

Dynamics of physical fitness changes in preschool children, schoolgirls and female students of Eastern Siberia (Russia)

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Abstract

Purpose: the analysis of physical fitness dynamics of the preschool children, schoolgirls and female students living in the region with an intense ecological situation.

Material: In total were surveyed: 1580 preschool children (age 4-7 years), 3211 schoolgirls (age 7-17 years) and 5827 female students (age 17-21 years). It was applied physical fitness tests of various groups of Russia population.

Results: It was determined three essential periods of the main characteristics changes of physical fitness. The preschool age is characterized by the expressed gain of results. The lowest characteristics were revealed in senior age (after 17-18 years). Female students have relative stabilization value of these indicators.

Conclusions: it is necessary to change the content of the educational process of physical training in educational institutions of the region.

Keywords: preschool children, schoolgirls, female students, physical fitness.

Introduction

Increase in the level of physical fitness – is one of the most important tasks. They have to be solved in the course of physical training of younger generation in general [1] and also of preschool children [2], school pupils [3] and female students [4]. The health of each nation in many respects depends on the efficiency of its solving. Physical conditions of children [5] and young people considerably determine the level of their health [6]. It is extremely important to understand and to estimate correctly physical fitness of modern preschool children, schoolgirls and female students [7]. The factor of strengthening of the pedagogical orientation of physical training of students at the non-major universities is especially relevant now. Such universities don't train future experts in physical culture and sport [8].

The physical fitness is the result of physical training to a certain kind of activity. This process is characterized by the level of development of the main quality for this activity (endurance, force, dexterity, flexibility, speed). The degree (high, average, low) of their mastering is also very important [9]. The process of assessment of this level has to be based on the comparison of testing results to standards. It is necessary to consider the dynamics of a gain of individual characteristics in each age group [10].

Pedagogically purposeful impact on the development of physical qualities is very important [11]. It is performed in indissoluble correlation with training in physical

capacities. This process is directed at promoting the full display of physical qualities. Their progress is shown at different steps of age development. This role is especially essential to successful mastering motor skills. It is very important to add and to correct impact of physical work on the development of physical qualities [12]. The main content of the first initial training is a comprehensive physical education of preschool children. It is necessary to control children's mastering of basic techniques of physical exercises performance [13].

Characteristics of children's physical activity are collected on a basis of examination of homogeneous groups of children. Children live in a certain region. All this is the basis for calculation of their physical fitness standards. These standards can be considered the most important tool of primary control over a condition of physical health of the younger generation [14]. The objective assessment of physical fitness is very important. It is necessary to consider the regularities of preschool children develop in the motor sphere.

Many researchers have described differences in parameters of children physical fitness of different regions of Russian Federation (RF). It is theoretically proved the need of introduction, so-called large zone standards at the level of the big region (territory, area) [15]. It is supposed introduction of separate regional assessment standards at the city level.

Nowadays in Eastern Siberia region is applied only the all-Russian standards for assessment of children's motor qualities. Irkutsk region (Irkutsk city) has been chosen as one of five basic platforms. Collecting and processing of materials for monitoring researches have been organized

[16]. Development of performing technology was carried out. Examinations of physical development and physical fitness of various age and gender groups of the population were conducted [17].

The monitoring system is actively developed in Russian Federation nowadays [18]. It allows to perform the analysis, assessment, and prediction of the physical health condition of preschool children, school students, female students. Also, it is possible to develop hygienic standards of physical activities and correctional programs for them. These actions are directed to the strengthening of health and characteristics improvement of physical fitness of the younger generation. Also, it is necessary to improve the forms and methods of their physical training [19].

In the different countries is the actual need for modern studying of specific features of youth [20]. It is performed at physical culture training and different kinds of sport [21]. Researchers pay the closest attention to the choice of optimum physical activities [22] on an organism engaged [23]. Loading corresponds to opportunities of an organism of athletes [24]. Determination of health condition [25] is always very relevant direction for the scientists of different countries. A lot of attention is paid to maintenance of optimum health level of the population.

Within application of physical health monitoring in various regions of Russian Federation was performed a study of physical fitness characteristics of various groups of the population, for example, pupils of Moscow schools (Russia) [26]. The analysis of physical fitness condition of pupils of schools of Yekaterinburg and Sverdlovsk region (Russia) has been made [27]. It was performed the analysis of physical fitness monitoring of school pupils of Khanty-Mansi Autonomous Okrug (Russia) [28]. It was applied scientific-technological support of the social and pedagogical design of health condition monitoring system of different groups of a population of the Kabardino-Balkar Republic (Russia) [29]. These researches demonstrated that there are age and gender differences. These differences are defined also by ethnonational peculiarities of the population.

It is also necessary to consider the influence of climatic conditions on the development of children motor abilities. It is necessary to consider in the training of future teachers physical culture [30]. The Australian researchers pay special attention to the study and creation of programs of physical training [31]. The youth has to demonstrate a special approach to positive attitude formation towards own health [32] in sports activities [33]. It is very important in the choice and receiving sports education [34].

Hypothesis. The research of the physical fitness of preschool children, schoolgirls, and female students will allow to increase the efficiency of their physical training.

Research purpose. To study physical fitness of children, teenagers and student's youth in the municipal preschool educational institutions (MPEI), in municipal educational institutions high comprehensive schools (MOI HCS) and in the higher educational institutions (HEI).

Material and methods

Participants: it was examined: 1580 preschool children at the age of 4–7 years (researches haven't included the children with chronic diseases) (Irkutsk, Russia); 3211 schoolgirls at the age of 7–17 years (Irkutsk, Russia); 5827 female students at the age of 17–21 years (1–4 year of study) (Irkutsk, Russia).

Organization of a research. It was applied tests of physical fitness of various groups of Russia population [35]. Researches were performed two times per year: at the beginning (September) and at the end (May) of the academic year (from September 2004 to May 2007). For girls (age 4-7 years) four tests were applied: on flexibility ("seated forward bend" test); on speed ("30 m run" test); on force – it was measured the dynamic force of girdle of inferior extremity muscles ("standing long jump" test); on high-speed and power endurance of flexors of the back ("Sit-ups in 30 s" test) [36, 37, 38].

The following tests were performed by schoolgirls and female students: for assessment of high-speed endurance and dexterity connected with change of the direction of the motion and alternation of acceleration and braking ("shuttle run" test); for assessment of force and static endurance of muscles of the girdle of superior extremity ("bent suspension" test); for measurement of active flexibility of a backbone and bending in coxofemoral joints ("seated forward bend" test); for measurement of high-speed and power endurance of flexors of the back ("Sit-ups in 30 s" test); for determination of the general endurance (1 000 m run test – schoolgirls, 5 min run – female students); for speed assessment (run tests: 20 m run – female students and 30 m run – schoolgirls); for measurement of dynamic force of girdle of inferior extremity ("standing long jump" test) [36, 37, 38].

Statistical analysis. It was applied the software of Microsoft Excel 7.1 and "Statistica 6.1". The statistical significance of the average values of independent samples was estimated by Student's t-test at $p < 0,05$.

Results

It is possible to trace the data shown in this publication (according to performed monitoring researches) at the age from 4 to 21 year (tab. 1).

It was revealed the changes in physical fitness characteristics in girls and female students of various age stages according to the results of the performed research.

It was performed the analysis of characteristics change of high-speed and power of body muscle endurance in examined persons (tab. 1, fig. 1). They can conditionally be divided into 4 stages:

- the 1st stage – the expressed rise (4–7 years) of indicator values – up to 7,6 times a year at the age up to 7 years;
- the 2nd stage – a moderate gain (8–11 years) of indicator values – up to 0,8 times a year at the age up to 11 years;
- the 3rd stage – a low gain (11–17 years) – up to 0,5 times a year;
- the 4th stage – decrease in values of the studied

indicator to 1,1 time in a year (17-21 years).

The analysis of flexibility characteristics of a spinal column and bending in coxofemoral joints (fig. 2) shown that its changes proceed in five main stages:

- the 1st stage – from 4 to 6 years. There are no essential changes;
- the 2nd stage – the expressed rise (7–11 years) of indicator values up to 1,5 cm a year;
- the 3rd stage – from 11–13 years appears wavy changes of characteristics. By age 12 years (0,4 cm a year) there is an insignificant decrease in values. By age

13 years (0,2 cm a year) it increases again;

- the 4th stage – an intensive gain (14–18 years). At this stage, the minimum gain is in 15 years (to 0,2 cm a year), and maximum – is in 18 years (3,3 cm a year);

- the 5th stage – from 19 to 21 years. Characteristics of flexibility whether don't change (19 years) or slightly increase up to 0,3 cm a year.

The dynamic force of muscles of the lower extremities (fig. 3) can also conditionally be subdivided into the 5th a stage:

- the 1st stage – from 4 to 6 years – intensive (up

Table 1. Physical fitness of preschool children, schoolgirls, and female students

Test \ Age (years)	4	5	6	7	8	9
Sit-ups in 30 s (times)	4,3 ±0,3	5,5** ±0,2	8,0** ±0,3	15,6* ±0,4	16,3*** ±0,2	18,0* ±0,2
Seated forward bend (cm)	3,8 ±0,4	3,0 ±0,3	4,0*** ±0,3	5,5*** ±0,6	6,0 ±0,3	6,5 ±0,3
Standing long jump (cm)	62,9 ±1,2	79,2* ±0,9	93,5** ±0,9	100,3*** ±2,0	109,5* ±1,1	120,8* ±1,0
Age (years)	10	11	12	13	14	15
Sit-ups in 30 s (times)	19,9* ±0,2	21,7* ±0,2	22,2* ±0,1	22,5 ±0,2	22,3 ±0,2	22,5 ±0,2
Seated forward bend (cm)	7,5** ±0,3	8,6* ±0,2	8,2 ±0,2	8,8*** ±0,2	9,9* ±0,3	10,1 ±0,3
Standing long jump (cm)	135,4* ±0,9	145,9* ±0,8	154,2* ±0,7	158,2* ±0,7	163,4* ±0,7	167,8* ±0,8
Age (years)	16	17	18	19	20	21
Sit-ups in 30 s (times)	22,7 ±0,2	23,5*** ±0,3	22,5*** ±0,1	22,8** ±0,01	22,5*** ±0,1	21,6** ±0,2
Seated forward bend (cm)	11,2 ±0,3	12,5* ±0,5	15,8*** ±0,1	15,8* ±0,1	16,1 ±0,2	16,4 ±0,3
Standing long jump (cm)	169,1 ±1,1	171,8 ±1,4	156,9* ±0,4	157,0 ±0,1	155,4*** ±0,5	156,0 ±0,9

*P<0,001, ** P<0,01 , *** P<0,05, in relation to the previous age.

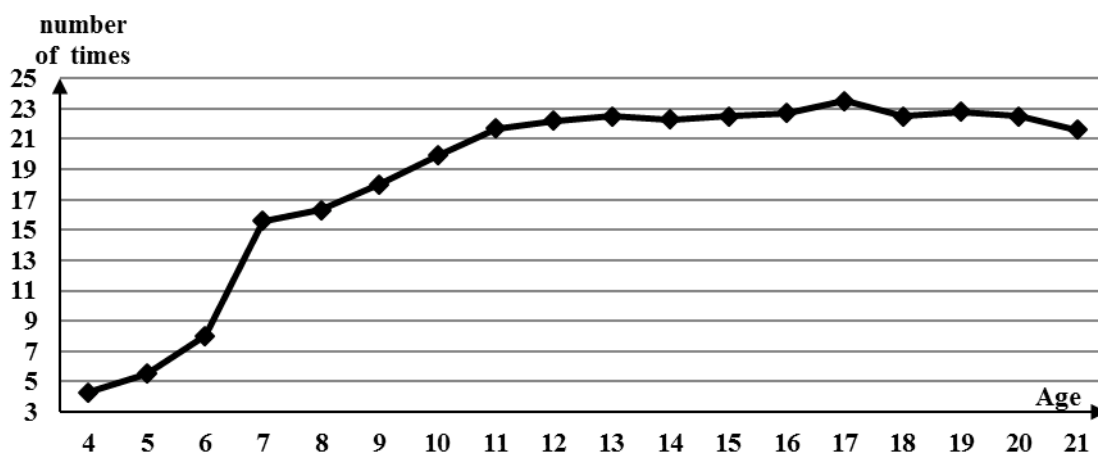


Fig. 1. Results of performing the test “Sit-ups in 30 s”

to 16 cm a year) development of characteristics of this indicator;

- the 2nd stage – moderated (4–14 cm a year) development at the age of 7–12 years. It should be noted that at the age of 9–12 years it is more expressed (9–14 cm a year);

- the 3rd stage – a moderate gain (from 13–17 years);

- the 4th stage – the expressed decrease in indicator values (up to 15 cm a year by 18 years);

- the 5th stage – stabilization (19–21 years).

Earlier we determined 5 stages of motor qualities development (high-speed and power endurance of body muscles, the flexibility of a spinal column and bending in coxofemoral joints, the dynamic force of girdle of inferior extremity muscles). Their main changes can be divided into 3 stages: 1st stage (preschool age). He is characterized by the expressed gain of results. At the 2nd stage (8–16, 17 years) it is defined their moderate gain which becomes more active during the sensitive periods. At the 3rd stage (girls senior to 16, 17 years) is the insignificant gain of fitness or even its essential decrease.

It was considered the maximum and minimum values of the average level of their development in the construction of a diagram. According to the results of

comparison the level of physical fitness of children from municipal preschool educational institutions (Irkutsk) [1] with children from other regions of Russian Federation [16] it was revealed: in the test “Standing long jump” (fig. 4.) – regional values was worse only in 4 years girls; in other age categories they approach to the all-Russian standards, though remain at lower level. In 6 years girls from Irkutsk have little improvement of the low limits of values of these indicators in comparison with preschool children from other regions of Russian Federation.

In the test “Sit-ups in 30 s” (fig. 5) girls from Irkutsk have lower results, than their contemporary (Russian Federation) in 4–5 years. However in 6–7 years the upper limit of values of regional indicators accrues and comes nearer to all-Russian, and their lower limit – has values significantly below.

The Irkutsk preschool children demonstrated the worst results at the age of 4–5 years in the “30 m run” test (fig. 6). However in 6–7 years they improve values of this indicator to the level of their equals in age from other regions. In 6 years Irkutsk preschool children improve the upper limits of this indicator.

In school-age children of Irkutsk, the better results of speed testing (“30 m run”, fig. 7) were at all age.

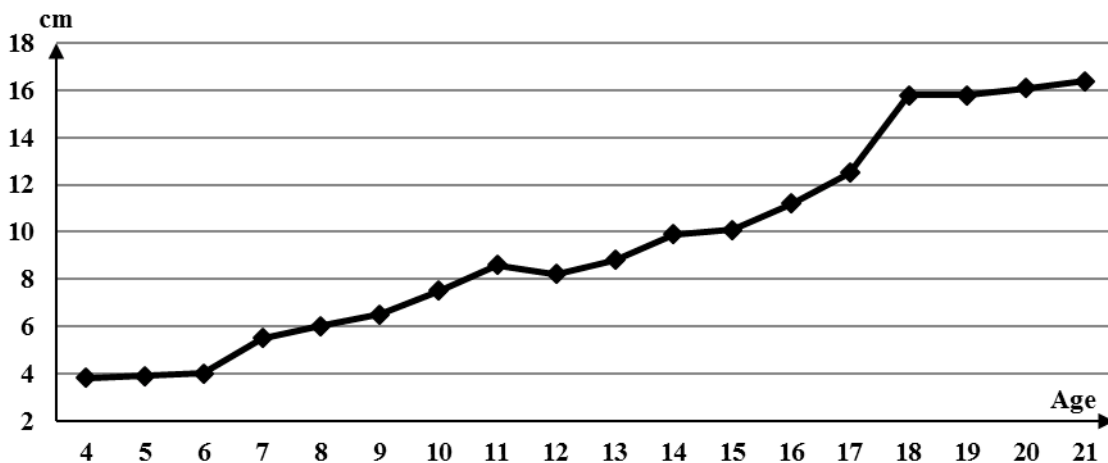


Fig. 2. Results of performing the test “Seated forward bend”

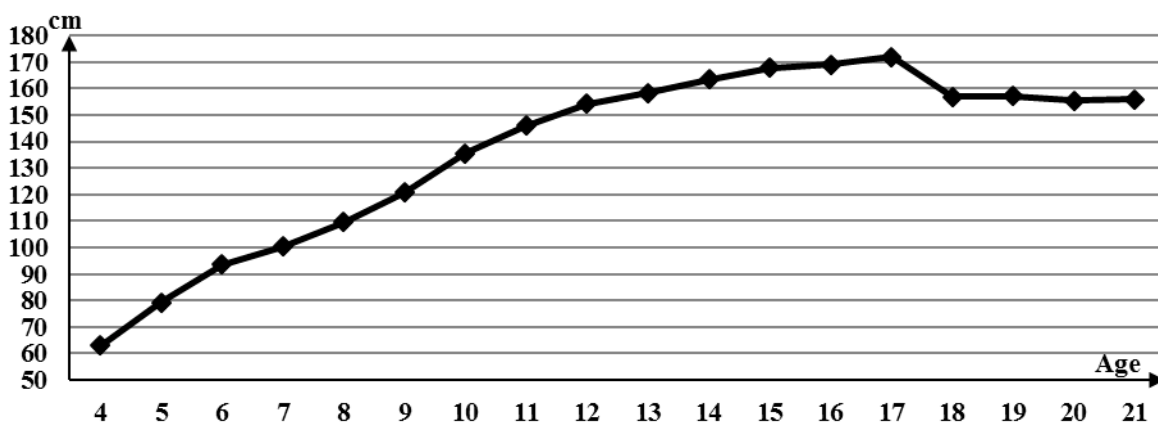


Fig. 3. Results of performing the test “Standing long jump”

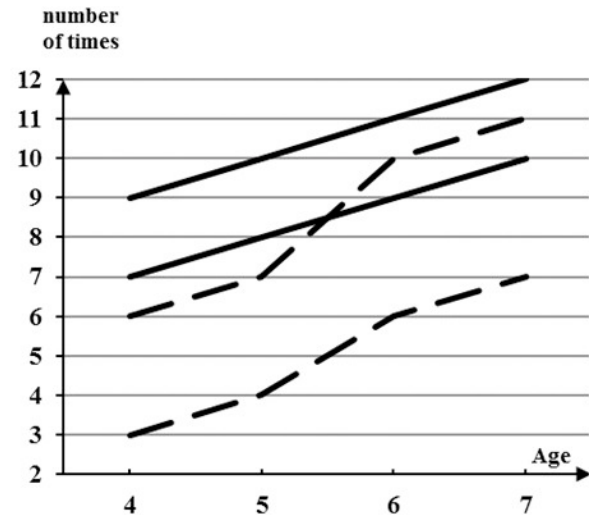
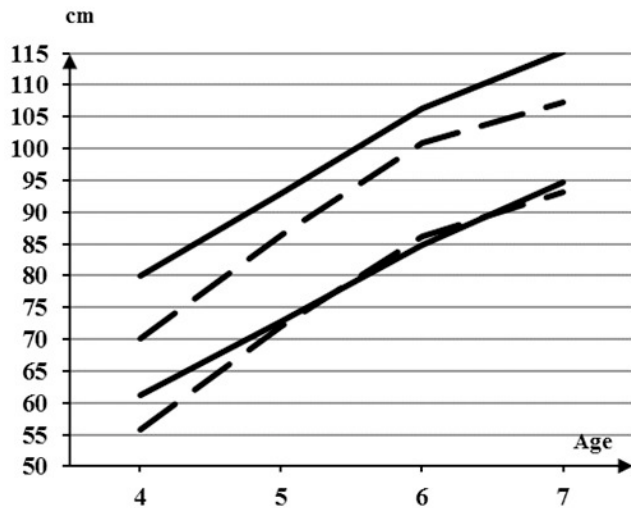


Fig. 4. Results of performing the test «Standing long jump» **Fig. 5.** Results of performing the test «Sit-ups in 30 s»

----- average level of preschool children and pupils of the municipal educational institution of Irkutsk

_____ - the average level of preschool children and pupils according to the all-Russian standard.

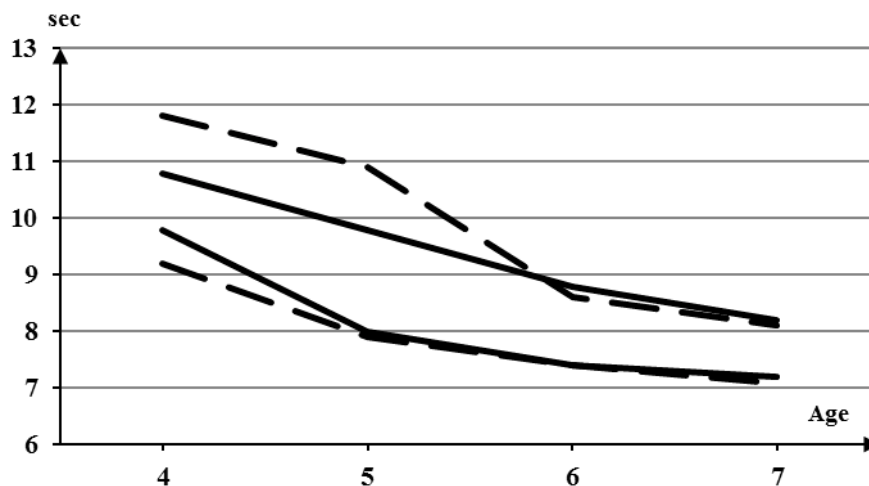


Fig 6. Results of performing the test “30 m run”

----- average level of preschool children and pupils of municipal educational institutions of Irkutsk

_____ - the average level of preschool children and pupils according to the all-Russian standard.

The test result on the assessment of the dynamic force of the girdle of inferior extremity muscles (“Standing long jump”, fig. 8) was almost identical in both compared groups. At the age of 7 and 8 years, it was slightly worse in Irkutsk schoolgirls.

In the test for determination of flexor muscle force (“Sit-ups in 30 s”, fig. 9) pupils of Irkutsk have higher results at all age groups.

The analysis of test results on the determination of the general endurance (“1000 m run”, fig. 10) has shown that girls of Irkutsk from 7 to 12 years only have better characteristic. Then their values become worse, and in 15–17 years advantage of results have Russians.

In considering and comparing of motor qualities characteristics in pupils of Irkutsk schools and the all-Russian standards it was revealed that they are almost

equal in testing muscles dynamic force of the girdle of inferior extremity. In girls of Irkutsk at all age, it is better results of tests for speed assessment (“30 m run”). Besides, in 7–17 years they have a higher force of body flexor muscle (“Sit-ups in 30 s”).

Discussion

Experts support the necessity of carrying out monitoring and performance of physical fitness level assessment of children, teenagers, and youth of student’s age. Such researches have to be performed during preschool and elementary education at schools. It is important to include as active as possible the physical fitness monitoring in the general assessment of the social and public life of the educational institution. Thus our research is coordinated with other scientific work [28]. It is also agreed with other

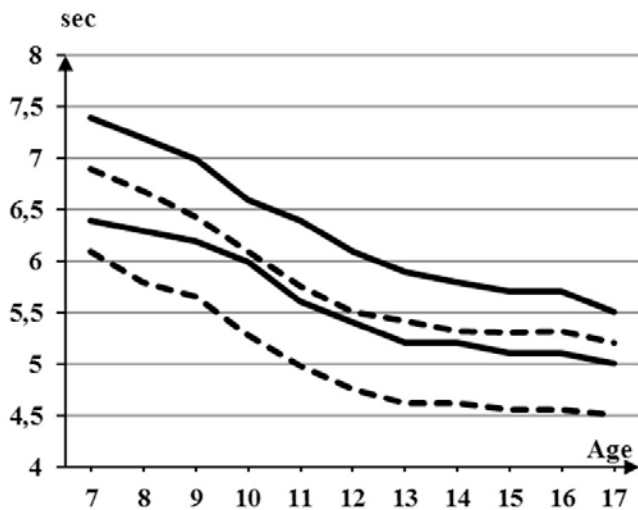


Fig. 7. Results of performing the test «30 m run»

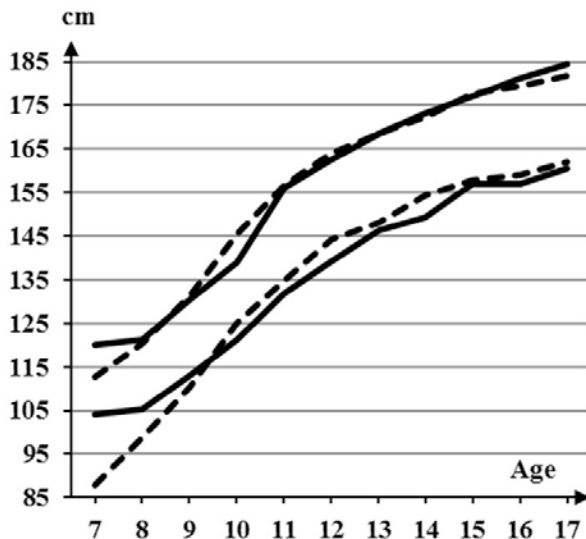


Fig. 8. Results of performing the test «Standing long jump»

--- - average level of preschool children and pupils of municipal educational institutions of Irkutsk

_____ - the average level of preschool children and pupils according to the all-Russian standard.

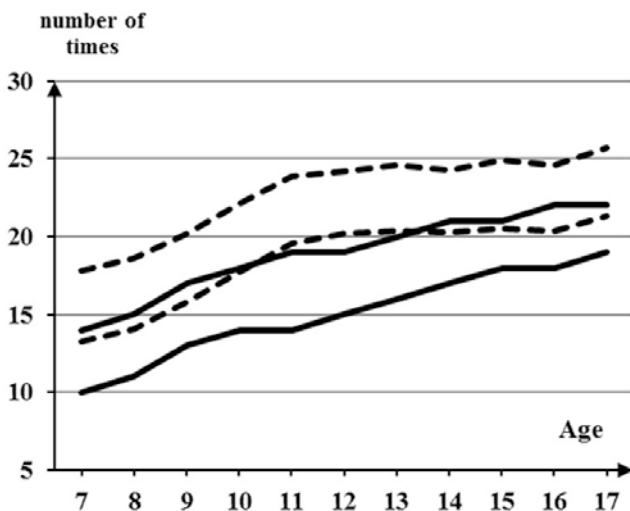


Fig. 9. Results of performing the test «Sit-ups in 30 s»

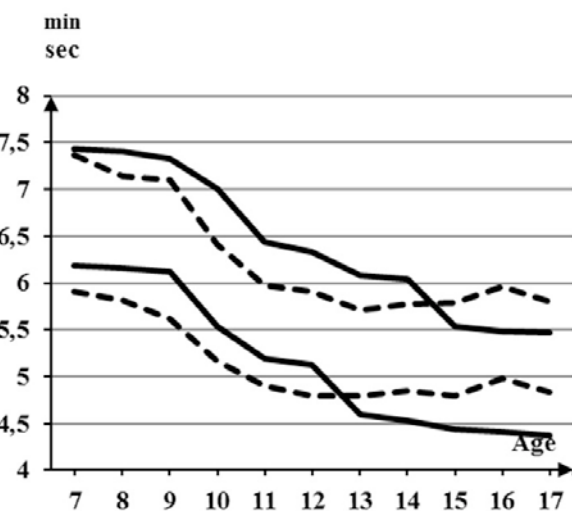


Fig. 10. Results of performing the test «1000 m run»

--- - average level of preschool children and pupils of municipal educational institutions of Irkutsk

_____ - the average level of preschool children and pupils according to the all-Russian standard.

researches [26] in different regions of Russian Federation [27, 29]: monitoring implementation activities [14] of population physical health [18], physical development of children [2], teenagers [5], youth [4].

Improvement of physical training in school pupils [3] is directed to an increase in the level of their physical fitness [6]. Therefore this research doesn't conflict with the general tendencies [6] in the physical training of preschool children [16] and school pupils [15].

The solution of the task of health passport development [19] is agreed with the general [9] and regional settings [7]. Global distribution of a hypodynamia [20] and overweight in young people does this research even more demanded and relevant [30]. In this case, the position

of authors of the article coincides with the opinion of a number of foreign experts [21]. For example, in a question of studying and increase in physical activity [31] of preschool children [23], elementary-school age children [24], teenagers and students [25]. Experts make the offers in the general concept of the increase in level of youth health. It is implemented in training programs on physical training [30] among modern young people.

It was revealed some distinctions in comparison of regional standards of physical fitness with the all-Russian characteristics [16]. Perhaps, it is defined by population living conditions in Eastern Siberia [13].

It is possible to draw the following conclusions in comparison of regional standards of physical fitness

of preschool children from Irkutsk with all-Russian characteristics: Irkutsk girls seriously concede to contemporaries from other regions according to the key indicators. Especially these distinctions are expressed at the age of 4–5 years in the tests “Sit-ups in 30 s” and “Standing long jump”. However, from 6 to 7 years the borders of regional standards increase. Then they approach all-Russian, and according to speed value – coincide with them.

Our research of motor qualities of Irkutsk schoolgirls has allowed to draw the corresponding conclusions. It was revealed age features in the analysis of studying results of the motor qualities dynamics in girls and female students. Their intensive improvement is mainly in 9–11 years. Such tendency is characteristic for Irkutsk and of the Russian schoolgirls. In a number of characteristics, the advantage of all-Russian standards is defined only at the senior school age (15–17 years). The differences between the results of the compared groups are minimized at the younger age. It is revealed that extent of motor qualities development (limit of the average level) in them coincides with all-Russian standards according to the majority of the studied indicators. However, girls from Irkutsk have authentically higher values of high-speed and power endurance of body muscles.

In the meantime, for increasing in level of physical

fitness of preschool children, schoolgirls and female students requires the development of qualitatively new approaches. It is important that these approaches corresponded to each age and social group at the level of a class or student’s group. Training to increase the physical fitness level have to take place according to educational programs in each concrete educational institution. It is especially important to consider age features of preschool children, schoolgirls, and female students.

Conclusions

Results of a research allow to develop criteria for evaluation of effective work of instructors and physical culture teachers in the creation of educational process.

The received results are recommended to apply in teaching and educational activities at comprehensive and sports schools, on physical culture chairs of higher education institutions.

The database of examination results and the developed standards of physical fitness of Irkutsk girls and female students from 4 years to 21 years could serve as a ground for further scientific research of physical fitness of various groups of the population.

Conflict of interests

The author declares that there is no conflict of interests.

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