

Analysis of indicators of physical development of children of senior preschool age

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Children's health is the most valuable asset of every civilized society; it creates the physical, intellectual, spiritual and social foundation of the state. It was established that the deviation of physical development indicators from the age norms of development and the disharmony of development is accompanied by changes in the health status of children.

Purpose: make an analysis of indicators of the physical development of children 5–6 years.

Material & Methods: analysis and synthesis of scientific and methodological literature, Internet resources and educational programs, pedagogical observation, determination of the level of physical development (anthropometry method), index method (Pigne index), methods of mathematical statistics.

Results: analysis of anthropometric indicators of length and body weight, chest circumference in boys and girls 5–6 years old allowed us to determine that these indicators in all three gender and age groups correspond to the average level.

Conclusions: children 5–6 years old, head circumference are low (<54 cm). Biological age in 50,0% of boys and in 62,1% of girls in I, II and III age groups corresponds to the passport age. The majority of boys 5–6 years old (64,3%) and girls (59,2%) have a harmonious constitution ($p > 0,05$), 35,7% and 40,8% of children have a disharmony in development, respectively. According to the Pigne index, in children of 5–6 years old, in all three age groups, normostenic (5,2%) and asthenic (94,8%) body types are observed.

Keywords: children 5–6 years of age, physical development, biological age, body harmony, preschoolers.

Introduction

Children's health is the most valuable asset of every civilized society; it creates the physical, intellectual, spiritual and social foundation of the state. The physical health of a child is such a state of his body when the indicators of the main physiological systems are within the normal range and adequately change in the process of its interaction with the environment, the harmonious interaction of all organs and systems, their dynamics and balance [6].

Indicators of physical development are important parameters of health. Physical development is the process of changing the forms and functions of the human body during its individual life, characterized by a set of features that determine the external indicators of the physical condition of the body at a certain stage of its development (A. Sabirov, V. Pantic, G. Gatz, 2016).

According to G. S. Nikiforov (2006), physical development in general form is a state of the human body, which is characterized by the possibilities of adaptation to various environmental factors, the level of physical development, physical and functional readiness of the body to perform physical activities [14]. B. H. Landa (2017) believes that the path to health begins with its diagnosis, measurement of quantitative and qualitative indicators [3; 12].

In the scientific works of V. I. Fedorenko (2015) it was found that deviations of physical development indicators from age norms of development and disharmony are accompanied by changes in the health status of children: the greater the disruption in physical development, the greater the likeli-

hood of illness [19]. Children who have a harmonious physical development by age are considered the least vulnerable. But almost a third of children have marked deviations in their health status, which are associated with a violation of the pace of age development under harmonious status (V. Pasechnik, G. L. Petrina, 2017 [15], I. G. Bondar, 2014 [2]).

Modern views on the need to study the physical development of preschool children are considered in a number of scientific studies (B. K. Assessing, 2004 [1]; Yu. M. Shevchenko, S. M. Dubyaga 2009; D. Chayka, N. V. Moskalenko, 2012; N. V. Moskalenko, A. V. Polyakova, J. Kovrov, 2013 [13], V. A. Druz, G. P. Artemyeva, N. V. Nechitailo, 2014, S. Zamrozevich-Shadrina, 2014 G. Petrenko, 2015 [16], V. I. Fedorenko, L. N. Kitsula, 2015; I. Vovchenko, 2016 [5]; K. A. Slabinskaya, M. A. Mameshina, 2017 [17], S. P. Duditska, 2017 [8]). Scientists note a tendency to reduce the level of physical development of preschoolers, which is due to the fact that children of senior preschool age have a high need for physical activity and cannot always realize it at the proper level. It should be borne in mind that the independent physical activity of children 5–6 years old in the conditions of preschool education institutions is increasingly limited to an increase in the duration of studies with a static posture and an increase in children's interest in computer technologies (A. Bohinich, 2007; M. A. Runova, 2007). This leads to the search for new approaches to the use of physical education in the educational process of children of senior preschool age, taking into account their level of physical development and somatic health.

Purpose of the study: make an analysis of indicators of the physical development of children 5–6 years.

Material and Methods of the research

Studies were conducted in the educational complex number 28 and the institution of preschool education number 337, the Dnieper. The study involved 135 children 5–6 years old, of whom 67 (49%) are girls and 68 (51%) boys. The children were divided by gender and into three age groups [4] 5 years, 5,6 and 6 years (Table 1).

Research methods: analysis and synthesis of scientific and methodological literature, Internet resources and educational programs, pedagogical observation, determination of the level of physical development, index method (Pigne index), methods of mathematical statistics.

Results of the research

Physical development is a complex of morphofunctional traits characterizing the age level of a child's biological development. The physical development of preschool children, along with the disease, is one of the most important indicators of the health of the child population (T. Yu. Krucevich, 2011 [11]; E. S. Vilchkovsky, N. F. Denisenko, 2011 [4]). To determine the level of physical development, we used indicators: body length, body mass, chest circumference (CC) (according to E. S. Vilchkovsky, N. F. Deniseko, 2011), head circumference (HC) (according to N. A. Tupchiy, 2001) and the Pigne Index (according to M. V. Chernorutsky). The results were compared with regulatory [4; 10; 18; 20].

One of the most stable indicators of physical development is body length, since it has the least impact on the environment. This is a peculiar indicator of not only the process of human growth at certain age stages, but also the level of maturity of children (A. D. Dubogai, 1991, V. Pasechnik, 2017 [15]). According to the studies of the body length of girls and the age group, the average is 109,23±6,49 cm, II age group – 112,95±6 cm, Group III – 116,19±4,32 cm. Significant difference between the results and There are no groups II and III ($p>0,05$). The difference between the maximum and minimum indicators of body length in girls 5–6 years is reduced, that is, there is a slowdown in the growth of body length.

The body weight of a child depends on the influence of various factors, on lifestyle and on environmental effects (V. P. Murza, 2001, V. Pasechnik, 2017). The average body mass of girls and the age group was 17,92±2,13 kg, Group II – 17,50±2,42 kg, Group III – 18,06±2,62 kg. Comparing the indicators of the body mass of girls between the I, II and III age groups, it can be noted that there are no significant differences ($p>0,05$). The difference between the maximum and minimum value in terms of body mass of girls 5–6 years old is 3–5 kg, which is natural.

The chest circumference indicators in girls I, II and III age groups correspond to the age norm (53–62 cm). There are no significant differences between the groups ($p>0,05$). We compared the results of measuring the head circumference with the average for this age group [18]. The study found that most girls (95%) have a low level (<54 cm).

The study of the physical development of boys 5–6 years old showed that the average length of the body in the I age group is 110±4,38 cm, in the second age group – 115,11±3,88 cm, in group III – 117,04±4,87 cm. A significant difference between the results is observed in boys I and II age groups ($p<0,05$). There are no significant differences in indicators of body length between age groups II and III ($p>0,05$). The difference between the maximum and minimum indicators of body length in boys 5–6 years old decreases, that is, there is a slowdown in the growth rate of body length.

In boys I, II and III age groups, according to bodyweight studies, the average index is approximately the same 18,52±2,22 kg. Significant differences between these age groups are not observed ($p>0,05$). Tracing the indicators of the third age group, it can be noted that the maximum indicator was 25 kg, and the minimum – 15 kg, with a difference between the indicators of 10 kg. There is no significant difference between the indicators of body weight of boys II and III age groups ($p>0,05$). In terms of body mass indicators of boys of all three age groups, the difference between the maximum and minimum values is about 6–10 kg, which is natural and individual in the development of each child.

The average chest circumference in boys of all ages, compared with standard values, are at an average level (54–52 cm). The head circumference indicators of boys is low (<54 cm).

The average indicators of the body length of boys and girls and the age group have no significant differences ($p>0,05$). But there are significant differences in I and III age groups between the maximum values of girls and boys ($p<0,05$). As the age of children increases, the difference between maximum and minimum values in I, II and III age groups between boys and girls decreases, which indicate a slowdown in growth.

When comparing the average body weight of girls and boys of all three age groups, there is a difference of ±1–2 kg, this is due to the different growth rates of children. There is no significant difference between the chest circumference of boys and girls ($p>0,05$).

The distribution of boys of the I, II and III age groups by levels of physical development showed that the majority of boys I (52,6%) and III (73,9%) age groups have an average growth rate in body length. Almost 1/3 boys of the II age group (38,9%) have an average level of indicators of body length. The aver-

Table 1
Distribution of children by age groups

No. i/o	Sex of the child	Age groups of children (%)					
		I group (5 years)		II group (5,5 years)		III group (6 years)	
		Age range	%	Age range	%	Age range	%
1.	Girls	4,9–5,2	38,8	5,3–5,8	23,9	5,9–6,2	23,9
2.	Boys		27,9		26,5		33,8

age and high levels were observed in 61,1% of boys.

In terms of body weight, 42,1% of boys of the I age group have an average level, 26,4% – low and below average. 31,6% of boys of 5 years have above average and high levels. Most boys of the II age group (61,6%) have an average level, and 33,3% have a low and below average. More than half of children in age group III (69,5%) have a low and below average level in terms of body weight.

In terms of chest circumference, the average level is observed in boys of the II (77,8%) and III (65,2%) age groups. In 31,6% of boys and age groups were low and below the average level of CC, the average level – in 47,4% and above average and high – in 21,0% of children. In terms of head circumference, most boys I (94,7%), II (83,3%) and III (87,0%) of the age groups have a low level.

The distribution of girls 5–6 years by levels of physical development showed that the indicators of body length almost half of girls I (50,0%), II (50,0%) and III (56,3%) of age groups are on average. Body mass indexes for most girls in the 1st and 2nd age groups are also on average (61,5% and 66,7% respectively). In the second age group, 37,5% of the girls have an average level and 50,1% are below the average and low body mass. In 56,3% of girls 6 years of age, body mass indexes are on average, and 43,8% are low and below average.

More than half of the girls I (65,4%), II (81,3%) and III (81,3%) of the age groups according to CC indicators have an average level. Indicators of the head circumference in most girls I (88,5%), II (93,8%) and III (75,0%) of age groups are at a low level.

The non-parametric (centimetric) method and the tables of the centile distribution of attributes are used for the individual assessment of physical development and harmony of the physical development of children. According to the method, the area of "very low" values ranges from up to 3 cents, "low" values – from 3 to 10 centiles, "below the average" – from 10 to 25 cents, the "average" level – from 25 to 75 centiles, "above average" – from 75 to 90 centiles, "high" values – from 90 to 97 centiles, and the area of "very high" values – above 97 centiles.

If the difference in centile "corridors" between any of the three indicators (body length, body weight, chest circumference) does not exceed one, then we can speak of a harmonious physique, otherwise, a disharmonious one. (E. D. Duca, T. L. Vasilyeva, N. V. Mishina, 2000 [9]).

In the first age group, both boys (57,9%) and girls (65,4%) have a harmonious physique. The disharmony physique – in 42,1% of boys and 34,6% of girls (Table 2). There is a high percentage of boys (72,2%) in the second age group with

a harmonious physique, and the majority of girls in this age group (56,3%) show disharmony physique.

Almost the same number of children of the III age group (51,1%) has a harmonious physique, and disharmonious – 47,8% of boys and 50,0% of girls.

The proportionality of the physical development of the body of children 5–6 years old, we determined by the anthropometric coefficient of the Pigne index. If we evaluate it by the method of E. S. Vilchkovsky, then in our study in 17,6% of boys and in 20,9% of girls, proportional physical development is observed (Figure 1). 82,4% of boys and 79,1% of girls have disproportion in physical development.

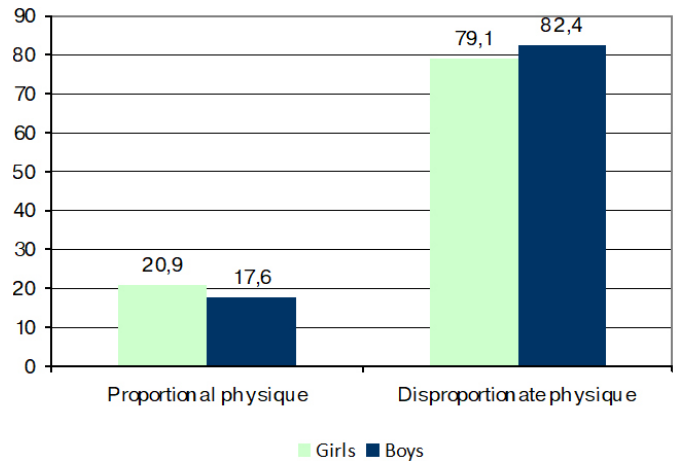


Figure 1. Distribution of children 5–6 years of age according to the Pigne index (according to E. S. Vilchkovsky)

Pigne index estimation according to V. M. Chornorutsky provides a definition of the constitution of the body of children 5–6 years. Thus, in the study, it was possible to distinguish the normostenic type in 5,2% of children and asthenic body type in 94,8% of boys and girls of I, II, and III age groups.

Scientists note [7; 11], determining the biological age in conjunction with the indicators of physical development allows us to more accurately assess the level of functional capabilities of the main systems of the body, increases (A. V. Polyakova, N. V. Moskalenko, 2015). Determining the compliance of biological age with a passport is an important criterion that necessitates the selection of adequate means and methods in planning physical education classes in preschool education institutions (A. V. Polyakova, 2015, T. Yu. Krutsevich, N. I. Vorobev, G. V. Bezverkhnyaya, 2011). The biological age of children 5–6 years old was estimated by the method of N. A. Tupchii, where the author uses the method of assessing body proportions and the child's height according to gender and age standards [18].

Table 2 Percentage distribution of children 5-6 years old by harmonious physical development

No. i/o	Sex of the child	5 years		5,6 years		6 years	
		HP	DP	HP	DP	HP	DP
1.	Boys	57,9	42,1	72,2	27,8	52,2	47,8
2.	Girls	65,4	34,6	43,7	56,3	50,0	50,0

Remark. HP – harmonious physique, DP – disharmony physique.

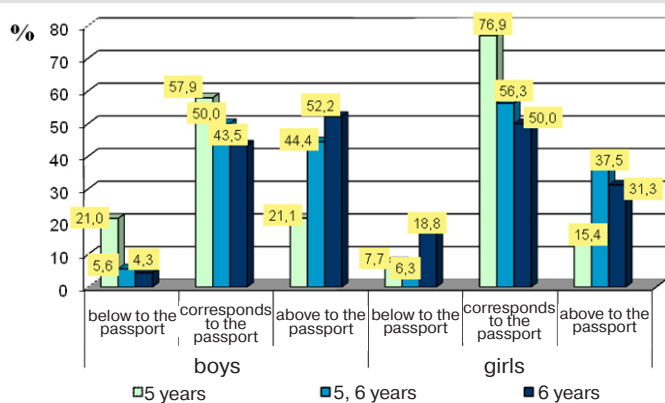


Figure 2. Distribution of children 5–6 years of biological age

Comparing the biological age (according to indications of physical development) with the passport one (Figure 2), one can see the correspondence of the indicators in 57,9% of boys and 76,9% of girls in the first age group.

In the second age group, the biological age corresponds to a

passport in 50,0% of boys and 56,3% of girls. In almost half of boys (52,2%) and girls (50,0%) of the age group III, there is a discrepancy between the biological and passport age in the direction of increasing the number of children with a biological age higher than the passport age. Thus, the biological age of 54,8% of children (boys – 30,4%, girls – 24,4%) correspond to the passport age with a tendency to acceleration in 36,3%.

Conclusions / Discussion

Analysis of the results of the study of the physical development of children 5–6 years old showed that in all three age and gender groups anthropometric indicators correspond to the average level. There is no significant difference between the groups according to the student's criterion ($p < 0,05$). In most preschoolers, head circumference indicators are low.

Harmonious physique have a 60,0% of children, 40,0% – disharmonious. According to the Pigne index in 19,3% of preschoolers, proportional physical development is observed. Only 5,2% of children have normostenic type of structure of body. Biological age in 54,8% of preschool children corresponds to the passport.

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