Willwéber Tomas, Čillík Ivan. Physical development and general physical performance of children at the age of 5 – 10 years. Journal of Education, Health and Sport. 2017;7(8):309-316. eISSN 2391-8306. DOI http://dx.doi.org/10.5281/zenodo.848206
http://ojs.ukw.edu.pl/index.php/johs/article/view/4733

The journal has had 7 points in Ministry of Science and Higher Education parametric evaluation. Part B item 1223 (26.01.2017).
1223 Journal of Education, Health and Sport eISSN 2391-8306 7

The authors declare that there is no conflict of interests regarding the publication of this paper.
Received: 01.08.2017. Revised: 02.08.2017. Accepted: 23.08.2017.

Physical development and general physical performance of children at the age of 5 – 10 years

Tomas Willwéber
Department of Physical Education and Sports, Faculty of Arts, Matej Bel University, Banská Bystrica, Slovakia

Ivan Čillík
Department of Physical Education and Sports, Faculty of Arts, Matej Bel University, Banská Bystrica Slovakia

Abstract
The aim of this study is to find out the level of general physical performance of children in younger school age depending on the age of individuals. We present the results of body development and general physical performance of children in younger school age in this contribution. Monitored sample consisted of 80 probands at the age of 5 – 10 years: I. group 5 – 6 years (39 probands), II. group 7 – 8 years (29 probands), III. group 9 – 10 years (12 probands). We used standing long jump, knee throw over a head, 4 x 10 m shuttle run, endurance shuttle run to find out general physical performance. We did not recorded statistically significant difference ($p > 0.05$) in intersexual comparison in neither age group. We recorded statistically significant differences ($p < 0.05$) between age groups: in body height, in body weight, standing long jump, knee throw over a head, in 4 x 10 m shuttle run and in endurance shuttle run. We did not recorded any statistically significant dependence in BMI between age groups. *The partial output is part of the: VEGA 1/0571/16.*
Keywords: somatic parameters, conditional physical abilities, younger school age, dependencies

Introduction
Physical development and physical performance are inseparably linked to the exercise activity. Movement as an expression of life is inherently connected and transformed into all the functions of the human body, and its decline and limitation, which has emerged in the last decades, is significantly negative. It is shown that lack of physical activity acts as one of the most important factors causing a number of health problems, such as cardiovascular diseases or weakening of the locomotor apparatus that suffer a large percentage of population.

The level and quality of basic motor skills in children of pre-school and younger school age are significant to fulfill existing and basic needs as well as to satisfied biological and

civilizations´ needs (Malina, 2004).

Opportunities for participation in organized sport activities at young school age are increasing as well as opportunities for participation in more competitive sports environment. The interest of parents and trainers in helping young people to increase their sport performance is conditioned by simultaneous fitness and early specialization. So, there is a question: How Young is "Too Young" to Start Training? (Myer et al., 2013).

While chronological age is used in sport for including and dividing into age categories, differences in somatic parameters and motor skills related to adulthood occur around 6-7 year of life (Malina et al., 2005).

Laczo et al. (2014) state that the growth dynamics in this age range is characterized by approximately 5 cm annual height gain. According to Oravcová (2010) during this period a child will grow an average of 5 - 7 cm per year.

In younger school aged children, basic physical abilities are constantly evolving due to high spontaneous and movement activity. Because body changes are not so significant, children gain bigger control over their bodies and therefore, their motor skills can be improved (Vágnerová, 2005).

Insufficient versatile preparedness for sports practice and competition may be the result of a current decrease in interest for an exercise activity in children and adolescents and it is a prerequisite for an increased risk of injury (Myer et al., 2013).

The current evaluation of anthropometric parameters and motor skills provides more accurate information about the developmental process of children. However, it is not well known whether there is a relationship between motor abilities and anthropometric parameters in children, or between different tests of evaluation of a motor ability (Milanesse et al., 2010).

The aim of this contribution is to find out the level of general physical performance of children in younger school age depending on the age of individuals.

Method

Younger school age children participated in this research. Monitored sample consisted of 80 probands at the age of 5 – 10 years. The research was carried out using a cross-sectional study where the monitored sample was divided into three groups: I. group 5 – 6 years (39 probands) 6.09 ±0.6 years, II. group 7 – 8 years (29 probands) 7.95 ±0.57 years, III. group 9 – 10 years (12 probands) 9.84 ±0.46 years.

We found out basic somatic indicators: body height, body weight, BMI. Body height was measured with an anthropometer. Body weight was measured using a diagnostic device InBody 120 (Biospace Co., Ltd.; Seoul, Korea).

We used the following tests to diagnose conditional abilities: the standing long jump, the knee throw over a head, 4 x 10 m shuttle run, endurance shuttle run. The standing long jump, a test of explosive strength of lower extremities was performed according to the methodology of Moravec et al. (2002). The test of knee throw over a head used to find out explosive strength of upper extremities and trunk (Šimonek, 2015) was modified with the respect to the age of children, we used volleyball instead of 1 kg medicine ball. 4 x 10 m shuttle run (Čillík et al. 2014) was used to test running speed with changes of direction. Brown (2001) recommends this test for diagnosing of selection of talent at given age category. We used endurance shuttle run to find out endurance abilities, according to the methodology Moravec et al. (2002).

Testing was performed under the same conditions in October 2016. All tested individuals were heathy, without any signs of defects in physical development. At first, probands were introduced with the way of performing and evaluating tests. After a standard warm-up, selected tests followed in order to determine general physical performance. Before the survey, we received informed consent from parents about the possibility of implementing a survey.

In this research, we used basic statistic characteristics: arithmetic mean, standard deviation, maximu and minimum. The statistical significance between the genders in parameters of physical development and physical abilities was determined by using a t-test. To evaluate the statistical significance of differences in the level of physical performance among the age groups, ANOVA was used. Statistical dependence was evaluated at significance level $p < 0.05$.

Results

There were not recorded any statistically significant differences ($p > 0.05$) between the boys and girls in the individual monitored groups in the parameters of physical development and general physical performance.

The results of the level of physical development and the current level of physical performance point to the linear dependencies of the differences between the age groups (Table 1).

Table 1. Comparison of parameters of physical development and general physical performance between age groups

	BH [cm]	**BW [kg]**	**BMI [i]**	**SLJ [cm]**	**KTOH [cm]**	**4 x 10 m [s]**	**ESR [n]**
I. group (5 – 6)	118.29 ±5.8	22.93 ±3.31	16.01 ±1.48	115.08 ±21.6	381 ±105	14.83 ±1.62	17.21 ±8.37
II. group (7 – 8)	130.64 ±4.48	28.99 ±4.82	16.04 ±1.27	137.97 ±17.15	532 ±97	13.83 ±2.6	27.93 ±12.73
III. group (9 – 10)	137.18 ±7.65	30.23 ±3.67	16.89 ±2.26	150.5 ±20.25	647 ±76	13.04 ±0.94	41.08 ±12.24
ANOVA	1.64E-15 *	6.62E-07 *	0.0357 *	1.41E-07 *	3.25E-10 *	0.0001 *	4.66E-09 *

Note: BH – body height, BW – body weight, BMI – body mass index, SLJ – standing long jump, KTOH – knee throw over a head , 4 x 10 m – shuttle run 4 x 10 m, ESR – endurance shuttle run, * – statistically significant ($p < 0.05$)

In physical development parameters, we noted statistically significant changes between the groups. In the body height, there was a statistically significant ($p < 0.05$) change in all three age groups of selected subjects $p = 1.64E-15$. Between the first and second group, the value $p = 3.43E-12$ was found. Between the second and third group the value was $p = 0.0027$.

Our results strongly correspond to the theoretical origins of Oravcová (2010), Čillík et al. (2014); Laczo et al. (2014) about the linear development of body height in children and adolescents (Figure 1).

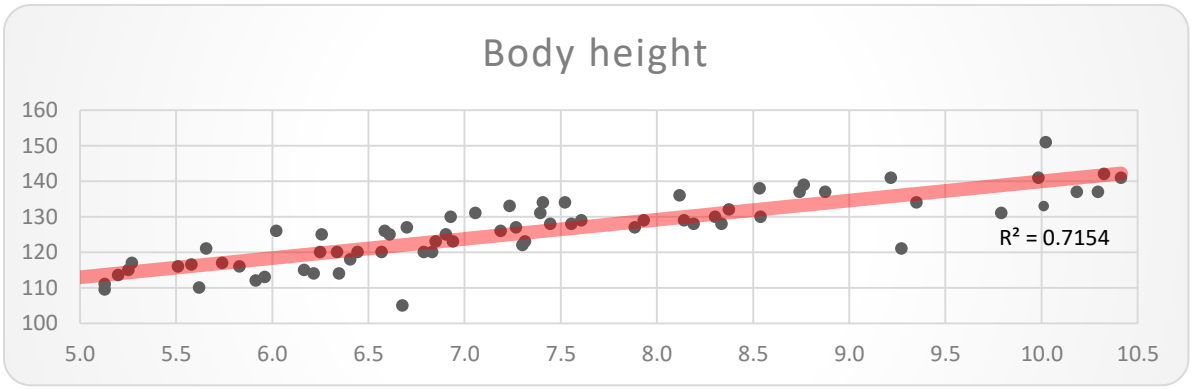

Figure 1. The dependence of body height on age

In body weight, a statistically significant change ($p < 0.05$) was shown in all three age groups of selected subjects $p = 6.62E-07$. Between the first and second group, the value $p = 8.12E-06$ was found. Between the second and third group it was $p = 0.0067$.

Our results correspond to the theoretical origins of Oravcová (2010), Čillík et al. (2014); Laczo et al. (2014) about the linear development of body weight in children and adolescents (Figure 2).

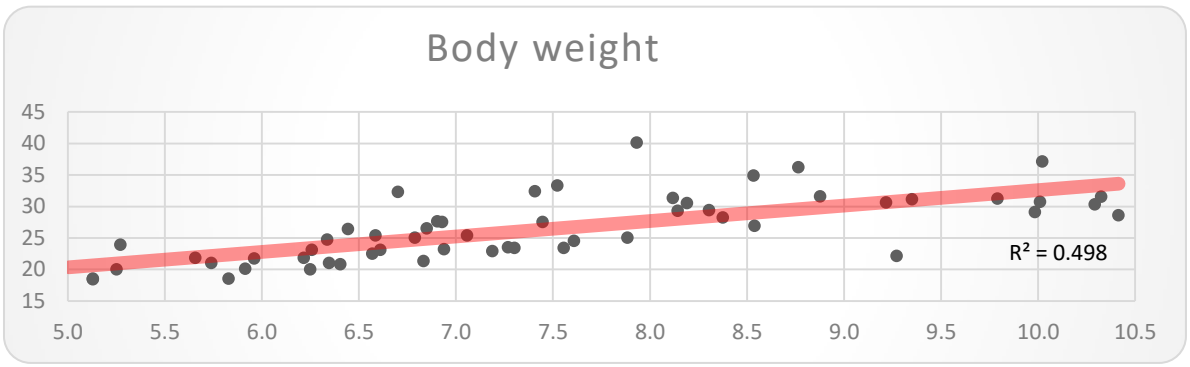

Figure 2. The dependence of body weight on age

In the body mass index, a statistically significant dependence ($p > 0.05$) was not shown in all three age groups of selected subjects $p = 0.0357$. Between the first and second group the value $p = 0.1149$ was found. Between the second and third group the value was $p = 0.2804$ (Figure 3).

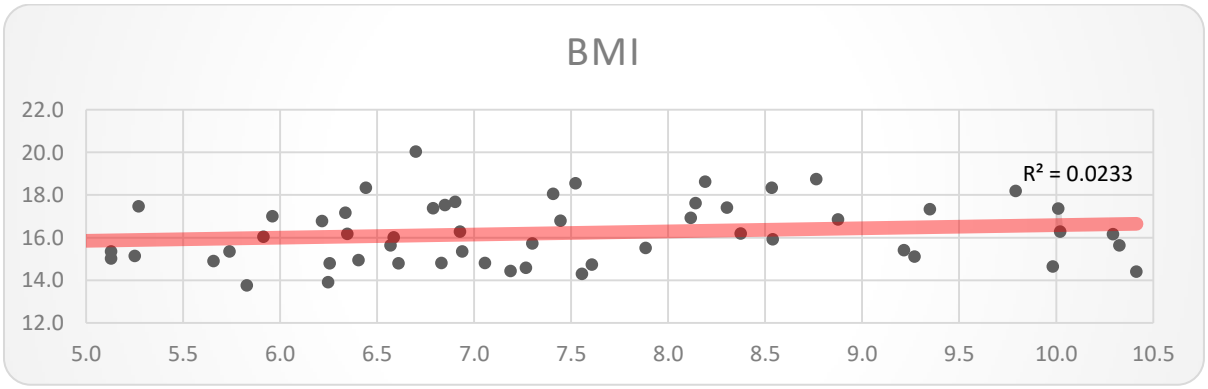

Figure 3. The dependence of BMI on age

In the standing long jump test, a statistically significant change was found ($p < 0.05$) in all three age groups of selected subjects $p = 1.41E-07$. Between the first and second group the

value p = 1.33E-05 was found. Between the second and third group the value was p = 0.0468 (Figure 4).

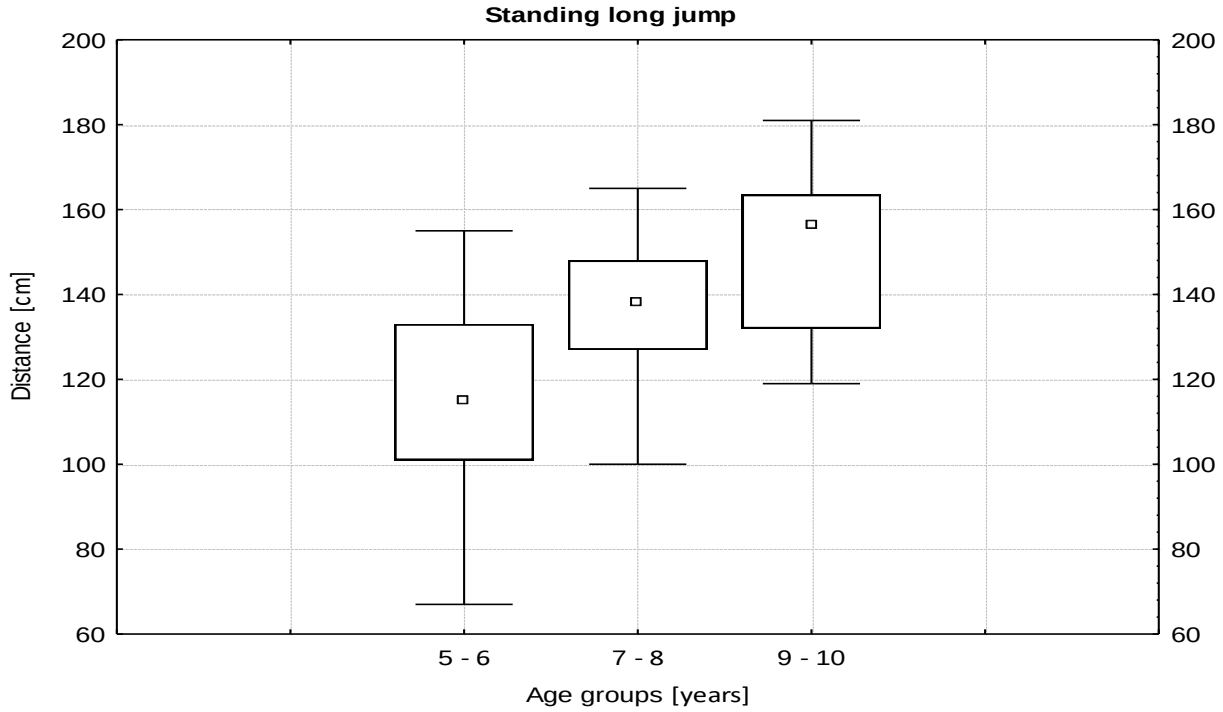

Figure 4. Standing long jump of individual age groups

In the test of knee throw over a head, a statistically significant change ($p < 0.05$) was shown in all three age groups of selected subjects p = 3.25E-10. Between the first and second group the value p = 4.56E-07 was found. Between the second and third group the value was p = 0.0119 (Figure 5).

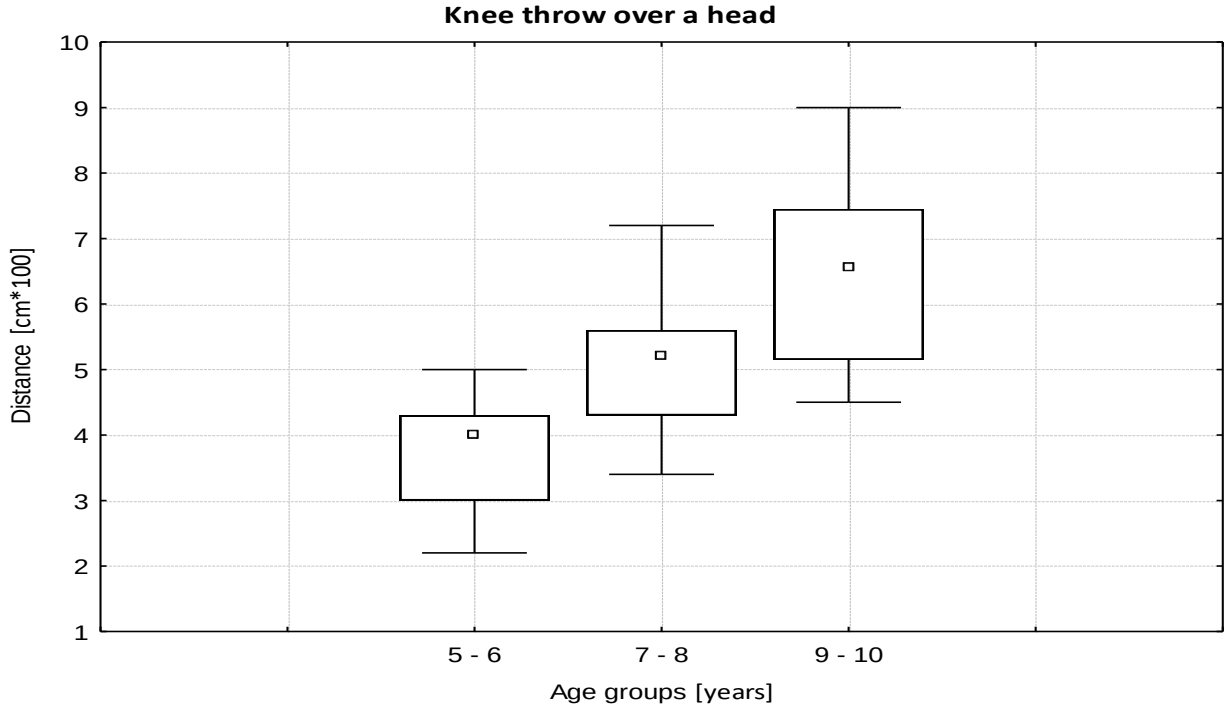

Figure 5. Knee throw over a head of individual age groups

In the test of shuttle run 4 x 10 m, a statistically significant ($p < 0.05$) change was shown in

the age groups of selected subjects p = 0.0001. Between the first and second group the value p = 0.0146 was found. Between the second and third group the value was p = 0.0614 (Figure 6).

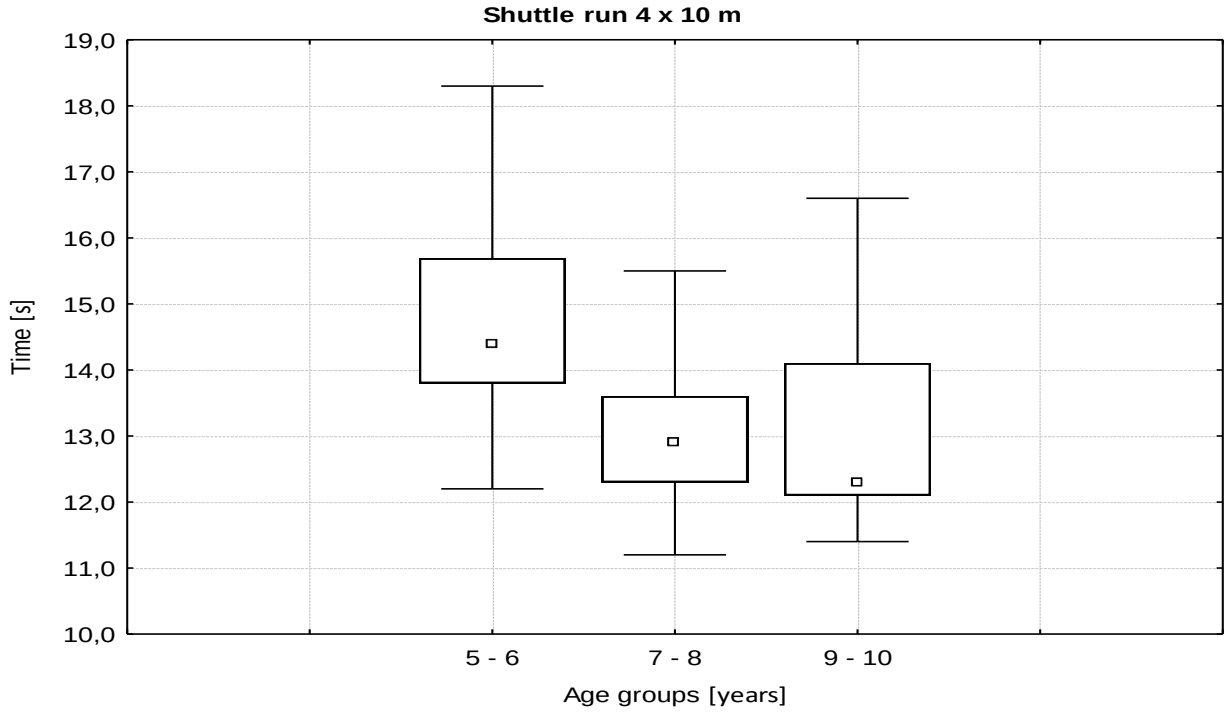

Figure 6. Shuttle run 4 x 10 m of individual age groups

In the test of endurance shuttle run, a statistically significant ($p < 0.05$) change was shown in all three age groups of selected subjects p = 4.66E-09. Between the first and second group the value p = 8.52E-05 was found. Between the second and third group the value was p = 0.0041 (Figure 7). However, the performance increase is not linear, because in the third age group the best and the worst performance is worse than in the second age group.

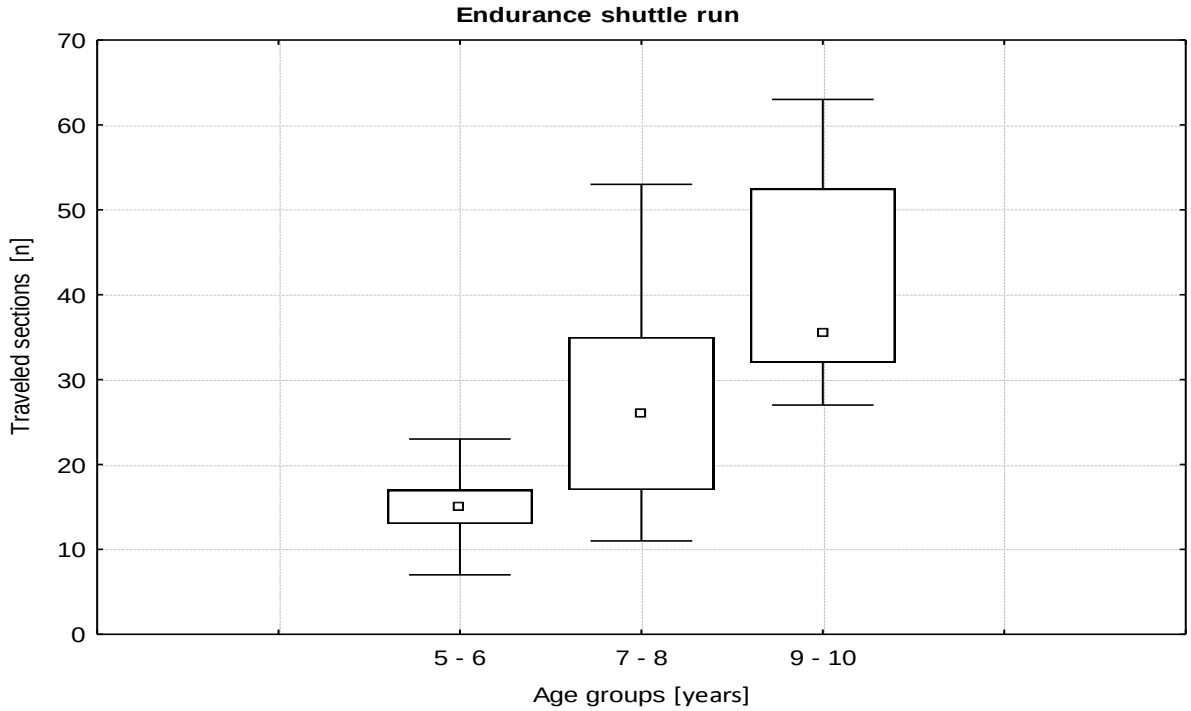

Figure 7. Endurance shuttle run of individual age groups

Discussion

Both shuttle run 4 x 10 m and standing long jump can be found in Brown's (2001) set of tests recommended for identifying sport talent. The standards for shuttle run 4 x 10 m are as follows: 12.6 s (6 years of age), 12.3 s (7 years of age), 12.0 s (8 years of age), 11.7 s (9 years of age) and 11. 4 s (10 years of age). Our results respond to the developmental trends, but they significantly differ in the achieved values of comparable age groups, because our probands have reached higher values. Standards in the standing long jump test are: 140 cm (6 years of age), 145.5 cm (7 years of age), 155 cm (8 years of age), 164 cm (9 years of age) and 173 cm (10 years of age) (Bown, 2001). Our results respond to the developmental trends, but they significantly differ in the achieved values of comparable age groups, because our probands have reached lower values.

Milanesse et al. (2010) recorded in the standing long jump 120 cm (116 - 124) in 6 - 7-year-old children, 130 cm (122 - 138) in 8 - 9-year-old children. They noted a statistically significant difference ($p < 0.001$) between the age groups. These results are comparable with the results of our subjects. In body mass index they recorded BMI 16.3 (16-16.6) at the age of 6 – 7, BMI 16.45 (16.4-16.5) at the age of 8 – 9. They did not record any statistically significant difference ($p = 0.089$) between the age groups (6 - 12 years of age). The values of BMI as well as the differences between the subjects are similar to our subjects.

When comparing our results with the research (Podstawski & Boryslawski, 2012), we state significant similarities in body development except for BMI, which is lower in our subjects. The authors report for boys aged 7 - 9 (8.01 ± 0.85) years body height of 132.18 ± 8.05, body weight of 30.6 ± 7.29 and BMI of 17.36 ± 3.02, for girls aged 7 - 9 (8.02 ± 0.86) years they recorded 129.91 ± 8.22 body height, 28.32 ± 6.33 body weight and 16.64 ± 2.52 BMI. In the indicators of general physical performance we recorded 27.8 cm higher average value in favor of our 7 to 8-year-old (7.95 ± 0.57) children. On the other hand, when comparing the running speed with changes of direction, our subject (7 - 8 years of age) reached 0.7 s higher average value.

Conclusion

In the survey, we recorded differences in the physical development and general physical performance between the age groups. In the body height, we note the increasing linear dependence ($p = 1.64E-15$) with respect to the age of the probands. We also state the dependence in body weight ($p = 6.62E-07$). A slight increasing trend but not statistically significant ($p = 0.0357$) also occurred in BMI between the age groups.

The level of general physical performance in individual years of children's life points out to favorable differences of physical performance with a rising age. In the age groups, we recorded statistically significant differences in general physical performance. In all tests, we recorded a steady increase of performance, with the exception of shuttle run 4 x 10 m between the groups 7 - 8-year-old and 9 - 10-year- old children.

Our results confirm that the explosive power of upper and lower extremities and endurance running capacity are evenly increasing in accordance with physical development. We did not record a steady increase in running speed with changes of direction in the oldest age category. This may also be due to a smaller number of subject members in the oldest age category.

Physical development and general physical performance should be monitored regularly in order to record the current status or to record positive and negative deviations of children, and to take steps to further improving of healthy development and increasing of physical performance in time.

Acknowledgments

This contribution is a part of Grand project VEGA 1/0571/16 The impact of training on physical abilities, physical and functional development of 5 – 6 years old children.

References

Brown, J. (2001). *Sports talent: How to identify and develop outstanding athletes*. Champaign, IL: Human Kinetics.

Čillík, I., Kollár, R., Kremnický, J., Pivovarníček, P., Tokárová, M., Ďurják, O., Švachová, S., & Murínová, A. (2014). *General physical performance and physical development of the first grade pupils attending primary schools in Banská Bystrica*. Hradec Králové: Gaudeamus.

Laczo, E., Buzgó, G., Cihová, I., Cvečka, J., Kalinková, M., & Rupčík, Ľ. (2014). *Rozvoj a diagnostika pohybových schopností detí a mládeže.* [Development and diagnostics of physical abilities of children and youth]. Bratislava: NŠC a FTVŠ UK v Bratislave.

Milanese, C., Bortolami, O., Bertucco, M., Verlato, G., & Zancanaro, C. (2010). Anthropometry and motor fitness in children aged 6-12 years. *Journal of Human Sport and Exercise*, 5(2), 265-279.

Malina, M. R. (2004). Motor development during infancy and early childhood: overview and suggested direction for research. *International Journal of Sport and Health Science*, 2, 50-66.

Malina, M. R., Cumming, S. P., Morano, P. J., Barron, M., & Miller, S. J. (2005). Maturity status of youth football players: a noninvasive estimate. *Med. Sci. Sports Exerc*, 37(6), 1044-52.

Moravec, R., Kampmiller, T., Sedláček, J., Ramacsay, L., Slamka, M., Šelingerová, M., et al. (2002). *Eurofit. Telesný rozvoj a pohybová výkonnosť školskej populácie na Slovensku.* [*Eurofit. Physical development and physical performance of the school population in Slovakia.*] Bratislava: Slovak Society for Physical Education and Sport.

Myer, G. D., Lloyd, R. S., Brent, J. L. & Faigenbaum, A. D. (2013). How Young is "Too Young" to Start Training? *ACSMs Health Fit J.*, 17(5), 14-23.

Oravcová, J. (2010). *Vývinová psychológia*. [Development psychology]. Banská Bystrica: Pedagogická fakulta, UMB v Banskej Bystrici.

Podstawski, R., & Boryslawski, K. (2012). Relationships between selected anthropometric features and motor abilities of children aged 7-9. *Clinical Kinesiology*, 66(4): 82–90.

Šimonek, J. (2015). *Testy pohybových schopností*. [Tests of physical abilities]. Nitra: Pandan s.r.o.

Vágnerová, M. (2005). *Vývojová psychologie*. [Development psychology]. Praha: Univerzita Karlova.