



## PHYSICAL STATE WITH LIMITATIONS OF PRESCHOOLERS IN THEIR PSYCHOLOGICAL AND PHYSICAL DEVELOPMENT

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**Abstract:** *Preschoolers with unbalanced psychophysical development are becoming more prevalent today, which is a bad trend. At the same time, society provides effective remedies to this issue. Preschoolers in this group can develop more favourably than their healthy classmates under specific circumstances, and this process can be controlled within the framework of the current educational systems. Determining the content of physical exercises to correct children with special needs' psychophysical development and supporting preventative and health measures requires research on the markers of physical condition in children with special needs.*

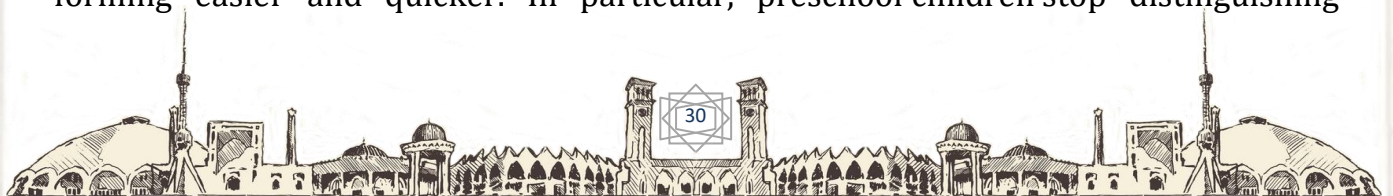
**Key words:** *peers, cardiovascular system, respiratory system, approach, indicator.*

### INTRODUCTION

Children's health is a major factor in determining a country's overall health. This is a society's most valuable resource (Efimenko, 2013; Nedilko & Rudenko, 2013; Prystupa, Petryshyn & Bodnar, 2013; Pityn, Pasichnyk, Galan, Melnyk & Semeryak, 2018). Formation of preschooler's health, full development of organs and his body systems are important tasks of preschool educational institutions (Pasichnyk, Pityn, Melnyk, Semeryak, & Karatnyk, 2018).

In our period, there has been a negative shift in the dynamics of children's population health. (Dalen, Ingvaldsen, Roaas, Pedersen, Ingebrigt, & Aune, 2017). Children with chronic pathologies and those with disabilities are both on the rise. Currently, prenosological morphological and functional abnormalities are present in around 50% of children under the age of six. Modern preschoolers' psychophysical development is characterised by a tendency to see more kids with unbalanced psychophysical development (in 1998 -55.9%, in 2005 - 59.4%) (Nedilko & Rudenko, 2013; Shafransky, 2016). This largely applies to children with psychophysical retardation due to impaired activity of various or several analyzers (visual, auditory), with organic damage of central nervous system (CNS), with mental retardation (MR), speech disturbances, musculoskeletal disorders, behavior disorders, emotional abnormalities, and severe multiple disorders (Nedilko & Rudenko, 2013; Shafransky, 2016).

Preschool education is optimal for the inclusion of children who require correction of psychophysical development into the general education environment. It is so because at this time the acceptance aof various personal manifestations is forming easier and quicker. In particular, preschool children stop distinguishing





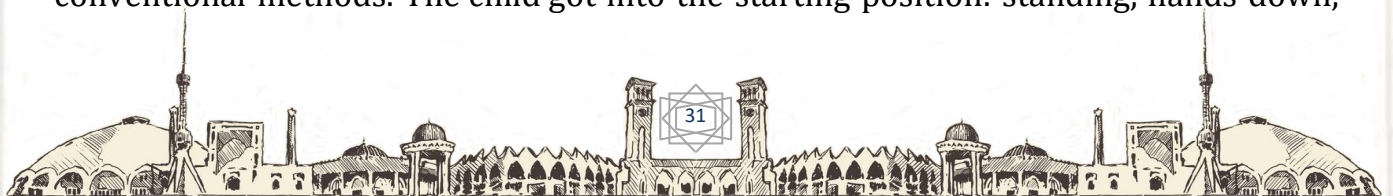
differences between people, actively master cultural skills and abilities, etc. much faster than adults do (Mavilidi, Okely, Chandler, Cliff, & Paas, 2015; McNeill, Howard, Vella & Cliff, 2020). Moreover, under certain conditions, the development of preschool children, who need correction of psychophysical development may equalize or approach the level of development of healthy peers, and within the existing educational systems, this process can be managed (Prystupa et al 2013).

Today, studies related to the development of approaches, directions, methods, etc. of working with children who have disorders of psychophysical and intellectual spectrum are important and relevant. In particular, such scientists as der Fels, te Wierike, Hartman, Elferink-Gemser, Smith, & Visscher (2015) have focused on the relationship between motor and cognitive skills of children of different ages with developmental disorders. Other specialists (Wouters, Evenhuis & Hilgenkamp, 2020) today deal with studying physical fitness of children of different ages with moderate and severe intellectual disabilities. The researchers (May, Chan, Lindor, McGinley, Skouteris, Austin, McGillivray & Rinehart, 2021) are also studying the impact of dance on the diverse abilities of children with disabilities. In general, including these works, there are significant number of modern scientific papers on the issues of children with special needs. This means that modern society, both at the scientific and practical levels, tries to socialize children with disabilities properly, to create opportunities for their rational physical development, provide decent living conditions and prospects for their future.

Physical education is an important part of inclusive education. It contributes to the formation of a number of positive personality traits and physical improvement, and naturally combines not only biological, but also social aspects (Carson, Hunter, & Kuzik, et al., 2016). Physical education is designed to promote the use of psychophysical capabilities of the child's body for self-realization in society (Garvey, 2018; Kyriakos, 2020). This is possible by means of rationally organized motor activity, using saved functions, residual health, and natural physical resources. In the context of the above, the study of indicators of physical condition is important for substantiation of preventive and wellness measures, determination of physical exercises content to correct the psychophysical development of children with special needs.

### **MATERIAL AND METHODS.**

The following research methods have been applied in the paper: general scientific (analysis, generalization of literary sources data); pedagogical (ascertaining experiment); medical and biological. The program included anthropometric studies that were conducted according to conventional methods. In our research, we determined the body weight (kg), body height (cm), chest circumference (cm), head circumference (cm), wrist dynamometry of the leading arm (kg). The hand muscles strength was measured using a child wrist dynamometer (DRP-30) according to the conventional methods. The child got into the starting position: standing, hands down,





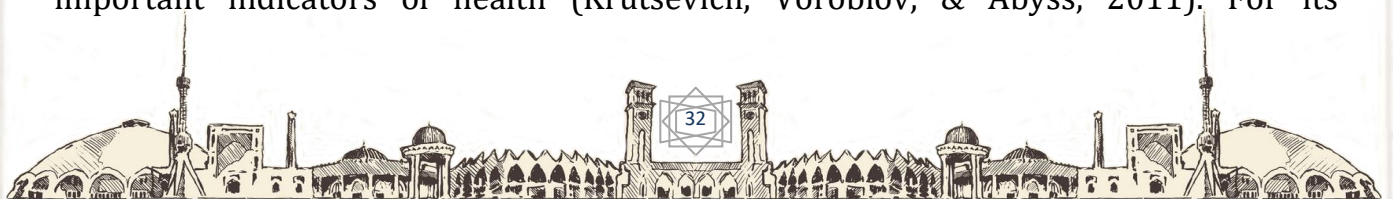


and on the signal he/she squeezed the dynamometer as much as possible by the leading hand, taking it aside. There were two attempts. Children had 1-2 minutes to rest between the attempts. The measurement results were recorded with an accuracy to 0.1 kg. All anthropometric measurements were carried out in accordance with generally accepted rules and requirements of anthropology. A height meter was used to determine the body height, medical weight - the body weight. A measuring tape was used to measure chest and head circumference. The physical development assessment of children was made by comparing their individual indicators with the average age standards. The biological age and the Quetelet index were calculated based on the obtained indicators. In determining the biological age of the studied cohort of children, we used the ratio of head circumference to body height and performed appropriate calculations. The obtained data were compared with the indicators of biological age of the assessment scale of the physical fitness of preschool children. The Quetelet index (QI) was used to determine the body weight (BW) to height (H), which was calculated by the formula  $QI = BW / H$ . The study of acute respiratory diseases duration per year was carried out on the basis of copying from medical records and visit logs. Evaluation of hemodynamics was performed according to the data of palpatory heart rate monitoring, tonometry by auscultation Korotkoff method, with the determination of: heart rate (HR), systolic (SBP), diastolic (DBP) and pulse (PBP) blood pressure. The Robinson index was used to determine the reserve-functional capacity of the cardiovascular system that characterizes the systolic work. The Robinson index was calculated using the formula:  $HR \times SBP / 100$  (relative units). RI values were distributed by reserve levels (the lower the index value at rest, the higher the maximum aerobic capacity of the body): low - more than 96 RU, below average - 86-95 RU, average - 76-85 RU, above average - 71-75 RU, high - less than 70 RU. A complex indicator that reflects the level of adaptive capacity of the child's body is the adaptation index based on regressive ratios of heart rate, systolic and diastolic blood pressure, age, body weight and height. All these indicators play a significant role in the formation, consolidation of the adaptive activity of the body, and the levels of their regressive relationships can characterize the level of adaptation of adaptive potential (AP) in general according to Baevskiy & Bersenev (1997).

### RESULTS.

The development and alteration of biological forms and bodily processes in a developing child reflect their physical health. Physical condition is assessed using a variety of morphological characteristics of physical maturation, biological and chronological age conformity or mismatch, functional indicators of various body systems, level of non-specific immune resistance, indicators of posture construction, and other factors.

Physical development is a continuous process and its harmony is one of the most important indicators of health (Krutsevich, Vorobiov, & Abyss, 2011). For its





assessment, factors including body height, weight, chest circumference, somatometric data calculation, and anthropometric index were taken into consideration.

The analysis of the obtained body weight and height characteristics of preschool children with psychophysical disabilities did not reveal their lagging behind the established normative values for persons of the appropriate age and sex (Krutsevich et al, 2011). The obtained indicators of the head circumference were within the normative values in all examined children (Tupchiy, 2001; Patricia, Kyriaki & Chronoula, 2019).

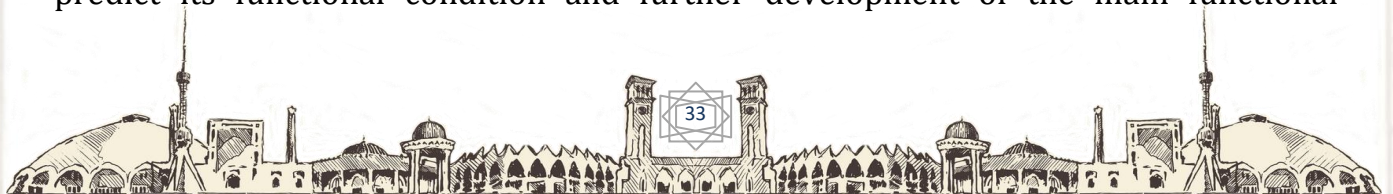
An important indicator for assessing physical development is chest circumference. Its value closely correlates with the functional indicators of respiratory and cardiovascular systems. Thus, according to our data, the chest circumference indicator was in the range of 55.42-57.71 cm in girls and 55.66-61.40 cm in boys. These results coincide with the age parameters (Krutsevich et al, 2011). Thus, according to a number of physique indices (height, weight, chest circumference), the surveyed children with special needs have an average level of physical development according to the table of standards (Krutsevich et al, 2011).

Among the important characteristics of the child' musculoskeletal system development is the wrist dynamometry. In particular, the studied children showed the indicator of the wrist strength in the range of 4.00-5.50 kg in girls and 4.14-6.10 kg in boys.

According to this indicator, all surveyed children with psychophysical disorders have the indicator of wrist muscle strength of the leading hand below the norm. This indicates a low level and developmental delay of the children' musculoskeletal system. It is known that the body's resistance to adverse factors is evaluated by the number and duration of acute respiratory diseases that the child had in the previous year (Cobley, Abraham & Baker, 2008; Mainstone-Cotton, 2017). The obtained data showed that the incidence of diseases in the surveyed children ranged from 18.57 to 24.50 days in girls and from 18.62 to 21.20 days in boys. The estimate of the number of days per year missed in connection with acute respiratory diseases in girls and boys with psychophysical disorders is 2 points and indicates a level below average (Tupchiy, 2001).

Calculation of the slouch back index in children with special needs made it possible to find out that girls and boys with MSD, MR, DS and ASD are characterized by a high degree of slouch back. The values of slouch back index correspond to the average level only in children of both sexes with MSD. Lower than average ranges are inherent in children with MR, DS and ASD. The most noticeable low values of the slouch back index were recorded in children with MSD (Tupchiy, 2001). In general, this can be explained by the fact that older preschool age is a critical period of development, which is characterized by accelerated growth rate.

Universal indicators of adaptive processes in the body, based on which we can predict its functional condition and further development of the main functional







systems, are indicators of cardiovascular and respiratory system (Garvey, 2018). It was proved (Baevskiy, & Bersenev, 1997) that the functional and reserve capabilities of the cardiovascular and respiratory systems are the basis for the formation of adequate compensatory reactions of the body to environmental influences. The results of cardiovascular and respiratory systems functional testing of the surveyed cohort of children are shown in Table 2.

We have found that the resting heart rate in girls was in the range of 91.85-100.00 beats per minute, in boys -92.00-100.88, respectively. As we can see from the table, the average heart rate corresponds to appropriate indicators in children with MSD and SD. At the same time, children with ASD, DS and MR have slightly higher heart rate than the age norm for both sexes.

According to the analysis of surveyed cohort, it was found that the average values of SBP (90.50-103.50 mm Hg) and DBP (57.12-68.71 hg) were within the age norm. The values of children' PBP, at the same time, ranged from 32.4 to 37.25 mm Hg.

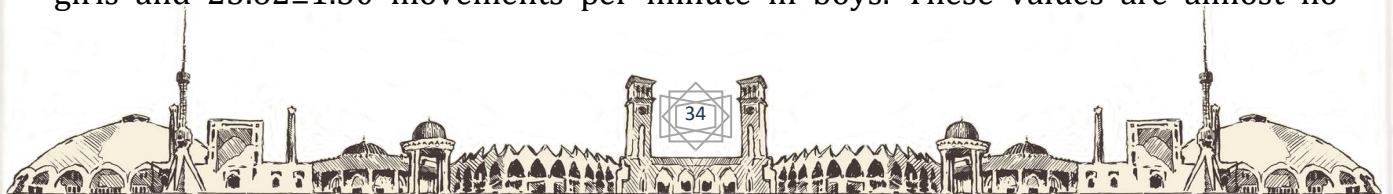
To quantify the energy potential of the child's body, a reserve indicator was used - Robinson index, which characterizes the systolic work of the heart.

Comparison of the average values of the Robinson index with the rating scale (Vetoshkina & Klyuchnikova, 2009) shows that the results of girls and boys with DS, ASD and MR correspond to a low level. Children with MSD have a below average level of cardiovascular system regulation. An average index level was established only for children with SD.

The analysis of the adaptive potential values revealed that among all surveyed children with psychophysical disorders 36.0% of girls and 55.2% of boys had a satisfactory level of adaptive capacities, 56.0 5% of girls and 41.3% of boys - had tense adaptation, while 8.0% and 3.5% respectively - unsatisfactory adaptation (Fig. 2). It is noteworthy that no child has been found to have any adaptation failure among the surveyed group.

An important indicator of cardiovascular system evaluation is endurance coefficient (EC). In normal condition in older preschool children, it should be equal to 23-25 RU. An increase in the value of this indicator relative to the norm indicates a weakening of the cardiovascular system function, a decrease - to strengthening. In general, the average endurance coefficient of the surveyed children with special needs of both sexes, regardless of the disability, indicates a weakening of the cardiovascular system functioning. The division of girls and boys with psychophysical disorders by the value of endurance coefficient is presented in Figures 3-4.

According to the survey, the RR was within the normal range (Wilczkowski, 2012) in girls and boys with MSD and in average was equal to  $23.00 \pm 0.81$  movements per minute and  $23.30 \pm 1.14$  movements per minute, respectively. The RR in children with SD was slightly higher, namely  $23.85 \pm 1.34$  movements per minute in girls and  $23.62 \pm 1.50$  movements per minute in boys. These values are almost no





different from peers' indicators without psychophysical disorders. The highest RR values are inherent for girls and boys with DS ( $26.00 \pm 1.00$  movements per minute and  $25.00 \pm 1.41$  movements per minute, respectively). The obtained RR values of children with MR and ASD exceed the average normative values and are in the range of 24.00-24.28 movements per minute.

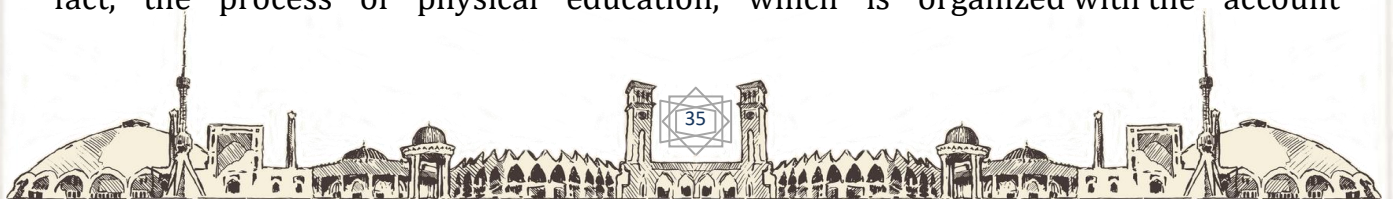
When comparing the functional indicators of the respiratory system with the rating scale (Wilczkowski, 2012), it was found that the results of girls and boys with MSD correspond to a score of 3 points, and girls and boys with SD, MR, DS and ASD - 2 points. Thus, children with MSD have an average level of the respiratory system functionalities, and children with SD, MR, DS and ASD have below average level, respectively.

### DISCUSSION.

According to numerous studies, the physical education process of preschool children with psychophysical distractions should provide maximum conditions for the full development of these category children. There is also a need of correction the existing manifestations of dysontogenesis in them (Efimenko, 2013; Glushchenko et al, 2013; Pasichnyk et al, 2018). In the course of the research, we confirmed that the features of development of children with psychophysical disabilities are caused by lagging behind the norm in most indicators (Efimenko, 2013; Pityn et al, 2018; Maelan et al, 2019). This, in turn, leads to functional impairment of some physiological systems. The observed decrease in the functional condition of the motor analyzer in children with psychophysical disabilities, which arises due to limited motor activity, leads to a reduced performance of the cardiovascular and respiratory systems. Children with psychophysical disabilities, compared with healthy peers, have respiratory, heart rate and morbidity rates throughout the year that are more frequent. The decrease in the functional condition of the motor analyzer in the surveyed children leads to a weakening of functional activity of the cardiovascular system of the body during exercise Baevskiy, & Bersenev, 1997; Adamo, Wilson, Harvey, et al., 2016).

Our experimental material supplements the data of other authors on the most pronounced weakening of cardiovascular and respiratory system activity in children with autism spectrum disorders, Down syndrome and mental retardation. The detected deviations indicate the presence of motor disorders caused by organic lesions of the central nervous system, disorders of the intellectual, emotional and volitional sphere, low level of perception, processing of motor material (Pasichnyk et al, 2018).

The conducted research supplements and confirms the scientific information that development and teaching of children with special needs should take place under the influence of natural and purposeful correction and pedagogical process (Nedilko, & Rudenko, 2013; Prystupa et al, 2013; Pasichnyk et al, 2018; Pope, Zeng, Gao, 2017). In fact, the process of physical education, which is organized with the account







of a differentiated approach to every child with psychophysical disabilities, will successfully solve the problem of correction of their psychophysical development and integration into society.

### CONCLUSIONS.

The findings of a study on the physical health indicators of 5–6-year-old kids with aberrant psychophysical development revealed that these kids don't lag behind their healthy classmates in terms of the major anthropometric measures. It is known that their biological age matches the one on their passport. Regardless of the handicap, the disease incidence rates in children with special needs of both sexes show an inadequate level. The vast majority (MSD, MR, DS, ASD) of the surveyed girls and boys are characterized by a slouch back, except for children with SD. As a result of the research, an impairment of the cardiovascular system functional conditions has been found, which is characterized by a slight increase in heart rate at rest. An unsatisfactory quality of cardiovascular system regulation (92.0% in girls, 75.8% in boys) was reported in most of the surveyed children. Reduced adaptive capacity of the cardiovascular system was found in children of both sexes with MR, ASD, and DS, while a satisfactory level of adaptation was found in their peers with MSD and SD.

The values of endurance coefficients of the examined children with special needs, regardless of the defect, indicate cardiovascular system weakening. External respiratory system indices (RR) in children with MR, SD, DS and ASD are below the average level. Only peers with MSD have an average level of this indicator.

According to the data, preschoolers with psychophysical developmental disorders typically fall behind normative values for kids their age group in terms of their physical condition. At the same time, it can be correctly adjusted by utilising carefully considered physical education tools and techniques. The type of the child's psychophysical development defect, the unique functional capacities of his or her body, and, consequently, a differentiated approach to learning and development of this cohort, must all be taken into consideration when choosing these means and approaches.

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