Study of 20-21 year-old girls' power- and speed-power ability parameters

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Abstract

Today the low level of physical operability of youth acts as a burning issue in Russia. Within the solution of current situation in the country the All-Russian sports complex "Ready for Work and Defense" (RWD) demanding optimum development of physical qualities that staticizes the real scientific work is introduced. Research was carried out on the basis of the Yelabuga Institute of the Kazan (Volga) Federal University in which students of the 3rd course at the age of 20-21 (n=26) took part. Experiment consisted in testing physical fitness, measuring maximum alactic muscle capacities of the lower extremities, anthropometries, as well as in carrying out the factorial analysis of the received indicators. This complex of tests and measurements allowed to reveal the level of physical development and physical fitness, as well as to define the major factors influencing indicators of power and speed-and-power abilities of 20-21 year old girls. The analysis of test indicators included in the RWD program confirmed a low development level of power and speed-and-power readiness of 20-21 year old students. We received average values of indicators in tests: standing long jump (177,69±18,25), dip up lying on a floor (5,73±6,85), dip up in hanging on a low crossbeam (6,76±4,34), stoop and stretch lying on a back (38,34±5,87), 100-meters dash (17,76±1,26). The factorial analysis of the studied indicators revealed the leading component promoting manifestation of power and speed-and-power abilities of 20-21 year old girls; that is the anthropometrical data and dynamic muscle force of a humeral belt. The second important component is a speed-and-power endurance of the lower extremities muscles. Less significant are the components 3 and 4 – maximum and explosive opportunities of muscles and speed-and-power endurance of abdominal tension muscles. The received research results encourage us to act in order to develop the technique aimed on power and speed-and-power readiness of 20-21 year old students.

Keywords: power abilities, speed-and-power abilities, physical fitness, students, 20-21 year old girls.
The main need and priority of any country is the healthy and physically developed youth. The aspiration to physical activity forms the basis for healthy life. Data of scientific researches confirm decrease in health state of the younger generation and deterioration in their physical fitness [1, 2]. The role of physical training in the solution of problems in the field of public health care is indisputable [3, 4, 5]. Potential of regular trainings and physical culture for health is confirmed by numerous researches [6, 7].

Health of the person in many respects is based on a high development level of the qualitative parties of the person's motive activity, force, speed, and endurance [8, page 70].

For human development and strengthening of the nation health the President of Russia V. V. Putin issued the Decree "About Revival of the All-Russian Sports Complex "Ready for Work and Defense" (RWD)" [9]. This complex was entered in 1931 in Russia and actively existed till 1991. The RWD complex represents a program and standard basis of physical training system of various national groups of the Russian Federation which establishes the state requirements to physical fitness and provides preparation and implementation of standards for 11 gender and age steps.

The RWD tests for women from 18 to 24 years belong to the first age group of the 6th step in which the main part of tests is directed to manifestation of speed-and-power and power abilities (running broad jump or double beat standing long jump; 500 g implement put (throw), dip up from a low crossbeam or dip up lying on a floor, stoop and stretch lying on a back (1 min.), and 100 m dash). "Force as physical quality is basic for the person. The development level of power indicators defines the development level of speed, endurance, flexibility and dexterity, i.e. forms all other physical qualities of the pupil" [10, page 358]. All this defines the high importance of power training.

However, according to research data, "most students (81%) have low indicators of body muscle force; 14,3% are fit, that is estimated "below average" and only 4,8% of girls have average force values" [11, page 45]. Weak power readiness of students negatively affects their physical health as power training is a basic component of the general physical development.

According to the abovementioned, the research objective is to determine the level of power and speed-and-power abilities for 20-21 year old students of higher education institutions.

**Research methods**

During research we used the following methods: analysis of scientific and methodical literature, pedagogical supervision, testing of physical fitness, anthropometry and math-statistical data processing.

Research was carried out on the basis of the Yelabuga Institute of the Kazan (Volga) Federal University in which the students of the 3rd course at the age of 20-21 (n=26) who are not exempted from PE took part. Experiment consisted in measuring indicators of power and speed-and-power abilities of motive tests (Table 1) and in their subsequent comparison with standards of the RWD complex tests. Further by the factorial analysis [12] the leading component promoting manifestation of power and speed-and-power abilities of 20-21 year old girls is revealed.
Research results

Table 1. Ratio of power and speed-and-power abilities indicators of 20-21 year old girls with norms of RWD

<table>
<thead>
<tr>
<th>Tests (units)</th>
<th>RWD norms for 18-24 year old girls</th>
<th>Girls 20-21 years old (X±δ) n=26</th>
</tr>
</thead>
<tbody>
<tr>
<td>standing long jump (cm)</td>
<td>gold 195</td>
<td>silver 180</td>
</tr>
<tr>
<td>Dip up from floor (quantity of times)</td>
<td>gold 14</td>
<td>silver 12</td>
</tr>
<tr>
<td>Hanging dip up on a low crossbeam (quantity of times)</td>
<td>gold 20</td>
<td>silver 15</td>
</tr>
<tr>
<td>Stoop and stretch lying on a back (quantity of times per 1 min.)</td>
<td>gold 47</td>
<td>silver 40</td>
</tr>
<tr>
<td>100-m dash (sec.)</td>
<td>gold 16.5</td>
<td>silver 17.0</td>
</tr>
</tbody>
</table>

Note: X – an arithmetic average, δ – a standard deviation

Fig. 1. Percentage ratio of the "standing long jump" test indicators for 20-21 year old girls (n=26) with norms of RWD

Fig. 2. Percentage ratio of the "Dip up from floor" test indicators for 20-21 year old girls (n=26) with norms of RWD
The flexion and the extension arms in vise on the low beam

3.80% 26.90% 69.30%

gold silver bronze unsigned

Fig. 3. Percentage ratio of the "Hanging dip up on a low crossbeam" test indicators for 20-21 year old girls (n=26) with norms of RWD

The flexion and the extension of the body from the position lying on the back

11.50% 19.20% 26.90% 42.40%

gold silver bronze unsigned

Fig. 4. Percentage ratio of the "Stoop and stretch lying on a back" test indicators for 20-21 year old girls (n=26) with norms of RWD

The running 100 meters

7.70% 26.90% 19.20% 46.20%

gold silver bronze unsigned

Fig. 5. Percentage ratio of the 100-m dash test indicators for 20-21 year old girls (n=26) with norms of RWD

Table 2.
Factorial scales matrix for 20-21 year old girls

<table>
<thead>
<tr>
<th>Test name</th>
<th>Interpretation of the allocated factors</th>
</tr>
</thead>
</table>

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Table 3. Main indicators for 20-21 year old girls

<table>
<thead>
<tr>
<th>Factors</th>
<th>Major factors</th>
<th>% Dispersi overall yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Anthropometrical data and dynamic force of humeral belt muscles</td>
<td>38.6%</td>
</tr>
<tr>
<td>2</td>
<td>Speed-and-power endurance of the lower extremities muscles</td>
<td>22.6%</td>
</tr>
<tr>
<td>3</td>
<td>Maximum explosive muscle capabilities</td>
<td>10.4%</td>
</tr>
<tr>
<td>4</td>
<td>Speed-and-power endurance of the abdominal muscles</td>
<td>8.4%</td>
</tr>
<tr>
<td>Dispersi overall yield in %</td>
<td></td>
<td>80%</td>
</tr>
</tbody>
</table>

Research results and discussion

The comparative analysis of power and speed-and-power abilities indicators for 20-21 year old girls with norms of RWD (Table 1) allows to say that:

1) average value of the "Standing long jump" test indicators corresponds to a bronze sign (177,69±18,25);

2) testing in dip up lying on a floor defined that average value of 20-21 year old girls indicators does not meet the standard (5,73±6,85);
3) an arithmetic average value when testing indicators of dip up in hanging on a low crossbeam is also below norm (6.76±4.34);

4) to a bronze sign average value of motive test indicators in the "Stoop and stretch lying on a Back" is equated (38.34±5.87);

5) average value of indicators on 100 meters dash is below norm (17.76±1.26).

The percentage ratio of indicators in the studied motive tests demonstrates that:

1) 11.5% of girls meet the "gold sign" standard in standing long jump, "Silver sign" – 42.3% of girls, "Bronze sign" – 15.4% of girls and 30.8% meet none (Fig. 1);

2) in the "Dip up lying on a Floor" test 19.2% of girls met the standard "Gold sign", 3.8% – "Silver sign", 7.7% – "Bronze sign", 69.3% of girls have indicators below norm (Fig. 2);

3) testing of indicators in dip up in hanging on a low crossbeam did not reveal the indicators meeting "Gold sign" standards, the standard "Silver sign" was met by 3.8% of girls, "Bronze sign" – 26.9% of girls, "No sign" – 69.3% of girls (Fig. 3);

4) 11.5% of girls met the standard "Gold sign" in the "Stoop and stretch lying on a back" test, 26.9% – "Silver sign", 42.4% – "Bronze sign" and 19.2% of girls did not hit a qualifying standard of RWD (Fig. 4);

5) in 100-meters dash 7.7% of girls met the standard "Gold sign", indicators of 26.9% of girls met "Silver sign" standards, "Bronze sign" - 19.2% of girls, and 46.2% of girls did not meet the standard of RWD (Fig. 5).

According to the obtained data of the factorial analysis (Table 2), in group of 20-21 year old girls the following results were received.

The share of the 1st factor makes 38.6% of the general dispersion of selection (Table 3). This factor makes the greatest contribution to the generalized selection dispersion which we designated as "anthropometrical data and dynamic muscle force of a humeral belt". In this factor the following tests were defined: leg length; height; arm length; dip up in hanging on a low crossbeam; body weight; dip up lying. At the moment it testifies to the high importance of anthropometry and dynamic muscle force of a humeral belt in manifestation of power and speed-and-power abilities.

The 2nd factor (22.6% of the general dispersion of selection) is characterized as "speed-and-power endurance of muscles of the lower extremities" (Table 3). This factor consists of the following indicators: 100 m dash; 10 m dash; standing long jump. This factor is the second for the importance, defining power and speed-and-power abilities of 20-21 year old girls.

Less significant in manifestation of power and speed-and-power abilities of 20-21 year old girls are the 3 and 4 factors given below. The 3rd factor (10.4% of the general dispersion of selection) is defined as "maximum and explosive muscle capacity" (Table 3). This factor consists of the following indicators: MAP (maximum alactic power) of the lower extremities muscles; bar press; MAP muscles of the lower extremities in W/kg; throwing of 1 kg of a stuffed ball from behind the head.

We designated the 4th factor (8.4% of the general selection) as "speed-and-power endurance of muscles of an abdominal tension" (Table 3). This factor consists of the test: stoop and stretch, lying on a back per 1 min.

Summary

Empirical research allowed to define low indicators of average values in tests: standing long jump (177.69±18.25) that corresponds to a bronze sign of RWD norms; dip up lying on a floor (5.73±6.85) that does not meet standards of RWD; dip up in hanging on a low crossbeam
(6.76±4.34) that is below norms of RWD; stoop and stretch lying on a back (38.34±5.87) that meets the requirements of a bronze sign; 100 m dash (17.76±1.26) that is below the minimum requirements of RWD standards.

The carried-out factorial analysis demonstrates that in manifestation of power and speed-and-power abilities the factor "Anthropometrical data and dynamic muscle force of a humeral belt" dominates.

**Conclusion**

Thus, these researches testify to low power and speed-and-power readiness of 20-21 year old girls expressed in discrepancy with norms of RWD that gives rise to need for development of the technique aimed on developing power and speed-and-power readiness of 20-21 year old students.
References