



Prerequisites for the physical development of preschool children for the realization of the tasks of physical education

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Abstract

Introduction: The preschool age is reasonably considered as the most significant period in the process of a child's body formation. It is at this particular age that the foundation is laid for personal health and physical qualities necessary for efficient participation in various spheres of social life in the future. The aim of this study is to get a knowledge about the dynamics and level of physical fitness in three- to six-year-old children. *Material and methods:* The study was carried out on the basis of pre-school institutions of Lviv and Lviv region in 2017. Altogether 1188 preschool children (n=1188) were involved in the research, including 418 children of junior preschool age (3 to 4 years old), 350 middle-aged preschoolers (4 to 5 years old) and 420 senior preschoolers (5 to 6 years old). Methods of research applied were as follows: analysis and systematization of scientific publications, educational experiment, educational testing, educational observations, Student's t-test, parametric statistics methods. *Results:* It has been found that with age the examined sample of children displays gradual improvement of all physical fitness characteristics. The findings testify to intensive and heterochronic development of children's motor qualities in the process of their ontogenesis. *Conclusion:* General physical fitness level of the majority of the examined children could be estimated as satisfactory and corresponding to the appropriate age standards. Our findings supplement the data on application of the available informative tests for preschooler's physical fitness assessment.

Keywords: physical fitness, children, preschool age, children development

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INTRODUCTION

Andrieieva et al. [1] acknowledge that the problem of children's health deterioration has become national burning issue. Well-being of society largely depends on the health of children. Galan et al. [7, 8, 10] emphasize an integral component of holistic teaching and upbringing of preschoolers is their timely and sound physical development. According to Bodnar et al. [2, 3], the child's physical development and health status are largely determined by the rate of motor qualities development.

Other authors [5, 14] emphasize the issues concerning physical fitness are considered to be focal problems of physical education. Pasichnyk et al. [15] consider, that physical education acquires special significance for preschoolers, since mainly at this period vital core locomotor competency and fundamental skills are formed; the foundation of motor experience is created; the ABC of motions is mastered, which subsequently complements a locomotor activity of an adult person.

According to the studies carried out by Duquette et al. [6], a significant number of preschool-age children nowadays possess insufficient level of physical fitness and motor activity. Taking into account the data concerning motor qualities heterochrony at the age of 4 to 6 years, as well as low and lower than average parameters of motor qualities in the majority of boys and girls, it is natural to come to the conclusion that the content of physical education for preschoolers regulated by the current state programs for preschool-age children education is hardly efficient to develop and maintain child's fitness shape and health, state Myravyev et al. [12].

The urgency of the study is stipulated by the requirements to investigate preschoolers' physical fitness characteristics in order to determine and substantiate the tendencies of physical education in preschool educational institutions.

MATERIALS AND METHODS

The study was carried out on the basis of pre-school institutions of Lviv and Lviv region in 2017. Altogether 1188 preschool children (n=1188) were involved in the research, including 418 children of junior preschool age (216 boys and 202 girls aging from 3 to 4), 350 middle-aged preschoolers (180 boys and 170 girls aged from 4 to 5) and 420 senior preschoolers (211 boys and 209 girls aged from 5 to 6). Methods of research applied were as follows: analysis and systematization of scientific and methodological publications and the Internet information resources, educational experiment, educational testing. The processing of the obtained material was carried out with the help of standard parametric statistics methods using the IBM SPSS 20 statistic explorer. Divergence probability was estimated according to Student's t-test.

Certain motor qualities, defined by N.A. Bernstein as psychophysical, were chosen as the objects of physical fitness testing. Part of the motor tests was borrowed from M. M. Yefimenko motor qualities game testing technique, another part – from methodological literature on the theory and method of physical education (author's interpretation). Each test is performed in the form of a mini-game with a fairy tale plot for every test. It is suggested that motor tests should be performed in a certain succession according to M. M. Yefimenko technique (from head to toes, that is, tests for hands and arms, tests for the trunk, tests for the legs and feet) and central tests (static equilibrium, arms-trunk-legs coordination).

The rate of fundamental motor qualities was estimated with the help of the following tests: strength development ("Strongman" *Eng.*) for hands grip dynamometry; explosive force ("Sturdy fellow" *Eng.*) to assess the distance of the throw of a stuffed ball; "Squirrel and a Nut" *Eng.*) to measure the height of the high standing jump); speed and strength (squatting for 10 sec – "Tilting doll" *Eng.*); flexibility (angled position from a seated posture – "Kitten" *Eng.*); agility (horizontal target practice with a tennis ball – "Hunter" *Eng.*); holding equilibrium standing on the toes – "Parrot" *Eng.*; coordination of movements (clapping hands over one's head and under one's knees – "Catching mosquito" *Eng.*); speed (frequency of running in place for 10 sec – "Centipede" *Eng.*); time motor response (during catching the ruler – "Catching fish"); speed of a single movement (plastic tennis ball throwing – "Quick hand" *Eng.*); strength stamina (holding up the raised legs in back-lying position – "Bridge" *Eng.*); fine motor skills (collecting buttons to a box for 10 sec. – "Tailor" *Eng.*).

RESULTS

Table 1 presents average characteristics of physical fitness of the examined boys and girls aging from 3 to 6.

According to the findings analysis the "Strongman" test fulfillment showed that the right hand strength characteristics have been improving with age in 3 to 4 and 4 to 5-year-old girls by 21.20 % ($p < 0.001$); in boys – by 22.07 % ($p < 0.001$). Left hand strength parameters in girls ameliorated during the period from 3 to 4 years of age and 4 to 5 years by 17.26 % ($p < 0.01$) and by 20.82 % ($p < 0.01$) in boys. During the period of accelerated growth from 4 to 5 and from 5 to 6 years of age in the girls this characteristics improved by 26.12 % ($p < 0.001$) in the girls, and by 30.46 % ($p < 0.001$) in the boys (right hand - by 29.79 % ($p < 0.001$) and left hand - by 33.30 % ($p < 0.001$) correspondingly.

Analysis of the dynamics of arms and shoulder girdle explosive force indicates that this characteristic has significantly high rates of growth during the period of 3 to 6 years of age for both genders. Thus, the rate of increase of the above mentioned parameter in the girls aged 3 to 4 and 4 to 5 makes 12.11 % ($p < 0.001$) and 23.58 % ($p < 0.001$) for the girls who are 4–5 and 5–6 years old. Corresponding results for the boys are 19.00 % ($p < 0.001$) and 17.30 % ($p < 0.001$) accordingly.

The legs explosive force epigenetics data testify to the fact that this parameter has been improving significantly during all age periods. Standing high-jump results of the children of both gender groups aging from 3 to 4 and from 4 to 5 testify to high rates of increase, i.e. 33.93 % ($p < 0.001$) in the girls and 37.27 % ($p < 0.001$) in the boys. It is worthwhile to mention that during the period of 4 to 5 and 5 to 6 years of age the rates of growth become slower, but nevertheless, remain high enough and make up 27.19 % ($p < 0.001$) and 21.23 % ($p < 0.001$) respectively.

The results of the test for fine motor hand skills showed that in the 3 to 4 and 4 to 5-year-old girls the increase of this parameter made 13.48 % ($p < 0.001$) and 13.29 % ($p < 0.001$) in 4 to 5 and 5 to 6-year-old girls, while the boys aged 3 to 4 and 4 to 5 displayed the rate of increase by 21.31 % ($p < 0.001$), but afterwards, at the age of 4 to 5 and 5 to 6 the rate has slowed down and made 11.67 % ($p < 0.001$).

Test for accuracy of movements showed unreliable improvement of this characteristic by 5.15 % ($p > 0.05$) in the girls and 0.99% ($p > 0.05$) in the boys, both groups aging from 3 to 4 and from 4 to 5. At the same time the age period from 4 to 5 and from 5 to 6 years of age is characterized by significantly high increase of this parameter by 28.57 % ($p < 0.001$) in the girls and by 27.29 % ($p < 0.001$) in the boys.

Statistically distributed changes in the characteristics of the test for movements' coordination were observed in the children of both sexes. Thus, for 3 to 4 and from 4 to 5-year-old girls the figures were as follows: 26.55 % ($p < 0.001$), and for the girls aged 4 to 5 and 5 to 6 – 19.97 % ($p < 0.001$) accordingly. Similar changes were observed in the boy's parameters, though their increment values were somewhat higher as compared with the girls' ones, as for the age of 3 to 4 and 4 to 5 (31.53 % ($p < 0.001$), so for the age of 4 to 5 till 5 to 6 (22.93 % ($p < 0.001$)).

Analyzing the data received in equilibrium test performance we could also notice the tendency for the results improvement with each age period. Thus, the period from 3–4 till 4–5 years of age is characterized with the indicator growth, though unreliable for the children of both sexes: 8.43 % ($p > 0.05$) in the girls and 10.64 % ($p > 0.05$) in the boys. However, the period from 4-5 till 5-6 years of age sees the acceleration rate of this quality progression by 18.85 % ($p < 0.01$) in the girls and by 19.39 % ($p < 0.001$) in the boys.

The test for single movement speed gives evidence of the rate of increase growth by 30.32 % ($p < 0.001$) in the girls during the age period of 3 to 4 and 4 to 5, and in the boys it was 38.34 % ($p < 0.001$). The same pattern was typical for the age period from 4 to 5 and 5 to 6 years, where the growth rate was 35.80 % ($p < 0.001$) and 33.42 % ($p < 0.001$) for the girls and the boys respectively, which bears evidence of an intensive development of speed characteristics in preschool age.

The parameters of movements' frequency were characterized by less accelerated growth rates. In the girls during the age period of 3 to 4 and 4 to 5 the rate was 15.43 % ($p < 0.001$), and in boys it was 13.95 % ($p < 0.001$). For the age period from 4 to 5 and 5 to 6 years it was 15.94 % ($p < 0.001$) and 12.98 % ($p < 0.001$) correspondingly.

Table 1. Preschool-age children's physical fitness characteristics, (n=1188)

| Characteristics | Age | Girls (n=581) | | | Boys (n=607) | | | t x1-x2 | p |
|-------------------------------------|-----|---------------|-------|------|--------------|-------|------|------------|--------|
| | | \bar{x} 1 | S | m | \bar{x} 2 | S | m | | |
| "Strongman" (right hand) [kg] | 3-4 | 4.68 | 1.34 | 0.09 | 5.24 | 1.23 | 0.08 | 4.43 | <0.001 |
| | 4-5 | 5.79*** | 1.26 | 0.09 | 6.54*** | 1.25 | 0.09 | 5.61 | <0.001 |
| | 5-6 | 7.53*** | 1.65 | 0.11 | 8.89*** | 1.92 | 0.13 | 7.74 | <0.001 |
| "Strongman" (left hand) [kg] | 3-4 | 4.18 | 1.19 | 0.08 | 4.69 | 1.13 | 0.07 | 4.47 | <0.001 |
| | 4-5 | 4.97** | 1.10 | 0.08 | 5.78** | 1.19 | 0.08 | 6.55 | <0.001 |
| | 5-6 | 6.71*** | 1.71 | 0.11 | 8.09*** | 1.88 | 0.13 | 7.79 | <0.001 |
| "Sturdy fellow" [cm] | 3-4 | 106.11 | 29.71 | 2.09 | 110.83 | 33.18 | 2.52 | 1.53 | >0.05 |
| | 4-5 | 119.79*** | 25.20 | 1.93 | 134.11*** | 28.03 | 2.08 | 5.02 | <0.001 |
| | 5-6 | 151.82*** | 41.12 | 2.84 | 159.52*** | 42.73 | 2.94 | 1.88 | >0.05 |
| "Tailor" [sec] | 3-4 | 34.43 | 5.58 | 0.39 | 36.03 | 5.99 | 0.40 | 2.85 | <0.01 |
| | 4-5 | 30.08*** | 6.31 | 0.48 | 29.09*** | 6.55 | 0.48 | 1.44 | >0.05 |
| | 5-6 | 26.33*** | 5.95 | 0.41 | 25.88*** | 6.38 | 0.43 | 0.73 | >0.05 |
| "Hunter" [number] | 3-4 | 2.08 | 1.00 | 0.07 | 2.00 | 0.93 | 0.06 | 0.84 | >0.05 |
| | 4-5 | 2.19 | 1.02 | 0.07 | 2.02 | 1.06 | 0.07 | 1.49 | >0.05 |
| | 5-6 | 2.92*** | 1.05 | 0.07 | 2.66*** | 1.10 | 0.07 | 2.51 | <0.05 |
| "Catching fish" [points] | 3-4 | 2.28 | 1.26 | 0.08 | 1.92 | 1.39 | 0.09 | 2.73 | <0.05 |
| | 4-5 | 2.50 | 1.20 | 0.09 | 2.27* | 1.35 | 0.10 | 1.70 | >0.05 |
| | 5-6 | 2.88** | 1.32 | 0.09 | 3.02*** | 1.24 | 0.08 | 1.14 | >0.05 |
| "Quick hand" [m] | 3-4 | 2.77 | 0.79 | 0.05 | 2.93 | 0.90 | 0.06 | 1.86 | >0.05 |
| | 4-5 | 3.76*** | 1.06 | 0.08 | 4.32*** | 1.38 | 0.10 | 4.23 | <0.001 |
| | 5-6 | 5.40*** | 1.47 | 0.10 | 6.03*** | 1.67 | 0.11 | 4.12 | <0.001 |
| "Kitten" [cm] | 3-4 | 4.39 | 4.80 | 0.33 | 3.34 | 4.95 | 0.33 | 2.20 | <0.05 |
| | 4-5 | 5.12 | 5.32 | 0.40 | 4.04 | 4.93 | 0.36 | 1.97 | <0.05 |
| | 5-6 | 6.44* | 5.11 | 0.35 | 5.13* | 5.26 | 0.36 | 2.59 | <0.01 |
| "Bridge" [sec] | 3-4 | 11.44 | 6.24 | 0.43 | 10.87 | 5.96 | 0.40 | 0.95 | >0.05 |
| | 4-5 | 14.80*** | 7.23 | 0.55 | 14.03*** | 8.26 | 0.61 | 0.93 | >0.05 |
| | 5-6 | 17.19** | 8.71 | 0.60 | 16.02* | 8.60 | 0.59 | 1.37 | >0.05 |
| "Squirrel and a Nut" [cm] | 3-4 | 10.13 | 2.75 | 0.19 | 10.74 | 3.09 | 0.21 | 2.14 | <0.05 |
| | 4-5 | 14.27*** | 2.64 | 0.20 | 15.66*** | 2.94 | 0.21 | 4.63 | <0.001 |
| | 5-6 | 18.76*** | 3.54 | 0.24 | 19.38*** | 3.47 | 0.23 | 1.82 | >0.05 |
| "Tilting doll" [number] | 3-4 | 8.05 | 1.35 | 0.09 | 8.22 | 1.38 | 0.09 | 1.24 | >0.05 |
| | 4-5 | 9.07*** | 1.34 | 0.09 | 9.36*** | 1.56 | 0.11 | 1.90 | >0.05 |
| | 5-6 | 10.17*** | 1.45 | 0.10 | 10.31*** | 1.60 | 0.11 | 0.90 | >0.05 |
| "Centipede" [number] | 3-4 | 21.11 | 4.75 | 0.33 | 22.80 | 5.45 | 0.37 | 3.37 | <0.001 |
| | 4-5 | 24.64*** | 5.39 | 0.41 | 26.22*** | 5.77 | 0.43 | 2.63 | <0.01 |
| | 5-6 | 28.91*** | 5.34 | 0.41 | 29.86*** | 4.75 | 0.32 | 1.92 | >0.05 |
| "Catching mosquito" [number] | 3-4 | 11.56 | 2.64 | 0.18 | 10.90 | 2.72 | 0.18 | 2.53 | <0.05 |
| | 4-5 | 15.10*** | 3.05 | 0.23 | 14.98*** | 3.10 | 0.23 | 0.35 | >0.05 |
| | 5-6 | 18.45*** | 3.28 | 0.22 | 18.86*** | 3.58 | 0.24 | 1.20 | >0.05 |
| "Parrot" [sec] | 3-4 | 8.74 | 4.22 | 0.29 | 7.20 | 3.74 | 0.25 | 3.94 | <0.001 |
| | 4-5 | 9.51 | 5.05 | 0.38 | 8.01 | 4.35 | 0.32 | 2.96 | <0.01 |
| | 5-6 | 11.49** | 6.80 | 0.47 | 9.73*** | 5.66 | 0.38 | 2.87 | <0.01 |

Note: * – significant difference $p < 0.05\%$; ** – $p < 0.01$, *** – $p < 0.001$

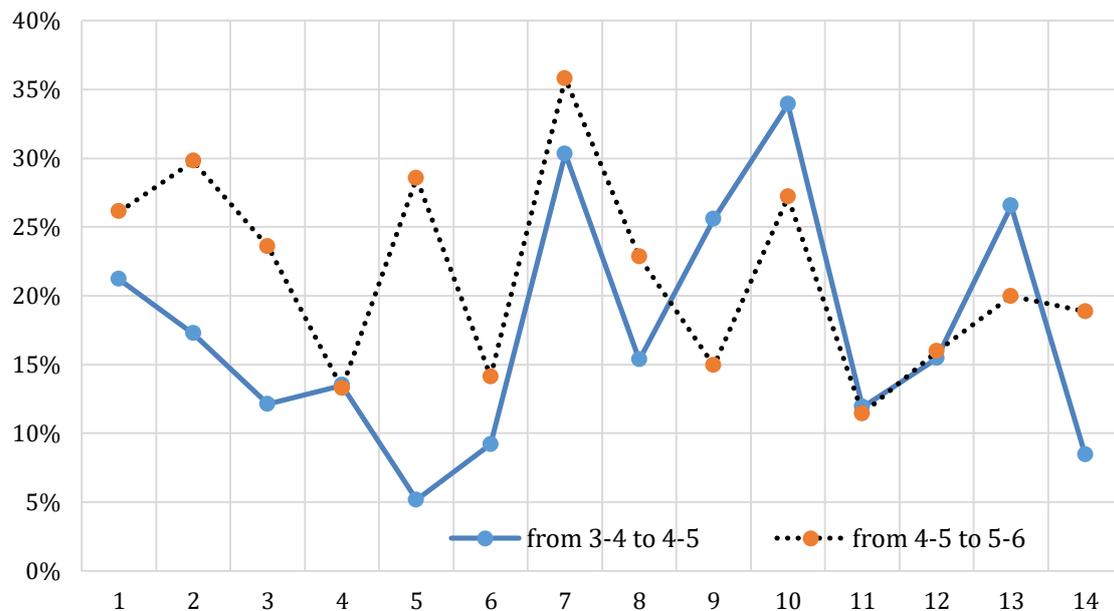


Figure 1. Profile of differences in physical fitness of 3 to 6-year-old girls (%):

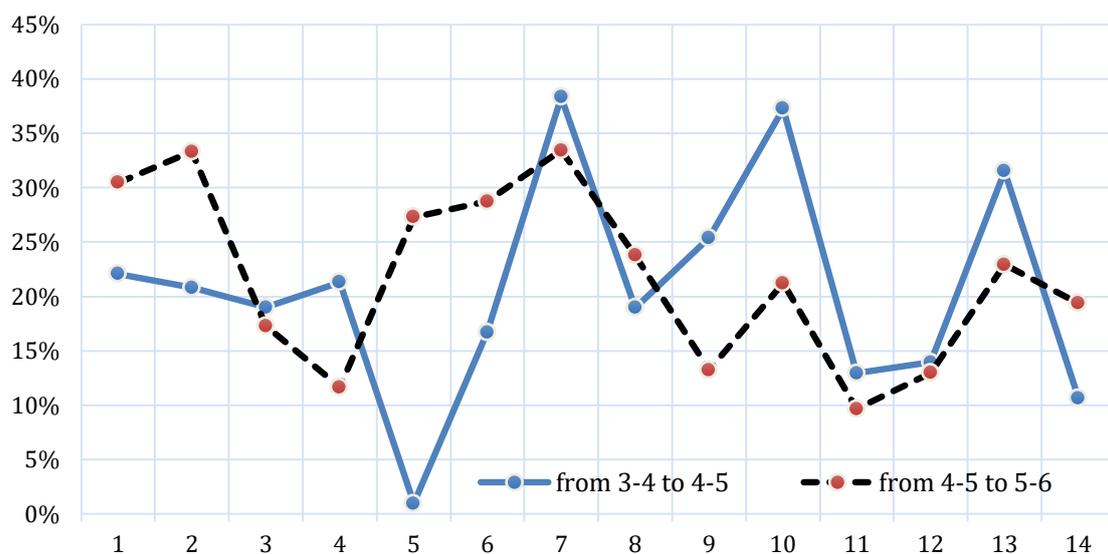


Figure 2. Profile of differences in physical fitness of 3 to 6-year-old boys (%):

1 – “Strongman” (right hand) [kg]; 2 – “Strongman” (left hand) [kg]; 3 – “Sturdy fellow” [cm]; 4 – “Tailor” [sec]; 5 – “Hunter” [number]; 6 – “Catching fish” [points]; 7 – “Quick hand” [m]; 8 – “Kitten” [cm]; 9 – “Bridge” [sec]; 10 – “Squirrel and a Nut” [cm]; 11 – “Tilting doll” [number]; 12 – “Centipede” [number]; 13 – “Catching mosquito”, [number]; 14 – “Parrot” [sec].

Table 2. Limits and standards of the five-mark signal rating scale of the tests results

| Level | Borders of the sigma deviations |
|-------------------|---------------------------------|
| Low | from $X-1.5S$ till $-2.5S$ |
| Below the average | from $X-0.5S$ till $-1.5S$ |
| Average | from $X-0.5S$ till $X+0.5S$ |
| Above the average | from $X+0.5S$ till $X+1.5S$ |
| High | from $X+1.5S$ till $X+2.5S$ |

Table 3. Distribution [in %] of 3 to 6-year-old children according to their level of physical fitness (n=1188)

| Characteristics | Age | Girls (n=581) | | | | | Boys (n=607) | | | | |
|-------------------------------------|-----|---------------|------|------|------|------|--------------|------|------|------|------|
| | | equal | | | | | equal | | | | |
| | | l | b/a | a | a/a | h | l | b/a | a | a/a | H |
| "Strongman" (right hand) [kg] | 3-4 | 4.5 | 26.7 | 40.6 | 21.8 | 6.4 | 1.8 | 30.1 | 39.4 | 21.3 | 7.4 |
| | 4-5 | 6.5 | 21.2 | 42.9 | 21.8 | 7.6 | 6.6 | 18.3 | 49.4 | 18.9 | 6.8 |
| | 5-6 | 1.9 | 32.1 | 39.2 | 19.1 | 7.7 | 4.3 | 28.4 | 37.5 | 21.3 | 8.5 |
| "Strongman" (left hand) [kg] | 3-4 | 6.4 | 25.6 | 41.3 | 19.3 | 7.4 | 3.7 | 26.4 | 45.4 | 17.6 | 6.9 |
| | 4-5 | 4.1 | 23.5 | 46.5 | 18.8 | 7.1 | 3.3 | 25.0 | 42.2 | 23.3 | 6.2 |
| | 5-6 | 2.4 | 29.2 | 41.1 | 18.6 | 8.7 | 3.3 | 29.0 | 40.3 | 17.5 | 9.9 |
| "Sturdy fellow" [cm] | 3-4 | 3.4 | 32.2 | 44.1 | 16.8 | 3.5 | 0.9 | 28.7 | 45.8 | 16.7 | 7.9 |
| | 4-5 | 4.7 | 21.2 | 46.5 | 24.7 | 2.9 | 2.8 | 21.7 | 47.2 | 22.2 | 6.1 |
| | 5-6 | 0.5 | 28.7 | 48.3 | 13.9 | 8.6 | 2.4 | 30.3 | 39.8 | 16.1 | 5.7 |
| "Tailor" [sec] | 3-4 | 8.4 | 17.8 | 48.5 | 20.3 | 5.0 | 6.5 | 20.4 | 45.8 | 21.8 | 5.5 |
| | 4-5 | 8.8 | 20.0 | 40.0 | 25.9 | 5.3 | 7.2 | 26.1 | 41.7 | 20.0 | 5.0 |
| | 5-6 | 7.2 | 20.6 | 34.5 | 36.8 | 0.9 | 7.6 | 20.4 | 35.5 | 36.5 | 0.0 |
| "Hunter" [number] | 3-4 | 3.5 | 22.2 | 65.0 | 6.9 | 2.4 | 2.3 | 26.8 | 64.9 | 5.1 | 0.9 |
| | 4-5 | 2.4 | 22.3 | 63.5 | 10.6 | 1.2 | 6.6 | 25.0 | 59.0 | 8.3 | 1.1 |
| | 5-6 | 0.0 | 8.1 | 62.7 | 22.0 | 7.2 | 0.5 | 14.7 | 62.5 | 16.1 | 6.2 |
| "Catching fish" [points] | 3-4 | 5.5 | 20.8 | 57.4 | 9.9 | 6.4 | 16.3 | 21.7 | 46.3 | 12.5 | 3.2 |
| | 4-5 | 2.9 | 18.2 | 57.6 | 15.3 | 6.0 | 9.4 | 19.4 | 51.8 | 12.8 | 6.6 |
| | 5-6 | 2.9 | 17.2 | 44.5 | 23.4 | 12.0 | 0.5 | 12.3 | 49.8 | 23.7 | 13.7 |
| "Quick hand" [m] | 3-4 | 0.0 | 32.2 | 43.1 | 19.8 | 4.9 | 0.5 | 29.2 | 48.1 | 16.2 | 6.0 |
| | 4-5 | 1.8 | 32.3 | 38.8 | 17.1 | 10.0 | 3.9 | 32.2 | 37.8 | 16.1 | 10.0 |
| | 5-6 | 5.7 | 27.3 | 35.9 | 24.9 | 6.2 | 3.8 | 31.7 | 30.3 | 26.1 | 8.1 |
| "Kitten" [cm] | 3-4 | 15.8 | 4.9 | 47.0 | 27.7 | 4.6 | 23.1 | 9.3 | 32.0 | 31.0 | 4.6 |
| | 4-5 | 18.2 | 5.9 | 40.0 | 32.3 | 3.6 | 16.6 | 3.9 | 38.4 | 37.8 | 3.3 |
| | 5-6 | 13.9 | 6.2 | 54.1 | 22.5 | 3.3 | 17.5 | 7.6 | 44.2 | 26.1 | 4.6 |
| "Bridge" [sec] | 3-4 | 0.0 | 37.1 | 31.7 | 21.3 | 9.9 | 0.0 | 35.2 | 44.4 | 12.0 | 8.4 |
| | 4-5 | 0.0 | 32.3 | 44.1 | 15.3 | 8.3 | 0.0 | 40.0 | 37.8 | 12.8 | 9.4 |
| | 5-6 | 0.0 | 34.9 | 41.6 | 15.8 | 7.7 | 0.0 | 32.2 | 43.2 | 15.6 | 9.0 |
| "Squirrel and a Nut" [cm] | 3-4 | 4.5 | 29.7 | 36.1 | 22.3 | 7.4 | 6.0 | 31.0 | 33.8 | 21.3 | 7.9 |
| | 4-5 | 9.3 | 17.1 | 41.8 | 25.3 | 6.5 | 4.4 | 18.9 | 48.9 | 22.8 | 5.0 |
| | 5-6 | 4.3 | 24.4 | 41.6 | 20.6 | 9.1 | 2.8 | 25.6 | 44.6 | 19.9 | 7.6 |
| "Tilting doll" [number] | 3-4 | 0.9 | 29.6 | 50.1 | 11.9 | 7.5 | 0.5 | 31.0 | 51.4 | 11.6 | 5.5 |
| | 4-5 | 1.2 | 8.2 | 55.3 | 30.6 | 4.7 | 3.3 | 27.2 | 48.4 | 18.3 | 2.8 |
| | 5-6 | 0.0 | 10.5 | 54.1 | 29.6 | 5.8 | 2.4 | 28.4 | 45.0 | 16.1 | 8.1 |
| "Centipede" [number] | 3-4 | 2.5 | 33.7 | 32.2 | 25.2 | 6.4 | 1.8 | 27.3 | 36.2 | 27.8 | 6.9 |
| | 4-5 | 3.5 | 23.5 | 37.6 | 28.8 | 6.6 | 6.6 | 25.0 | 30.7 | 33.3 | 4.4 |
| | 5-6 | 2.4 | 22.0 | 42.1 | 25.8 | 7.7 | 8.1 | 18.5 | 45.4 | 22.3 | 5.7 |
| "Catching mosquito" [number] | 3-4 | 0.5 | 24.6 | 41.8 | 25.2 | 7.9 | 0.5 | 19.4 | 51.4 | 22.7 | 6.0 |
| | 4-5 | 8.8 | 19.4 | 40.0 | 24.7 | 7.1 | 3.9 | 25.0 | 47.7 | 20.5 | 8.3 |
| | 5-6 | 3.8 | 23.9 | 47.5 | 16.7 | 8.1 | 3.3 | 24.2 | 42.2 | 23.2 | 7.1 |
| "Parrot" [sec] | 3-4 | 0.0 | 33.7 | 39.6 | 19.8 | 6.9 | 0.0 | 31.0 | 43.0 | 19.4 | 6.6 |
| | 4-5 | 0.0 | 37.1 | 42.3 | 15.3 | 5.3 | 0.0 | 32.2 | 43.4 | 19.4 | 5.0 |
| | 5-6 | 0.0 | 35.8 | 40.3 | 15.8 | 8.1 | 0.0 | 33.6 | 44.2 | 15.6 | 6.6 |

Notes: * l – low, b/a – below average, a – average, a/a – above average, h – high.

Specifying the dynamics of the speed of movement reaction, it was observed that for the age period of 3 to 4 and 4 to 5 in the girls this characteristic improved unreliably only by 9.20 % ($p > 0.05$), though better tendency of this parameter growth by 16.70 % ($p < 0.05$) could be observed in the boys. The period from 4 to 5 and 5 to 6 years of age was characterized by significant improvement by 14.12 % ($p < 0.01$) in the girls and by 28.73 % ($p < 0.001$) in the boys.

With regard to the dynamics of spine mobility characteristics in the children of both sexes, two periods of the results growth could be observed: during the age period from 3 to 4 and 4 to 5 this parameter increased insignificantly and was 15.35 % ($p > 0.05$) in the girls and 18.97 % ($p > 0.05$) in the boys, whereas during the age period from 4 to 5 and 5 to 6 it increased significantly by 22.83 % ($p < 0.05$) and by 23.77 % ($p < 0.05$) for the girls and boys respectively.

The test for strength endurance of the trunk and legs muscles displayed significant improvement of this parameter in both girls and boys of 3 to 4 and 4 to 5 years of age by 25.60 % ($p < 0.001$) and 25.38 % ($p < 0.001$) accordingly. But the age period of 4 to 5 and 5 to 6 witnessed the slowdown in the progression of this characteristic, which was 14.94 % ($p < 0.01$) and 13.24 % ($p < 0.05$) for the girls and boys respectively.

Results of the velocity strength test bear witness of the average increase rate of this parameter for the children of both sexes and for all the age periods. For the age period of 3 to 4 and 4 to 5 this characteristic grew by 11.91 % ($p < 0.001$) in the girls and by 12.96 % ($p < 0.001$). Similar tendency is true for the age period of 4 to 5 and 5 to 6: 11.43 % ($p < 0.001$) in the girls and 9.65 % ($p < 0.001$) in the boys.

To determine the level of physical fitness in preschoolers we distributed the children to five groups according to Yarmak et al. [19]. The estimation of each parameter of physical fitness corresponds to the five levels of development. The rating scales of the extreme limits are restricted $\pm 2,5 S$ (Table 2).

Table 3 shows the distribution of 3 to 6-year-old children according to the level of their physical fitness. The findings testify to the fact that the majority of 3 to 6-year-old girls and boys display satisfactory level of physical fitness.

DISCUSSION

According to numerous scholars [6, 11], the purposeful development of motor qualities should commence at pre-school age. Only under this requirement is it possible to provide the necessary physical fitness of a child, integrating the development of such physical qualities as speed, dexterity, flexibility, endurance and strength.

Our findings confirm the necessity of critical analysis of the existing tests for estimation of preschool children physical fitness. Pasichnyk [16] in his article also mentions similar approaches. The effectiveness of physical education in the preschool educational institutions is determined by the objectivity of the system for monitoring and estimation of children's physical fitness. We heartily support the scientific investigations of Yefimenko [20], who is looking for the ways to optimize control in physical education. Our findings supplement the data on application of the available informative tests for preschooler's physical fitness estimation [7].

As it is indicated by Halamanzhuk et al. [8], a tendency towards deterioration of preschooler's physical fitness and health status has currently been observed. According to our findings, a certain positive dynamics of physical qualities development in preschoolers aging from 3 to 6 could be noticed. Physical qualities progression takes place in accord with certain stages, which develop un-uniformly alongside with the development of personality. During sensitive periods specific qualities acquire the highest growth rates. The characteristics of preschooler's physical qualities adduced by Stahmer et al. [17] are similar to those obtained by other researchers.

Analyzable findings pertaining to gender aspect of physical fitness characteristics of preschool age children testify to the fact that the boys showed better results in hand strength test as compared with the girls. At the same time the girls displayed significantly higher parameters in flexibility and static equilibrium, thus confirming the scientific data, suggest Kaluska et al. [10].

The obtained results expand the data on the peculiarities of motor skills development in children during preschool age. Our findings indicate that the obtained information could be necessary for decision-making in physical education management and elaboration of comprehensive physical fitness programs for 3 no 6-year-old children.

Yarmak et al. [19] emphasize, that physical fitness is a significant component of physical education, providing a certain level of physical and mental health. According to numerous scholars the purposeful development of motor qualities should commence at pre-school age. Only under this requirement is it possible to provide the necessary physical fitness of a child, integrating the development of such physical qualities as speed, dexterity, flexibility, endurance and strength.

Our findings confirm the necessity of critical analysis of the existing tests for estimation of preschool children physical fitness. Three test exercises have been administered to determine the rate of dexterity. Other studies [8] also mention similar approaches. The effectiveness of physical education in the preschool educational institutions is determined by the objectivity of the system for monitoring and estimation of children's physical fitness. We heartily support the scientific investigations of the experts [16], who are looking for the ways to optimize control in physical education. Our findings supplement the data on application of the available informative tests for preschoolers' physical fitness assessment.

As it is indicated in numerous studies [5, 10, 17], a tendency towards deterioration of preschoolers physical fitness and health status has currently been observed. According to our findings a certain positive dynamics of physical qualities development in preschoolers aging from 3 to 6 could be noticed. Physical qualities progression takes place in accord with certain stages, which develop un-uniformly alongside with the development of personality. Hun et al. [9, 13, 14, 18] admit that during sensitive periods specific qualities acquire the highest growth rates. The characteristics of preschoolers physical qualities adduced by the authors [5] are similar to those obtained by other researchers.

Considering the findings pertaining to the level of movements' speed development, the results of the boys aged 4 to 5 and 5 to 6 exceeded the similar results of the girls in "Quick Hand" single movement speed determining exercise ($p < 0.001$). Similar tendency of the boys' results prevailing over the girls achievements could be observed in the performance of the "Centipede" test determining the frequency of movements, but at the age of 3 to 4 and 4 to 5 this tendency if not true ($p < 0.01$) and ($p < 0.001$) correspondingly.

The opposite tendency was observed when comparing the speed rates of motor response in the "Catching a Fish" test: the girls dominated over the boys ($p < 0.05$). With regard to the rest parameters that characterize the speed development on the gender basis no reliable differences were observed ($p > 0.05$).

Specifying the dynamics of speed qualities development, which was determined by the results of the three tests, it should be notified that on the whole over the period of time between 3 and 6 years of age the improvement of all characteristics was observed. Analyzable findings pertaining to gender aspect of physical fitness characteristics of preschool age children testify to the fact that the boys showed better results in hand strength test as compared with the girls. At the same time the girls displayed significantly higher parameters in flexibility and static equilibrium, thus confirming the scientific data.

The obtained results in Butin et al. [4] expand the data on the peculiarities of motor skills development in children during preschool age. Our findings indicate that the obtained information could be necessary for decision-making in physical education management and elaboration of comprehensive physical fitness programmes for 3 no 6 year old children.

CONCLUSIONS

In the course of the study it was found that the examined sample of children aging from 3 to 6 is characterized by gradual improvement of all physical fitness parameters with age. Considering the dynamics of physical qualities development in children, it should be noted that the age period between 4 to 5 and 5 to 6 is marked by fairly high significant increase of all physical fitness characteristics in the children of both sexes. Children belonging to 3 to 4 and 4 to 5 age group displayed significant growth by

most parameters of physical fitness, with the exception of tests for movement accuracy, static equilibrium and flexibility in the children of both sexes and speed of movement reaction in the girls. The findings testify to intensive and heterochronic development of children's motor qualities in the process of their ontogenesis. General physical fitness level of the majority of the examined children could be estimated as satisfactory and corresponding to the appropriate age standards.

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