DETERMINATION OF DIFERENCES IN RUNS BETWEEN BOYS AND GIRLS AGED 5.5

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The aim of this research is to determine whether there are distinctions in runs among five and a half year old boys and girls. The research is based on studying 80 girls and 64 boys from seven kindergartens in Slovenia. The following five measurement methods have been used in our research: a 10-meter run, a 150-meter run, a 10-meter run with a flying start, 4-times 5-meter run, and a 300-meter run. The results of the t-test indicate a statistically characteristic difference among boys and girls in 300 m run test results only, that is, a method used for measuring aerobic endurance. Other motor skills results have shown that there are no statistically characteristic differences among boys and girls. It is important that sport activities for boys and girls are organized for both groups of children equally. Especially girls must take part in a variety of running exercises in order to increase their aerobic endurance. They should be encouraged to take part in a variety of games which require activating the energy component of movement. Based on the results of this research we can say that physical education (PE) of preschool children should be planned regardless of sex and the PE program should be the same for both boys and girls.

Keywords: Preschool children, runs, speed, general endurance, comparing by sex.

INTRODUCTION

For children to optimally develop their potential skills, it is essential that PE is systematically and professionally planned already in the preschool period. PE must be based on professional grounds and findings in order for children to optimally develop their motor and functional skills (Kropej & Videmšek, 1996).

Just like any other human ability, motor and functional skills are both innate and acquired. At birth each one of us is given a certain degree to which one's potential could be developed when considering a normal course of development. The basic degree of motor skills development can however be exceeded by means of developmentally appropriate movement activities.

The most appropriate time for developing skills and personality is early childhood when the entire organism, in particular the nervous system, is most receptive for influences from the environment (Armstrong & Welsman, 2000). Due to the fact that we are, at the present time, limited by the space within our homes, endangered more and more by street traffic and recurringly facing a lack of time, children have fewer opportunities and less encouragement to fulfill their needs for movement activities. As a consequence, children do not obtain their development optimum given by their genetic potential. Skills and characteristics that children fail to gain in due course are very hard to or even not possible to make up for at a subsequent time (Videmšek & Karpljuk, 1999).

Generally speaking, testing preschool children is a very demanding process. The tests as well as the course of testing must be adapted to the children's early developmental period which causes quite some difficulties. Our lack of knowledge in the matter of preschool motor skills development represents an urgent situation. This is even more so true knowing that motor activities represent a major developmental stimulus for non-motor skills and characteristics. Besides that, contemporary children (primarily town children) grow up in an environment which impedes their need for movement activities and therefore all the activities they are involved in are planned (teachers, parents). Professionally planned motor activities are undoubtedly based on experts' findings but unfortunately those pertaining to the preschool period are quite rare. Since there are so many difficulties involved in testing preschool children, rather little researche is available in the field of preschool education (Kalar, Videmšek, & Zavrl, 2003).

If boys and girls participate in different activities and games, their learning in a number of areas of their development will also be different (Doupona, 1996). Boys generally love to run around the playground and play with a ball, while girls on the other hand quickly get bored and avoid games that require any kind of running. Girls usually look for some quiet game which takes place in one spot, and they like playing with dolls. Parents worry for their "princesses" who are usually dressed in pretty clothes. They do not let them run around and rather suggest quiet games.

Some other researchers have come to the conclusion that boys achieve better results in movement activities where explosive strength, speed and aerobic endurance play an important part. Girls however are more successful in rather quiet activities, like activities engaging fingers, arms and those that require balance skills. Morris, Williams, Atwater and Wilmore (1982) who have studied three to six year old children have ascertained that boys of all ages achieve statistically characteristic better results in tests of ball throwing whereas six year old girls have achieved better results in tests measuring static balance. These same authors have also established that five year old boys are better in speed running. Similar conclusions have been made by Miler (1993) who has studied some motor skills of five and a half year old boys and girls; boys have been more successful in running various distances (5 m, 10 m, 100 m, 150 m and 300 m) and in different motor tasks requiring strength (linked long jumps), thrusting a ball in a seated position, ball throwing, bent arm hang and side jumps. Studying a sample of six year old children, Bučar (1996) has ascertained that the results of motor skills tasks that require agility skills are not statistically characteristic. In her research studying differences of some motor skills among six year old boys and girls, Rošker (2001) has not ascertained huge differences in efficiency of performance. However, boys have on average been more successful in the long jump, side jump, and running with changing directions (in two tests to measure movement coordination). Videmšek (1996) has studied differences in performing motor tasks among three year old boys and girls using 23 tests. She has established that differences between three year old boys and girls are not statistically characteristic, except in some tasks which require the ability to manipulate with hands where boys were less successful.

Van Praugh (2000) has studied the responses of the cardio-vascular system on various types of strain. He has ascertained that heart beat rate in children rapidly adapts to increased strain as it abruptly increases from the very start of strenuous exercising. At the same time, children (particularly of younger age) have the ability to maintain a relatively high heart beat rate frequency during various movement exercises of either a competitive or entertaining nature – like games and dancing (Karpljuk, Videmšek, Kondrič, & Štihec, 2000).

Based on five metric test procedures, the aim of this research is to establish whether there are distinctions between five and a half year old boys and girls in some motor test results, which hypothetically define motor ability (speed) and functional ability (endurance). The aim is to ascertain whether it is reasonable to consider sex when planning sport activities for preschool children.

METHOD

Participants

The sample of subjects studied included 144 children, 64 boys and 80 girls from seven kindergartens in Slovenia. All the children were five and a half years old (± half a year) and they attended kindergartens which offered the same or similar working and material conditions. PE in all four kindergartens was conducted by a kindergarten teacher.

Instruments

Five metric test procedures used in this research can be divided into two hypothetical factors:

SPEED

- 10 m run (a 10-meter run)
- 150 m run (a 150-meter run)
- 10 m run (a 10-meter run flying start)
- 4 × 5 m run (4-times 5 meter run)

ENDURANCE

- 300 m run (a 300-meter run)

Procedures

Measured data has been processed at a computer data processing department, Faculty of Sport, Ljubljana, using the SPSS – 9.0 (Statistical Package for the Social Sciences).

Basic statistical parameters have been calculated for all variables. For the purpose of determining differences in motor skills among male and female subjects, the t-test has been used. Hypotheses were accepted or denied with a 5% risk (Q = 0.05).

RESULTS

Five metric test procedures have been used in this research.

With the tests 10-meter run (T10m), 10-meter run flying start (T10mL), 150-meter run, (T150m) and a 4-times 5 meter run (4 × 5m), we have measured the speed of five year old children.

A 10-meter run (T10m) is a metric procedure where the subjects have to, as fast as possible, run the 10-meter distance through the finish line. The main problem in testing was the understanding of the exercise's performance. Even though children have done a test run, there were still some individuals stopping before the finish line, which means that they started to slow down before the finish line.

Fewer problems were experienced in the 10-meter run at a flying start (T10mL). The aim of this test was to measure maximal speed; therefore, children started running 5 meters before the measuring start point, and

they were running through a seeming finish line that was 5 meters after the measuring end point (so the total distance run was 20 meters). This test made the children run a 10-meters distance that we measured for the maximum speed.

A 4-times 5 meter run (4 × 5m) is a metric procedure where a child running the distance steps over a marked line with at least one foot (upon running into the finish line, he/she runs as if the finish line is at least 1 m after the marked line).

A 150-meters run (T150m) was performed in a group. Children started running after a GO command and ran 3 laps. Upon each lap, they were told how many laps they had completed and how many they still had to overcome.

The results have shown that there are no statistically characteristic differences between boys and girls in the following tests: the 10-meter run, 10-meter run with a flying start, 150-meter run, and the 4-times 5 meter run. These results pertain to the sample studied (TABLE 1–4).

With a 300-meter test (T300m), the endurance of five and a half year old children was measured. A child's aerobic endurance is regulated by the cardio-vascular, respiratory and the thermoregulation subsystems. For children of this age, a 300-meter run represents a very long distance; therefore, not all children were motivated enough to overcome the entire distance. Some of them started off too fast and barely made it through the finish line. In terms of physiology, running activates all muscles, particularly the leg muscles, and the internal organs. It intensely affects the blood circulation and breathing.

The t-test results (TABLE 5) show that the difference between boys and girls in the 300-meter run is statistically characteristic. Within the subject sample studied here, boys have achieved a statistically characteristic better result than girls. Reasons for such results could be various – undoubtedly they could result from dissimilar activities and games which boys or girls participate in, leading into distinct functional capabilities.

TABLE 1
Results comparison among boys and girls – variable T10m

Variable	Group	Number	Mean	Std. dev.	Min	Max	t	**Sig.**
T10m	boys	64	319.84	46.67	241	398.00	0.536	0.594
	girls	80	314.95	30.52	266	381.00		

Legend:
T10m – 10 m run (tenths of seconds), T150m – 150 m run (seconds), T4 × 5 – 4 × 5 m run with flying start (tenths of seconds), T300m – 300 m run (seconds) Number – number of subjects (pupils), Mean – average result, Std. Dev. – standard deviation, Min – minimal result, Max – maximal result, t – T value, Sig. – significance

TABLE 2
Results comparison among boys and girls – variable T150m

Variable	Group	Number	AS	Std. dev.	Min	Max	t.	**Sig.**
T150m	boys	64	49.81	7.84	38	65.00	–0.748	0.457
	girls	80	51.10	6.76	40	69.00		

TABLE 3
Results comparison among boys and girls – variable T4 × 5

Variable	Group	Number	AS	Std. dev.	Min	Max	t	**Sig.**
T 4 × 5	boys	64	104.81	11.56	86	133.00	1.315	0.193
	girls	80	101.47	9.96	78	116.00		

TABLE 4
Results comparison among boys and girls – variable T10mL

Variable	Group	Number	AS	Std. dev.	Min	Max	t	**Sig.**
T10mL	boys	64	246.25	33.83	199.00	298.00	0.377	0.707
	girls	80	243.43	29.68	198.00	302.00		

TABLE 5
Results comparison among boys and girls – variable T300m

Variable	Group	Number	AS	Std. dev.	Min	Max	t	**Sig.**
T300m	boys	64	103.00	13.28	81	131.00	-2.427	0.018
	girls	80	110.00	11.20	91	131.00		

Based on the independent samples from the t-test (TABLE 1–5), four out of five results compared between boys and girls are not statistically characteristic. The only statistically characteristic difference occurs in a 300-meters run (T300) endurance test.

DISCUSSION

This research results have shown statistically characteristic differences between boys and girls only in the 300-meter run – in the endurance run test, boys have achieved statistically better results than girls. In other metric procedures, which hypothetically define the motor ability (speed), the results of boys and girls are approximately equal.

In this age period, speed is evidently a motor ability with no statistically characteristic differences between boys and girls. It is most likely that there is no such sex distinction in children's sport activities, which could cause differences in skills development. Sport activities in later age periods differ between boys and girls and it is assumed that as such, they do affect the differences in results between the two sexes. Certainly additional differences are affected by diverse physical development. As indicated by the results of a study by Štefančič et al. (1996), in the age period of five and a half years, there are no statistically characteristic differences between boys and girls in physical growth and development. Approximately the same physical development and the same exercise program therefore result in approximately the same speed skills results of boys and girls. Methods and instruments used to develop speed skills are very variegated and rather simple. For example, elementary games, various starts (initiated from different positions) continuously followed by short sprints, rhythmical hopping, up/downhill running, relay. All these types of running can be offered to preschool children and integrated into their games. Children should be offered an opportunity to get to know a variety of running activities and to participate in their first competitions (Škof & Milić, 2002).

It is necessary to stress that demanding methods of exercising in childhood do not result in distinctive improvements as one could expect (Schmidt, 1999), although there are some sports where coaches introduce such methods at a very early stage. Schmidt (1999) futher on states that from a physiological point of view, there are no characteristic endurance improvements in children. Daniels and Oldridge (1991), and Daniels, Oldrige, Nagle and White (1997), who have studied various groups of young athletes have established that certain changes in endurance skills, which are based on physiological and hormonal elements, begin to improve effectively in the ages between 10 and 13. These authors have established that the absolute values of VO_2 max (l/min) have increased, while the relative values of VO_2 max (ml/kg.min) in correlation with body mass have not changed.

In terms of the exercise process, it is likely that every person planning an exercise program (coach, PE teacher, sport amateur) tends to plan the program so as to have a positive effect. Particularly great is the significance of comparing the initial and the final (or intermediate) results. Improvements achieved by exercising are always gratifying; however, special attention should be paid when choosing the contents of exercising in the childhood period up, to the age of 16 (Noakes, 1991).

One of the principal reasons that girls have achieved lower statistically characteristic results in the 300-meters run undoubtedly lies in different activities and games girls participate in during the preschool period.

Different authors have thus come to similar conclusions that preschool boys are slightly more successful in motor skill exercises where the energy component of movement dominates. Based on observations and interviews with children and their parents, Kocman-Kuhar (1999) is of the opinion that the social, cultural and educational environment (especially within the family) influences the children's orientation and interests. In most cases, girls in families are raised to be gentle and housekeeping oriented whereas boys are treated as strong individuals. Doupona (1996) has defined specifics in the playing of preschool boys and girls: boys play in larger groups, with a variety of roles. Boys' games have rules which they often adapt according to the number of players but without losing the aim of the game. Boys are able to adapt their games according to their capabilities, and so the older they get, the more advanced and complex the games become. In their games, boys learn to stand for themselves and their friends which enables them to develop empathy and altruism. Just the opposite, girls games do not include many opportunities for them to develop various motor skills, neither are their games adventurous. Girls prefer to play indoors but do not show any interest in group and competitive

games. Girls' games require a lot of imagination and are based on a well established model. Their games in particular enable them to develop empathy and a better understanding of the surroundings. Rules of their games are clear and simple; negotiations in critical situations are rare. Girls' games require less strategy than boys' games and they do not offer sufficient opportunities for developing aerobic abilities. Girls' games also do not offer characteristics like contention, determination, and competitiveness.

Marjanovič, Umek and Zupančič (2001) have studied the differences between boys and girls in playing activities and defined six correlated differences:

- boys play more outdoors;
- the boys' social games differ with age more than the girls' social games;
- girls are more willing to play boy games than vice-versa;
- boys more often play competitive games for which they need a lot of space – team playing and competitions are characteristic for boys even with a non-sport game. Girls however are more cooperative in their games, they require less space – they play for example in a playground equipment, jump rope, and similar;
- boys are more tenacious in playing than girls: 72% of all boys' activities last for more than one hour, while there is only 43% of such activities with girls;
- boys' social games are played in larger groups than girls' social games.

Zalokar-Divjak (1998) says that children's play is in fact the best practice for endurance. Children have the ability to play for hours and hours. Unintentionally, they insert elements like walking, running, jumping, crawling and climbing. They have breaks which maintain their heart beat at the level of aerobic exercising. The "child" system alone functions on the principle of biological self-regulation, that is, their load of exercising is just right for their age and development phase. This is true only if we live in an unspoiled environment with no school and TV with long periods of sitting which excludes any muscle activity and additionally obstructs lung ventilation. To prevent such course of action, it is necessary to organize exercises with aerobic activities such as in kindergartens, sport centers and clubs. Both boys and girls must be encouraged to develop not only motor but also functional skills through games (Karpljuk, Videmšek, Kondrič, & Štihec, 2000). Some teachers are of the opinion that aerobic endurance (mostly based on the aerobic metabolism) is the first prerequisite for developing motor skills (Zalokar & Divjak, 1996; taken from Bingman, 1980). Based on the researcher's standpoint, encouraging endurance development in early childhood is very useful; not only for medical prevention (health) reasons, but also for developing the child's will and determination, and for creating a base ground for developing other skills at a subsequent time.

However, some past researchers (Sallis & McKenzie, 1991) have shown just the opposite. It has been established that endurance skills that are based on aerobic processes develop much sooner than those skills based on anaerobic processes. Furthermore, some findings about the maximum oxygen input have proved that children's aerobic skills are quite high (Rajtmajer, 1993).

Van Aaken (1993), Rajtmajer (1997) and many other researchers, doctors, coaches and teachers have ascertained that even very young children have the ability of running for 12 minutes or more. Van Aaken (1993) has established that five to six year old children could run up to even 10 kilometers a day while playing.

Children's load of running should be moderate and planned in minutes not in distance that they run. In real life however, this is very difficult to achieve. Children tend to compete with each other on every occasion. An exercise like "run by yourself" represents a rather "long-lasting" task for them. And yet a teacher must use this method and teach the children in this direction (Rajtmajer, 1993).

It is important that sport activities for boys and girls are organized for both groups of children equally. Especially girls must take part in a variety of running exercises in order to increase their aerobic endurance. They should be encouraged to take part in a variety of games which require activating the energy component of movement. Sport activity programs for preschool children should be planned for both boys and girls equally.

Despite the fact that this research has included a relatively small sample of children tested and the conclusions cannot be generalized, the research results have well contributed to the existing findings in the field of studying motor abilities of preschool children. With this research, we have moved yet another step forward to better professionally planned and conducted preschool physical education.

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URČENÍ ROZDÍLU V BĚHU MEZI CHLAPCI A DÍVKAMI VE VĚKU 5,5 ROKU

(Souhrn anglického textu)

Cílem tohoto výzkumu je určit, zda existují odlišnosti v běhu chlapců a dívek ve věku 5,5 roku. Výzkum je založen na studii 80 dívek a 64 chlapců v sedmi mateřských školách ve Slovinsku. Bylo použito těchto pěti měřicích metod: běh na 10 metrů, běh na 150 metrů, běh na 10 metrů s letmým startem, běh 4 × 5 metrů, běh na 300 metrů. Výsledky t-testu vykázaly statisticky významný rozdíl mezi chlapci a dívkami jen v běhu na 300 metrů, což je metoda používaná pro měření aerobní vytrvalosti. Výsledky ostatních pohybových aktivit vykazují, že mezi chlapci a dívkami není žádný statisticky významný rozdíl. Je důležité, aby sportovní aktivity byly organizovány rovnoměrně jak pro chlapce, tak pro dívky. Obzvláště děvčata se musí účastnit různých běžeckých cvičení v zájmu toho, aby vzrostla jejich aerobní vytrvalost. Měla by být povzbuzována, aby se účastnila různých her, které vyžadují aktivaci energetické složky pohybu. Na základě výsledků tohoto výzkumu můžeme říci, že tělesná výchova (TV) předškolních dětí by měla být plánována bez ohledu na pohlaví a že tělovýchovný program by měl být pro chlapce i dívky stejný.

Klíčová slova: předškolní děti, běhy, rychlost, celková vytrvalost, srovnání pohlaví.

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