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Original Article

Progress in physical fitness standards of students with various chest girths

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Abstract:
Clarification of physical qualities development in students with various physical fitness levels allows determining the optimal set of morphological features that characterize most motor abilities of children. The aim is to find out the students' level of competence while taking the standards of physical fitness by students with various chest girths. Testing of students' physical fitness was conducted by the approximate educational standards provided for Physical Education curriculum (2010). 327 students of senior school age: 146 - boys and 181 girls participated in testing of physical fitness level. It was found that chest girth has significant impact on senior schoolchildren' fitness level at speed, strength, and speed and power exercises. It has been established that chest girth influence on students' flexibility and endurance is somewhat less. The chest girth has virtually no effect on the level of agility in cyclic locomotion.
Key words: physical development, physical fitness, testing.

Introduction

As a result of analysis of the foreign physical fitness definitions we found that not all countries take into account the total physical development indices (PD). Some countries (Russia, Germany, Britain, the Netherlands, the USA, China and Singapore) don't use the anthropometric indices to refine the results of the test examinations.

However, the system of tests EUROFIT foresees the measurement of anthropometric parameters (length, weight, body fat component) in assessing the level of general endurance, muscle strength, strength endurance, speed, flexibility and balance. The use of anthropometric indices in clarification and correction of students' results while testing partly takes place in national tests in Poland (while evaluating the results of throwing medicine ball over the head the length of the body is taken into account). In Japan they take into account the body length and weight in assessing of physical fitness of children in all test exercises: 6-9 aged - long jump away, running for 50 meters, throwing a ball, jumping over the bar, slalom run; 10-17 aged - basic dynamometry, carpal dynamometry, torso bend forward, step test. The chest girth is not taken into account.

The educational process and standards of students' physical fitness (PF) in Ukraine is oriented towards an average student. This approach leads to the well-known consequences: negative attitude of students to exercise, reducing the degree of health impact studies, discrepancy between means and methods and students' abilities level. So now it is time to move from the group-oriented evaluation method towards differentiated (individual and typological) evaluating of study progress of the student.

Criteria search which are important to consider when implementing a differentiated approach in assessing the physical fitness of students remains a pressing problem. One of these criteria can serve as PD indices. PD indices are largely genetically determined and significantly affect the results of individual students' taking of separate standards (Bondarevskyy E.J., 1983). On the other hand the routine measurement of PD is simple and accessible. Therefore, these indices are considered the most important criteria for differentiated evaluating of students' PD in the same age-sex group (Bortsova A.N., 2006; Kaynov A.N., 2004).

Some experts in their research have started to solve this problem (Bortsova A.N., 2006; Palahyna N.I., 2005; Feofylaktov V., 2005 et al.). The results of their research show that the taking into account the somatometric indices contributes into increase students' level of physical fitness, physical and mental health and has a positive impact on the attitudes of young people towards physical education, optimizes physical activity and creates desire of physical perfection. It was shown (Bortsova A.N., 2006) that the PD indices correlate to physical fitness, especially at the senior school age ($r = 0.635$). Body type is one of the leading indices of morphological individuality among senior schoolchildren (Belyaev A., 2000).

We have found out that there are few solid scientific evidences devoted to the degree of PD indices impact on the results of the present day senior schoolchildren' PF tests. I t is not clear enough to what extent the chest girth (CG) affects the results of PD standards taking.

It is believed (Prusov P.K., 2005) that the absolute PF indices are the most informative at work related to the efforts of the body while replacing some external objects in space (throwing, lifting loads) and overcoming

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external resistance; while the relative PD indices are more informative in physical activity associated with the transfer of own body weight (walking, running, gymnastics).

Details of literature are contradictory. So some experts argue that the results of running the 100 meters and 1000 meters distances depend on the height (r = 0.44 and r = 0.42) (Feofylaktov V., 2005). Other specialists (Asenkevych R., 2002) found statistically significant relationships between somatic indices (mainly longitudinal body size) and the level of physical fitness in boys and girls, that is evident from the results of throwing a medicine ball at a distance, standing high jump, long jump pendulum running; flexibility indices deteriorated with increasing of body length. The third group of experts (Ostanyhrosh N.M., 1984; Palahyna N.I., 2005) insists on the absence of PD indices effect on physical fitness indices, as the correlation coefficients between indices and physical fitness according to the tests offered were almost equal to zero.

Some experts (Kaynov A.N., 2004; Krutsevych T., 2007) recommend considering only indices of length and weight, but the value of CG are not taken into consideration.

To justify the consideration of the importance of any PD index during differentiated assessment of physical fitness of senior schoolchildren5 it is important to know whether the children with above-average (or below average) PD levels have any benefits while taking test exercises. This information is very limited (Krutsevych T., 2007) because there is no records on the benefits of high (or low) PD indices of progress in taking PF standards by senior schoolchildren. The lack of such information doesn't allow determining the optimal set of morphological features which to the large extend characterize the motor abilities of children. Therefore it is advisable to ascertain the physical qualities levels of students with various PD to develop differentiated PF standards for students considering PD indices.

Connection of the study with academic programs, plans, and themes**.** The research was conducted according to the theme 3.7 in the field of physical education and sport science for 2011-2015 "Theoretical and methodological principles of mass monitoring and evaluation of development and physical fitness of various population groups" (0111U000192)

The objective of the research is to find out the level of competence in taking the standards of physical fitness by students with various levels of the chest girths.

Materials and methods

Testing (and evaluation) of students' physical fitness level was conducted according to the approximate educational standards prescribed in the physical education curriculum (2010) (Feofylaktov V., 2005). 327 students of senior school age: 84 boys and 73 girls of the 10^{th} grade and 62 boys and 108 girls of the 11^{th} grade, in total 146 boys and 181 girls.

Results

Analyzing the influence of the chest girth (CG) on the results of 30 meters distance running, we found that 64.5% of students with underdeveloped chest having run the distance got "unsatisfactory" mark, while 47.0% of students with a well-developed chest took the standard with "good" and "excellent" marks. That suggests that large chest girth positively affect the outcome of the speed race, and, accordingly, small ones lead to low levels of speed. However, it was found that 43.2% of students with larger than average size of chest girth showed unsatisfactory results. Therefore, it is clear that the direct relationship between CG and speed running is not observed, but the trend did exist (Table 1).

Table 1. Progress in physical fitness standards taken by students with various chest girths

Test exercises	Running 30m			Bend forward			Running 4x9m		
PD levels / Competence levels	AA	A	BA	AA	A	BA	AA	A	BA
H	***23,5***	17,2	6,6	1,3	0,7	0,0	*34,7*	35,5	*32,5*
S	23,5	18,2	3,9	5,2	5,9	4,3	*46,7*	30,2	*32,5*
A	9,9	13,0	25,0	26,0	16,4	8,5	16,0	15,4	22,1
L	43,2	51,6	**64,5**	67,6	77,0	**87,2**	2,6	18,9	13,0
Test exercises	Long jump			Running 1500m			Chin – ups		
PD levels / Competence levels	AA	A	BA	AA	A	BA	AA	A	BA
H	***14,6***	2,7	0,0	*12,9*	19,6	18,8	**28,0**	14,7	10,5
S	18,3	15,8	12,3	*38,6*	32,7	0,0	20,7	14,1	2,6
A	50,0	39,7	26,2	20,0	20,6	6,3	32,9	39,5	18,4
L	17,1	41,8	**61,5**	28,6	27,1	**75,0**	18,3	28,8	**68,5**

Notes:
1. Levels of physical development levels: AA – above average, A – average, BA below average;
2. Levels of competence: H –high, S – sufficient, A – average, L - low

The flexibility test revealed that students with small chest girths (87.2%) are characterized by low rates of flexibility. The low level of flexibility was observed also in the students with developed chest (in 67.6% of cases).

The analysis showed that students with above average size of CG (81.4%) demonstrate high performance in running skills. It is worth while to note that high level of agility can be achieved by pupils with small size of CG (65.0%).

High level of speed-power indices were observed in 14.6% of students with well-developed chest, while a large number (61.5%) of students with underdeveloped chest failed in standing jump. This indicates that there is a direct two-way connection between the level of speed strength and size of CG: students with high rates of chest girth achieve good results, students with low body weight inherent low levels of speed power.

We have established that 51.5% of students with well-developed chest are characterized by high and higher than the average level of general endurance, opposite to 75.0% of those with underdeveloped chest who showed low results performing endurance exercises. Thus it can be argued that the girth of the chest affects the results in running 1500 meters distance, the highest results in the race for endurance achieved students with above average levels of CG.

We have established that 28.0% of students with well-developed chest are characterized by high levels of strength; 68.5% of students with lower than average CG showed poor results in the arm strength exercise which points out a correlation between the levels of the chest development and this physical quality.

Discussion

Thus, summarizing obtained data we can argue that most of the results in physical fitness exercises used by teachers may be limited by the natural level of CG. This underlines the importance of this PD index, especially in the exercises testing speed, strength and speed power as well as flexibility and endurance. Unfortunately experts (Kaynov A.N., 2004; Krutsevych T., 2007) often neglected considering size of CG when evaluate the progress in taking PF standards by students.

Conclusions

The size of chest girth significantly determines the natural level of physical fitness of senior schoolchildren doing exercises testing speed, strength and speed power and to lesser extent flexibility and endurance, and has virtually no effect on the level of agility in cyclic locomotion. This emphasizes the importance of consideration of this PD index during differentiated assessment of physical fitness of senior schoolchildren.

Prospects for further research in this direction are seen in clarifying the impact of other PD indices on students' PF.

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