

INTERSEXUAL DIFFERENCES IN THE LEVELS OF PHYSICAL FITNESS AND PHYSICAL ACTIVITY IN CHILDREN FROM THE LIBEREC REGION

Jaroslav Kupr
*Klára Pochobradská

Department of Physical Education, Faculty of Science, Humanities and Education,
Technical University of Liberec, Studentská 2, 461 17 Liberec 1, Czech Republic
jaroslav.kupr@tul.cz, *klara.pochobradska@tul.cz

Abstract

The aim of the study was to find intersexual differences in the levels of physical fitness and physical activity in children from the Liberec region. The sample was 130 boys and 124 girls aged 10-12 years. For research was used the following method: for measuring of the level of physical activity - Yamax pedometers; for measuring of the level of physical fitness - 8 tests selected from test batteries Fitnessgram and Unifittest; for determining of the somatic development - the basic somatic characteristics. The significance of intersexual differences was assessed by testing the significance of the difference t-test in software Statistica, version 9.0. The test results showed different motor performance of boys and girls in four tests. This research has been supported by the research grant IGS FP TUL, no. 115/2009.

Keywords: physical fitness, physical activity, intersexual differences.

Introduction

Intersexual differences in the level of physical fitness and physical activity for boys and girls aged 10-12 years are an essential element in the structure of physical education in elementary schools. The concepts of physical activity and physical fitness are the fundamental kinanthropology concepts. Physical fitness is the state of human organism allows you to perform daily activities without undue fatigue and with sufficient headroom for the pleasant hours of free time (Freedson, Evenson, 1991; Malina et al., 2004). Given the different hereditary dispositions and different biological maturity, not all children achieve high levels of physical fitness, but they may be sufficiently physically active (Suchomel, 2002, 2004, 2006).

Relationship of physical activity and fitness may be important for the future development of children. Motivation for lifelong physical activity and for healthy lifestyles is an important component of both physical education process, but also prevention of lifestyle disease risk factors. Due to the published findings of a decreasing level of physical activity for the current generation of school children, we consider it important to identify and analyze the level of physical activity and physical fitness components in children in terms of intersexual differences. The findings of these differences between boys and girls may contribute to a better mix of physical education in elementary schools both at 1st stage (boys and girls together in the lesson) and the 2nd stage (separate boys and separate girls in the lesson). The knowledge about the level of children's physical activity and physical fitness, to possibility better respond to the needs of pupils in terms of their gender (Kupr, Suchomel, 2009; Kompán, Suchomel, 2009; Suchomel, Kříž, 2009).

1 The aim of our study

The aim of the study was to find intersexual differences in the levels of physical fitness and physical activity in children from the Liberec region.

2 The gradual aims

- Basic characteristics of representative samples.
- Analysis of levels of physical activity and physical fitness.
- Findings of intersexual differences.

3 Methods

3.1 The sample

The sample consisted of 130 boys and 124 girls aged 10-12 years from four randomly selected elementary schools in Liberec and one in Jablonec nad Nisou.

3.2 Measuring levels of physical activity

For measurement we used Yamax pedometers (see picture 1) for seven days. The results for individual days were recorded in the record sheets every morning under the supervision of the class teacher.

Pupils were able to record and evaluate the records of pedometers in the on-line system INDARES (www.indares.com).

3.3 Measuring of the components of physical fitness

We made use of selected tests from the Fitnessgram test battery (Cooper Institute, 2004; Meredith, Welk, 2004; Welk et al., 2002) and Unifittest (Měkota, Kovář et al. 1996). We used eight motor tests: endurance shuttle run, 90 push-ups, curl-ups, trunk lift, back-saver sit and reach on the right leg, back-saver sit and reach on the left leg, standing broad jump, shuttle run 4x10m.

The project also included measurement of basic somatic parameters (body height [cm], body weight [kg], BMI [kgm⁻²], body fat [%]).

3.4 Statistical processing

To determine the statistical significance of intersexual differences were used tests of significance difference (F-test and t-test). The indicators were accepted levels of 0.05 and 0.01. For a complete statistical analysis was used software Statistica 9.0 in a Sport laboratory of Technical University in Liberec.

4 Results and discussion

The basic characteristics of representative samples in terms of intersexual categories and somatic parameters are listed in Table 1. The table gives the values of body height [cm], body weight [kg] and BMI (Body Mass Index) [kgm⁻²].

Tab. 1 Basic characteristics of representative samples

| Somatic characteristics | Age category (years) | | | |
|--------------------------|----------------------|-------|--------------------|-------|
| | 10 - 12 years | | | |
| | Boys (n = 130) | | Girls (n = 124) | |
| | x | s | x | s |
| Body height [cm] | 151,00 | 14,50 | 148,02 | 18,59 |
| Body weight [kg] | 44,35 | 10,36 | 42,75 | 9,37 |
| BMI [kgm ⁻²] | 18,99 | 2,89 | 19,02 | 2,81 |
| Body fat [%] | 19,18 | 8,10 | 22,39 | 15,91 |

Note: n = sample size, x = diameter, s = standard deviation.

Characteristics of representative samples in terms of intersexual categories and by the measurement of the level of physical activity are presented in Table 2. Values show the average of student's steps in each day of measurement. The recommended standard is 10,000 steps per a day (www.indares.com).

Tab. 2 The results of measuring levels of physical activity

| Levels of physical activity | Age category (years) | | | |
|-----------------------------|----------------------|---------|------------------|---------|
| | 10 - 12 years | | | |
| | Boys (n = 130) | | Girls (n=124) | |
| | x | s | x | s |
| Monday [steps] | 9960,18 | 5203,06 | 8989,57 | 4309,71 |
| Tuesday [steps] | 11057,89 | 5716,05 | 10731,90 | 5391,28 |
| Wednesday [steps] | 9756,65 | 4203,29 | 9487,88 | 4329,52 |
| Thursday [steps] | 11388,21 | 4939,16 | 10640,10 | 5527,19 |
| Friday [steps] | 10946,52 | 6007,67 | 11151,13 | 8607,82 |
| Saturday [steps] | 10460,80 | 7639,43 | 8963,75 | 5391,67 |
| Sunday [steps] | 9254,77 | 5721,94 | 8032,08 | 4888,34 |

Note: n = sample size, x = diameter, s = standard deviation.

Characteristics of representative samples in terms of intersexual categories and by the measurement of the level of physical activity on weekdays, weekend days and week are

presented in Table 3. Values show the average of student's steps. The recommended standard is 10,000 steps per a day (www.indares.com).

Tab. 3 The results of measuring the level of physical activity on weekdays, weekend days and week

| Levels of physical activity | Age category (years) 10 - 12 years | | | |
|-----------------------------|---------------------------------------|---------|------------------|---------|
| | Boys (n = 130) | | Girls (n=124) | |
| | x | s | x | s |
| weekdays [steps] | 10646,76 | 5285,84 | 10218,98 | 5915,38 |
| weekend [steps] | 9860,39 | 6780,11 | 8495,94 | 5166,14 |
| week [steps] | 10424,69 | 5758,21 | 9730,54 | 5765,51 |

Note: n = sample size, x = diameter, s = standard deviation.

Evaluation of statistical significances of physical activity of boys and girls are presented in Table 4. The table shows the values of results of physical activity (weekdays, weekend days and week) and the statistical methods (F-test, t-test, p-volume and statistical significance). Values do not show statistically significant differences between boys and girls at level 0.05, even at level 0.01.

Tab. 4 Evaluation of statistical significance of differences in physical activity of boys and girls

| Evaluation of statistical significance | LPA | | |
|--|----------|---------|------|
| | weekdays | weekend | week |
| F-test | 2,18 | 1,62 | 1,68 |
| t-test | 1,31 | 0,81 | 1,78 |
| p-volume | 0,21 | 0,44 | 0,21 |
| Statistical significance | | | |

Note: LPA = Level of physical activities, * = statistically significant difference at level 0.05, ** = statistically significant difference at level 0.01.

Characteristics of representative samples in terms of intersexual categories and selected eight tests of physical fitness are presented in Table 5.

Evaluation of statistical significance of motor tests of boys and girls are presented in Table 6. The table shows the values of results of the level of physical fitness (endurance shuttle run, 90 push-ups, curl-ups, trunk lift, back-saver sit and reach on the right leg, back-saver sit and reach on the left leg, standing broad jump, shuttle run 4 x 10m) and the statistical methods (F-test, t-test, p-volume and statistical significance). Values show statistically significant differences between boys and girls at level 0.05, even at level 0.01.

Tab. 5 Results of the measurement components of physical fitness

| Components of physical fitness | Age category (years) | | | |
|--------------------------------|----------------------|-------|--------------------|-------|
| | 10 - 12 years | | | |
| | Boys (n = 130) | | Girls (n = 124) | |
| | x | s | x | s |
| T1 [number] | 36,82 | 16,71 | 32,90 | 16,29 |
| T2 [number] | 14,95 | 7,83 | 10,61 | 6,73 |
| T3 [number] | 57,68 | 19,39 | 59,03 | 19,48 |
| T4 [cm] | 27,53 | 5,79 | 26,06 | 7,03 |
| T5 [cm] | 26,06 | 5,69 | 30,74 | 6,18 |
| T6 [cm] | 25,07 | 5,59 | 30,36 | 6,26 |
| T7 [cm] | 148,27 | 23,46 | 139,31 | 27,26 |
| T8 [s] | 11,76 | 0,97 | 12,05 | 1,00 |

Note: n = sample size, x = diameter, s = standard deviation, T1 = endurance shuttle run; T2 = 90 ° push-up; T3 = curl-up; T4 = trunk lift; T5 = back-saver sit and reach on the right leg; T6 = back-saver sit and reach on the left leg; T7 = standing broad jump; T8 = shuttle run 4 x 10 m.

Table 6 Evaluation of statistical significance of differences in motor tests of boys and girls

| Evaluation of statistical significance | Motor test | | | | | | | |
|--|------------|------|------|------|------|------|--------|------|
| | T1 | T2 | T3 | T4 | T5 | T6 | T7 | T8 |
| F-test | 1,05 | 1,32 | 1,01 | 1,54 | 1,19 | 1,10 | 1,35 | 1,05 |
| t-test | 1,88 | 4,74 | 0,55 | 1,83 | 6,26 | 6,85 | 2,75 | 2,37 |
| p-volume | 0,06 | 0 | 0,58 | 0,06 | 0 | 0 | 0,0063 | 0,02 |
| Statistical significance | | ** | | | ** | ** | ** | * |

Note: T1 = endurance shuttle run; T2 = 90 ° push-up; T3 = curl-up; T4 = trunk lift; T5 = back-saver sit and reach on the right leg; T6 = back-saver sit and reach on the left leg; T7 = standing broad jump; T8 = shuttle run 4 x 10 m; * = statistically significant difference at level 0.05, ** = statistically significant difference at level 0.01.

Conclusions

The aim of the study was to find intersexual differences in the levels of physical fitness and physical activity in children from the Liberec region.

The results of our study showed, that the level of physical activity is in insufficient level during the weekend days for boys and girls. The girls have an insufficient level of physical activity on weekly number of steps. The results of the analysis of the level of physical activity including weekdays, weekend days and the total weekly number of steps do not reveal statistically significant differences between boys and girls.

The results of motor tests showed different motor performance of boys and girls in four tests: 90 ° push-up, back-saver sit and reach on the right and left leg, standing broad jump and shuttle run 4 x 10 m. In the back-saver sit and reach on the right and left leg were statistically

significantly higher values reported in girls than in boys. In all other cases were statistically significantly higher values observed in boys than in girls.

These results showed the poor level of physical activity of boys and girls. Decrease in the level of physical activity is one of the major problems of this age categories. Statistically significant intersexual differences indicate the varying levels of physical activity and physical fitness in boys and girls. This allows us to focus on the individual components of physical fitness and the overall development of physical activity.

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INTERSEXUÁLNÍ ROZDÍLY V ÚROVNI TĚLESNÉ ZDATNOSTI A POHYBOVÉ AKTIVITY U DĚTÍ V LIBERECKÉM REGIONU

Cílem projektu bylo zjistit intersexuální rozdíly v úrovni tělesné zdatnosti a pohybové aktivity u dětí v libereckém regionu. Výběrový soubor tvořilo 130 chlapců a 124 dívek ve věku 10-12 let. V rámci výzkumu byly využity metody: pro měření úrovně pohybové aktivity krokoměry Yamax, pro měření úrovně tělesné zdatnosti 8 vybraných testů z testových baterií Fitnessgram a Unifittest, pro určení tělesného rozvoje základní somatické charakteristiky. Významnost intersexuálních rozdílů byla posouzena prostřednictvím testování významnosti rozdílu testem v programu Statistica verze 9.0. Výsledky testování ukázaly rozdílnou motorickou výkonnost chlapců a dívek ve čtyřech testech. Při porovnání s publikovanými doporučeními pro děti školního věku ukazují výsledky na nedostatečnou úroveň o víkendových dnech u chlapců i dívek. Tento výzkum byl podpořen v rámci grantu IGS FP TUL, no. 115/2009.

INTERSEXUELLE UNTERSCHIEDE AUF DER EBENE KÖRPERLICHER FITNESS UND AKTIVITÄT BEI KINDERN IN DER REGION LIBEREC

Das Ziel dieses Projekts war es, die intersexuellen Unterschiede auf der Ebene körperlicher Fitness und Aktivität bei Kindern in der Region Liberec festzustellen. An der Untersuchung nahmen 130 Jungen und 124 Mädchen im Alter von 10-12 Jahren teil. Im Rahmen der Forschung wurden folgende Methoden angewandt: Für die Messung des Niveaus der körperlichen Aktivität ein Schrittzähler der Marke Yamax, für die Messung der körperlichen Fitness wurden von den Testbatterien Fitnessgram und Unifittest 8 Tests ausgewählt und zur Feststellung der körperlichen Entwicklung grundlegende somatische Charakteristik verwendet. Die Bedeutung von intersexuellen Unterschieden wurde mit Hilfe von T-Tests im Programm Statistica Version 9.0 bewertet. Die Ergebnisse der Testverfahren haben die Unterschiede motorischer Leistungsfähigkeit von Jungen und Mädchen in vier Tests gezeigt. Im Vergleich mit veröffentlichten Empfehlungen für Kinder im Schulalter zeigen die Ergebnisse ein unzureichendes Maß an Bewegung während des Wochenendes bei Jungen und auch Mädchen. Die Forschung wurde mit Hilfe von Zuschüssen der IGS FP TUL, Nr. 115/2009 gefördert.

RÓŻNICE MIĘDZYPLCIOWE W POZIOMIE SPRAWNOŚCI FIZYCZNEJ I AKTYWNOŚCI RUCHOWEJ DZIECI W REGIONIE LIBERECKIM

Celem projektu było stwierdzenie różnic międzyplciowych w poziomie sprawności fizycznej i aktywności ruchowej dzieci w regionie libereckim. Próba składała się z 130 chłopców i 124 dziewcząt w wieku 10-12 lat. W ramach badań zastosowano następujące metody: do pomiaru poziomu aktywności ruchowej krokomierze Yamax, do pomiaru poziomu sprawności fizycznej 8 wybranych testów typu Fitnessgram i Unifittest, natomiast do określania rozwoju fizycznego podstawowe cechy somatyczne. Znaczenie różnic międzyplciowych oceniano w drodze badania znaczenia różnic testem w programie Statistica wersja 9.0. Wyniki badań wykazały odmienną sprawność motoryczną dziewcząt i chłopców w czterech testach. Po porównaniu z publikowanymi zaleceniami dla dzieci w wieku szkolnych wyniki wskazują na niewystarczający poziom w dni weekendowe u chłopców i dziewcząt. Badanie zostało dofinansowane z grantu z IGS FP TUP, numer. 115/2009.