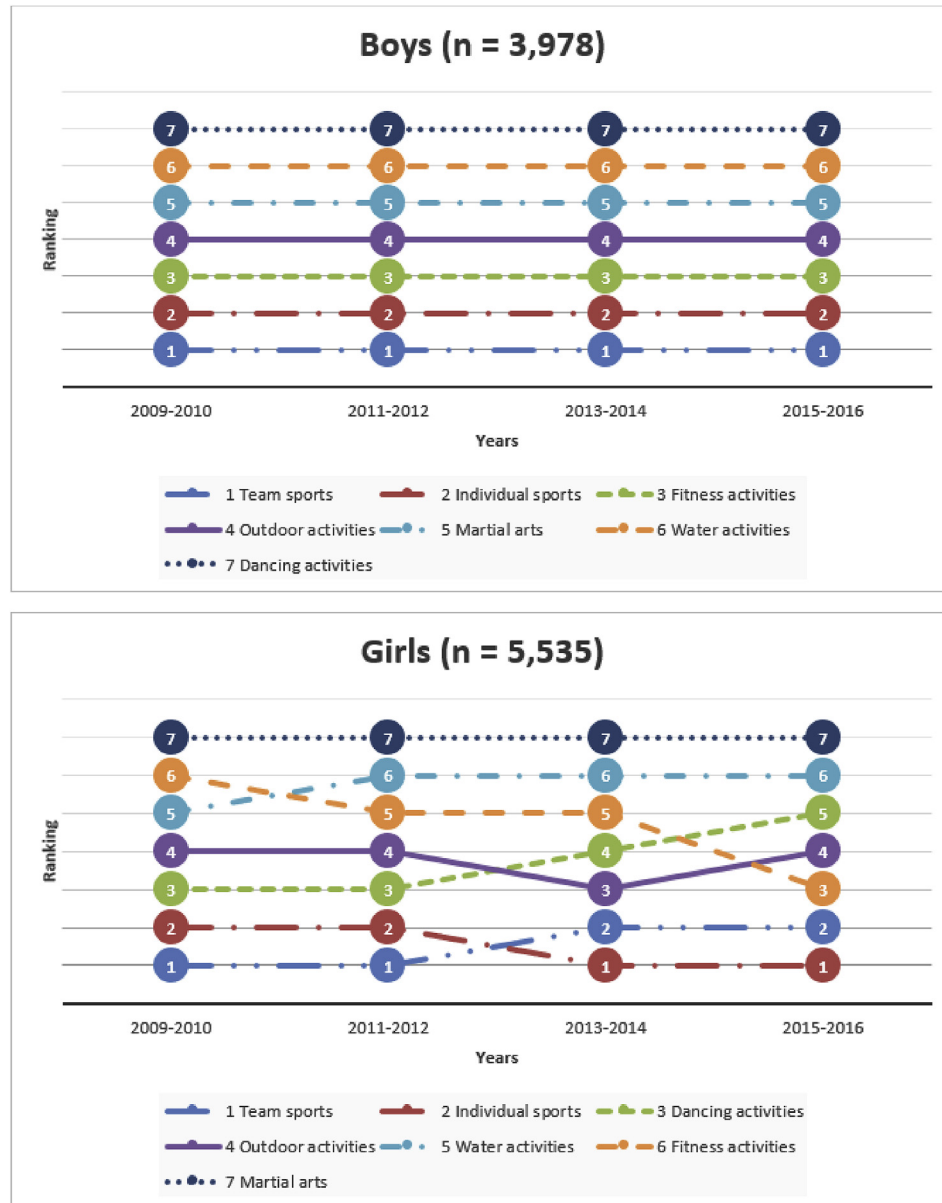


Fig. 2. Preference of fitness PA between 2009 and 2016.

Achievement of PA recommendations among adolescents preferring fitness PA

Both Czech boys ($\chi^2 = 27.0$; $p < 0.001$; $w = 0.18$) and Polish boys ($\chi^2 = 16.7$; $p < 0.001$; $w = 0.18$) with a higher preference for fitness PA achieved the weekly PA recommendation (3×20 min of VPA and 5×60 min of PA) at significantly higher rates than did boys with lower preference of fitness PA. Similar significant differences were observed for Czech girls ($\chi^2 = 12.7$; $p < 0.001$; $w = 0.09$) but not for Polish girls ($\chi^2 = 2.5$; $p = 0.12$; $w = 0.06$) (Fig. 3).

Apart from the preference for fitness PA, the following factors were significantly associated with meeting the PA recommendation (3×20 min VPA and 5×60 min PA): gender, country, size of the residence, ownership of a cottage, and in particular, participation in organized PA. The PA recommendation was met by 29.6% of participants in organized PA but only 14.9% of non-participants (Table 4).

Preference for fitness PA (moderate preference) was associated

with an increased likelihood (odds ratio [OR] = 1.30; 95% confidence interval [CI] = 1.12–1.52; $p < 0.001$) of achieving the recommendation for PA (Table 5). The variables included in Models 2 and 3 that were associated with higher odds for achieving the PA recommendation (gender, country, size of the place of residence, and participation in organized PA) did not decrease the predictive significance of fitness PA preferences.

There were no significant differences in weekly PA measured by pedometers between days of the week and fitness activities preference (days \times preference) ($F(12, 8052) = 1.41$; $p = 0.16$; $\eta_p^2 = 0.002$). Boys with low preference for fitness PA reported an average of 11,223 steps/day (girls 11,021 steps/day), boys with moderate preference 11,222 steps/day (girls 11,172 steps/day), and boys with high preference for fitness PA 11,273 steps/day (girls 11,175 steps/day). While the differences were not statistically significant, our data show that 50% of adolescents did not meet the essential recommendation for daily step count.

Table 2
Most frequently performed physical activity in boys.

Type of PA	Preference for fitness PA in Czech boys			Preference for fitness PA in Polish boys		
	High (rank/n/%)	Middle (rank/n/%)<	Low (rank/n/%)	High (rank/n/%)	Middle (rank/n/%)	Low (rank/n/%)
Football	1/89/22.0	1/192/34.5	1/215/28.7	1/66/28.2	1/131/33.2	1/171/29.3
Bodybuilding	2/60/15.5	7/19/3.4	11/15/2.0	2/37/15.0	7/9/2.3	8/14/2.4
Running	3/45/11.6	3/42/7.7	3/65/8.7	3/23/9.8	4/20/5.1	6/24/3.8
Floorball	4/28/7.2	2/47/8.4	2/92/12.3	15/1/0.4	11/2/0.6	11/3/0.51
Volleyball	5/14/3.6	4/26/4.7	6-7/22/2.9	4/17/7.3	2/43/10.9	2/67/11.5
Tennis	6/12/3.1	9/14/2.5	10/18/2.4	12/2/0.9	9/8/2.0	12/9/1.5
Ice hockey	7/12/3.1	6/19/3.4	8/21/2.8	15/1/0.4	12/1/0.3	10/1/0.2
Swimming	8/11/2.8	5/23/4.1	5/34/4.5	6/13/5.1	4/20/5.1	3/33/5.8
Cycling	9/10/2.6	10/12/2.1	6-7/22/2.9	8/7/3.0	7/9/2.3	5/23/3.9
Basketball	10/9/2.3	8/16/2.9	4/41/5.5	7/8/3.4	3/28/7.1	4/27/4.6
Artistic gymnastics	13/7/1.8	18/4/0.7	–/–/–	5/13/5.6	6/11/2.8	7/21/3.6
Table tennis	21/2/0.5	13/10/1.8	9/19/2.5	8/7/3.0	9/8/2.0	9/13/2.2

Bold text refers to favorite organized physical activities.

Table 3
Most frequently performed physical activity in girls.

Type of PA	Preference for fitness PA in Czech girls			Preference for fitness PA in Polish girls		
	High (rank/n/%)	Middle (rank/n/%)	Low (rank/n/%)	High (rank/n/%)	Middle (rank/n/%)	Low (rank/n/%)
Dance	1/75/13.1	1/118/18.3	1/217//20.6	2/22/9.9	2/38/13.5	2/93/11.4
Volleyball	4/62/10.9	2/90/13.9	2/158/15.0	1/30/13.5	1/61/21.6	1/183/22.6
Running (track and field)	3/67/11.7	3/59/9.1	3/123/11.7	2/22/9.9	3/26/9.2	6/36/4.4
Bodybuilding	2/73/12.8	8-9/24/3.7	15/17/1.6	5/15/6.8	10/8/2.8	13/7/0.9
Aerobic	5/50/8.8	4/48/7.4	4/56/5.3	6/14/6.3	5/15/5.3	10/21/2.6
Swimming	6/25/4.4	5/41/6.3	6/47/4.5	13/5/2.3	6/14/5.0	4/77/9.5
Floorball	8/20/3.5	12/19/2.9	8/36/3.4	16/1/0.5	13/2/0.7	15/2/0.2
Cycling	7/24/4.2	10/22/3.4	11/25/2.0	14/4/1.8	14/3/1.1	11/18/2.2
Basketball	9/17/3.0	7/25/3.9	7/43/4.1	6/14/6.3	4/20/7.1	3/81/10.0
Handball	9/17/3.0	8-9/24/3.7	9/30/2.8	9/7/3.2	8/11/3.9	8/22/2.7
Horse riding	17/5/0.9	6/26/4.0	5/50/4.7	16/1/0.5	9/9/3.2	7/28/3.5
Tennis	12/15/2.6	11/21/3.3	10/26/2.5	12/6/2.7	11/7/2.5	12/13/1.6
Artistic gymnastics	16/6/1.1	13/9/1.4	16/16/1.5	4/21/9.5	7/13/4.6	5/50/6.2
Badminton	21/4/0.7	14/8/1.2	17/14/1.3	8/12/5.4	12/5/1.8	8/22/2.7
Health exercise	14/11/1.9	15/7/1.1	28/5/0.5	9/7/3-2	13/4/1.4	13/7/0.9

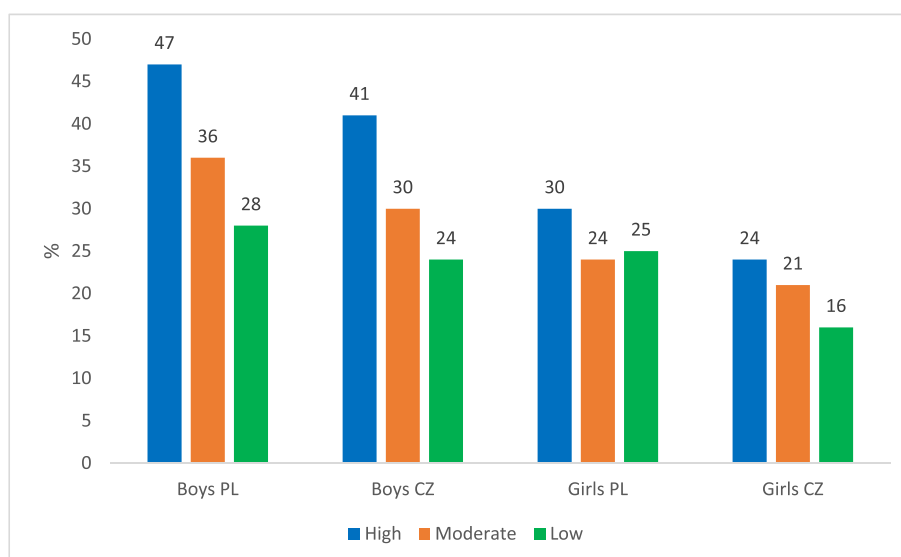


Fig. 3. Achievement of physical activity recommendation (3 × 20 min of vigorous physical activity and 5 × 60 min of physical activity) among Czech (CZ; n = 829) and Polish (PL; n = 504) boys, and Czech (n = 1505) and Polish (n = 710) girls according to preference for fitness physical activities (high/moderate/low).

Discussion

The key findings of the present study was that the preference for fitness PA in boys was highly stable over the 8-year study period,

with fitness PA third ranked after team and individual PA. For girls, an increasing trend was observed in the preference for fitness PA. These results of overall PA preference correspond with previously published studies.^{31,32,48,49}

Table 4
Achievement of the recommendation of 3 × 20 min of vigorous physical activity and 5 × 60 min of physical activity in adolescents (n = 4977).

Variables	Achieving PA recommendation			χ^2	P-value	w
	Total n (%)	No n (%)	Yes n (%)			
Preference for fitness PA						
Low	1145 (23.0)	1886 (78.5)	517 (21.5)	53.8	0.001	0.10*
Middle	1429 (28.7)	1053 (73.7)	376 (26.3)			
High	2403 (48.3)	768 (67.1)	377 (32.9)			
Gender				70.5	<0.001	0.12*
Boys	1959 (39.4)	1333 (68.0)	626 (32.0)			
Girls	3018 (60.6)	2374 (78.7)	644 (21.3)			
Age				3.1	0.21	0.03
15	1246 (25.0)	920 (73.2)	334 (26.8)			
16	1795 (36.1)	1362 (75.9)	433 (24.1)			
17	1936 (38.9)	1433 (74.0)	503 (26.0)			
BMI				0.47	0.49	0.009
<25	4502 (90.5)	3347 (74.3)	1155 (25.7)			
≥25	475 (9.5)	360 (75.8)	115 (24.2)			
Country				20.7	<0.001	0.06
Czech Republic	3334 (67.0)	2549 (76.4)	785 (23.6)			
Poland	1643 (33.0)	1158 (70.5)	485 (29.5)			
City (inhabitants)				31.2	<0.001	0.08
<1000	1118 (22.5)	873 (78.1)	245 (21.9)			
1000–29,999	1699 (34.1)	1307 (76.9)	392 (23.1)			
30,000–100,000	807 (16.2)	584 (72.4)	223 (27.6)			
>100,000	1353 (27.2)	943 (69.7)	410 (30.3)			
Home				0.98	0.32	0.01
Flat	2155 (43.3)	1590 (73.8)	565 (26.2)			
House	2822 (56.7)	2117 (75.0)	705 (25.0)			
Ownership of a dog				0.68	0.41	0.01
No	2499 (50.2)	1874 (75.0)	625 (25.0)			
Yes	2478 (49.8)	1833 (74.0)	645 (26.0)			
Ownership of a car				0.99	0.32	0.01
No	2022 (40.6)	1491 (73.7)	531 (26.3)			
Yes	2955 (59.4)	2216 (75.0)	739 (25.0)			
Ownership of a cottage				4.0	0.05	0.03
No	3454 (69.4)	2601 (75.3)	853 (24.7)			
Yes	1523 (30.6)	1106 (72.6)	417 (27.4)			
Participation in organized PA				112.0	<0.001	0.15*
No	1378 (27.7)	1172 (85.1)	206 (14.9)			
Yes	3599 (72.3)	2535 (70.4)	1064 (29.6)			

χ^2 = Pearson's chi-square; p = statistical significance; w = Cohen's effect size index; *p < 0.05; PA = physical activity.

Table 5
Odds ratio for meeting the weekly physical activity recommendation according to preference for fitness physical activity (high/middle/low) (N = 4977).

Variables	Model 1		Model 2		Model 3	
	OR (95% CI)	P-value	OR (95% CI)	P-value	OR (95% CI)	P-value
Preference for fitness PA (reference category: Low)						
Middle	1.30 (1.12–1.52)	0.001	1.25 (1.07–1.46)	0.005	1.22 (1.05–1.43)	0.01
High	1.79 (1.53–2.1)	<0.001	1.75 (1.50–2.05)	<0.001	1.77 (1.51–2.08)	<0.001
Gender (reference category: Female)			1.71 (1.50–1.95)	<0.001	1.64 (1.43–1.87)	<0.001
Male						
BMI (reference category: <25)			0.88 (0.71–1.10)	0.27	0.94 (0.75–1.18)	0.60
≥25						
Age (reference category: Age 15)			0.87 (0.74–1.03)	0.12	0.88 (0.75–1.05)	0.17
Age 16						
Age 17			0.96 (0.81–1.13)	0.59	1.07 (0.90–1.27)	0.44
Country (reference category: CZ) Poland					1.27 (1.07–1.49)	0.01
City (reference category: <1000) 1000–29,999					1.02 (0.84–1.24)	0.85
30,000–100,000					1.22 (0.96–1.55)	0.10
>100,000)					1.32 (1.05–1.66)	0.02
House (reference category: House) Flat					0.95 (0.81–1.11)	0.50
Ownership of dog (reference category: Yes) No					0.89 (0.78–1.02)	0.11
Ownership of car (reference category: Yes) No					0.97 (0.86–1.13)	0.84
Cottage (reference category: No) Yes					0.87 (0.75–1.01)	0.06
Organized PA (reference category: No) Yes					2.27 (1.92–2.69)	<0.001

PA = physical activity; OR = odds ratio; CI = confidence interval; *p < 0.05, **p < 0.01; Model 1 = agreement between preferred and actually performed PA; Model 2 = Adjusted for gender, BMI, and age; Model 3 = Further adjusted for country, city, house, ownership of dog, and ownership of car.

More detailed analyses of favorite activities among boys and girls indicated that fitness PA was very popular regardless of gender. Moreover, boys particularly preferred weight training, running (jogging), and cycling. Among girls, the most popular activities included dance and running (jogging), but also weight training and aerobics. To a large extent, these results contradict the often-used concept and perception of gender roles in the selection of activities and traditional understanding of sport in the context of gender.^{50–52}

Historically, females and femininity have been defined in relation and contrast to males and masculinity. Sports have been tied to the masculine domain, and there has been a legacy of bias against female athletes.⁵³ In the past few decades, this trend has been confronted and challenged. Females have obviously tackled these negative and limiting concepts and ideas suggesting that they should not participate in competitive activities, or show sweat or aggression, and have begun to include physical strength and athletic prowess in the definition of femininity. As a result, traditional stereotypes for females have slowly been changing. Our results confirm this development. Girls are not shy to choose VPA and energy-demanding sports. As such, there is no need to choose between sports and femininity anymore.

These findings are in contrast to previous findings. The intensity of physical activity is crucial in individuals' decision-making process, with some preferring VPA, others moderate physical activities (MPA), and others not preferring one over the other and preferring activity in itself.^{54,55} Evidence suggests that boys prefer more vigorous activities than do girls.⁵⁵ Females, particularly adults, typically prefer MPA, with the proportion preferring MPA generally increasing with increasing age.⁵⁵ MPA is also preferred by females with lower PA levels, retirees, and those who do not participate in sport.⁵⁶ Meanwhile, VPA is generally preferred by male adults, but in contrast to females, the proportion preferring VPA generally decreases with age.⁵⁷ No preference of MPA or VPA is found among older adults (65 years or older), those with less than high school education, retirees, and those who do not participate in sport.^{13,53–63}

The competitiveness of the activity is also important for participation. Males prefer more competitive activities (exclusively) compared to females, with the proportion with this preference generally decreasing with age and higher among those with low education.⁵⁴ On the other hand, non-competitive activities only are preferred by females, retirees, and those who do not participate in sport, with the proportion with this preference increasing with age (highest among women aged over 45 and men over 65).⁵⁶

On the other hand, Tammelin, et al.⁵⁵ reported significant differences in preferences between boys and girls, with boys preferring team-based MVPA, in particular football, basketball, and soccer, while girls preferred rather individual MPA such as dancing, cycling, skating, and walking. The studies were, however, conducted in different cultural settings, which may help explain this variability in results and may serve as an indicator of neutralising gender differences within Central European countries, particularly the Czech Republic and Poland.

It is reasonable to take educational, socioeconomic, demographic, ethnic, and other characteristics into account when analysing gender differences in PA preferences. In this context, Eime et al.⁶⁴ pinpointed the importance of organized PA in their conceptual model of "Health through Sport" (Fig. 4). We agree with the design of the model and, more precisely, the necessity to consider these characteristics. However, because of the complex design of our study, we could not address these aspects.

Research of this nature seems to be lacking in the current literature. When taking the combination of research methods into account, we were able to predict the odds of meeting the PA

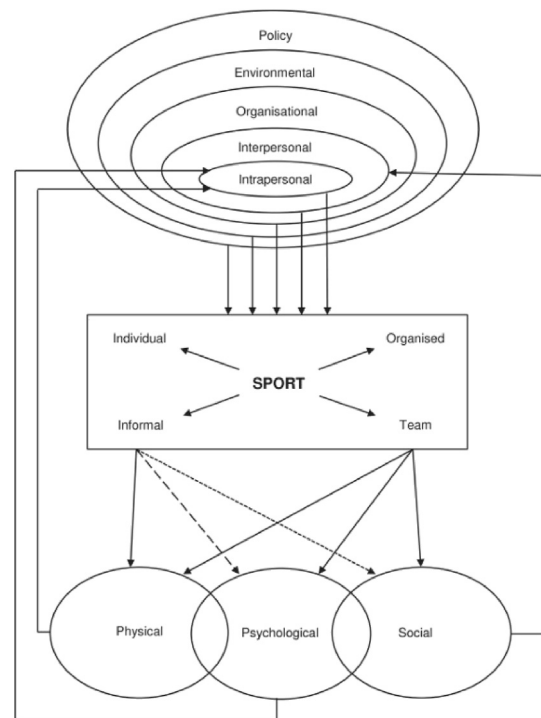


Fig. 4. Conceptual model of "Health through Sport".⁶⁴

recommendation through participation in specific types of physical/sport activity. From this perspective, fitness activities appear to be a suitable mediator to meet the minimum recommendation of daily PA.^{7–12,39}

The variables significantly associated with level of PA and meeting the PA recommendation were preference for fitness PA, gender, nationality, size of the place of residence, ownership of a cottage, and in particular, participation in organized PA.

The PA recommendation was met by almost 33% of adolescents who indicated a preference for fitness PA, but only by 22% of those not preferring fitness activities. Moreover, 32% of boys achieved the PA recommendation, compared with 21% of girls; 30% of Polish adolescents compared with 24% adolescents from Czechia; and 30% adolescents from large cities compared with 22% adolescents from villages with less than 1000 inhabitants. The most significant difference was observed between those who were and were not involved in organized PA, with 30% of those involved in organized PA meeting the PA recommendation compared to 15% of those not involved.

Strategies for PA promotion should be in line with increasing the odds of achieving the PA recommendations. The parameters of adequately conceived strategies must include the type of PA, its feature and intensity and, particularly, the preferences of groups or individuals. This is supported by research of Torstveit et al.⁶⁵ who indicated that adolescents who participate in organized sports had reduced odds for engaging in several unhealthy lifestyle habits, including PA, compared to those who did not participate.

Strengths and limitations

The cross-sectional nature of the data is a limitation of the present study. Other limitations are the effect of seasonality (varying preference in winter and summer months) and the time demands of the research study design.

On the other hand, this study has several strengths. First, it involved a unique combination of research techniques (objective

and subjective methods). Second, it used an online delivery, enabling flexible data collection. Third, the sample size was large despite the strict exclusion criteria.

Conclusions

When developing conditions for promoting adolescents' PA, it is necessary to consider preferred types of PA. Fitness PA was consistently ranked highly for boys over the study period, and it increased in popularity for girls, which is consistent with the literature indicating that boys, more so than girls, prefer VPA as fitness PA tends to be more vigorous in nature. Preference for fitness PA was also associated with an increased likelihood of achieving recommended levels of PA. We also identified that organized PA was important for meeting PA guidelines, suggesting that there is a potential to increase PA levels by targeting organized PA (e.g., rhythmic dance PA in girls). It is recommended that PA preferences and organized PA be considered in strategies and interventions aimed at increasing adolescents' overall PA levels.

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Declaration of competing interest

The authors declare no conflict of interest.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jesf.2019.10.001>.

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