STUDY ON THE DEVELOPMENT OF THE ABDOMINAL AND BACK MUSCLE STRENGTH IN THE U.P.B. WOMEN'S BASKETBALL TEAM

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Abstract
The study undertaken aims at improving the training process of the female students in the representative basketball team of the University Politehnica of Bucharest, by elaborating and implementing training programs, which include operational structures focused on the development of the abdominal and back muscle strength. The pedagogical experiment was conducted over two academic years and was carried out on a sample of 12 female students. Concretely, the U.P.B. girls basketball team conducted in each training lesson the programs intended to be experienced. The comparison of the results obtained by the subjects between the initial and final evaluation show significant differences, from a statistical viewpoint, in all tested parameters. The results obtained at the end of the experiment prove that the training programs which were used influenced positively the development of abdominal and back muscle strength and also the basic motor ability of the female students.

Keywords: abdomen, basketball, strength, musculature, back, female students

JEL classification: I20, I25

1. Introduction

To consider basketball as a means of physical education is to acknowledge its formative function since it contributes to the social integration of young people and to their multilateral training (physical, mental and moral) through the ludic activity specific to practising it.

Basketball, viewed from the perspective of the physical education means, can meet the demands of a good education for working out purposes among U.P.B. female students.

For a female athlete, maintaining physical capabilities beyond the health basic

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standards is as important as providing a high level of play over a longer period of time. (T. Predescu, G. Ghițescu, 2001, p.65).

Preparing the U.P.B. representative women's basketball team takes into account the anatomical, physiological and psychological peculiarities of female students. Along with the technical training and the tactical and psychological training, the physical training plays an important role in the preparation process of the female students, determining their performance in official games.

Practicing the basketball game influences positively the development of motor skills. They contribute essentially to the development of the basic motor skills which represent the background of basketball development. (M. Netolitzchi, 2008, p.65).

In order to increase the trainings efficiency and to increase the team performances, it was agreed together with the technical management of the UPB female students basketball team to work on developing a training plan that will lead to the optimization of their basic motor capacity. In this respect, one chose to initiate a pedagogical experiment that aimed to optimize and objectivise the female students’ training.

2. Material and Methods

2.1 The research objectives

- To establishing optimum operational structures for the development of abdominal and back muscle strength, and to include these in training programs;
- To verify experimentally the effectiveness of the developed programs.

2.2 The Research Hypothesis

It is assumed that the introduction of new and appropriate means and their variation can improve abdominal strength and back strength, thereby helping to optimize the female students training.

2.3 Research Methods

The bibliographic study method, the observation method (M. Epuran, 2005, pp. 207), the experiment method, the test and measurement method, the statistical method, the graphical method.

2.4 The Research Instruments

Which we used were represented by the following motor trials: from dorsal lying, trunk and limb raising to 90° for 30”, and also the trunk extension from facial lying for 30°.
2.5 Research Content

In order to verify the hypothesis issued, we organized a verification pedagogical experiment conducted on a working sample of 12 female students’ players of the UPB representative team. The research venue was the UPB game room which was adequately provided for to conduct the specific activity. The experiment was performed over a period of two years of training (2011-2013), during which we intervened in the preparation of the UPB female students’ basketball team in order to improve the training process by applying new and appropriate means, concretized in a succession of operational structures, aimed at optimizing the basic motor capacity and especially the development of the abdominal and back musculature.

The operational structures which were used were taken from the high-performance basketball (Brittenham, G. – 1997) and were adapted to the preparation level of the female students, the members of the U.P.B. representative team.

The means used in the preparation aimed at developing the abdominal musculature (oblique, superior, inferior) and at developing the back musculature.

For the force development there was made a two times per week training program, a program which is also used in N.B.A. (2 trainings – development of the abdominal force, 2 trainings development of the back force)

The programs may vary as time and intensity depending on the exercises overlap/superposition and number. The overlap/superposition advantages include: good muscular balance; increased preparation levels and increased bloodstream in the body segments. (National Bascketball Conditioning Coaches Association – 1997)

During the research there were made 4 measurements, so:

1. in the first semester of the 2011-2012 academic year, the initial testing;
2. in the second semester of the 2011-2012 academic year, the control testing;
3. in the first semester of the 2012-2013 academic year, the control testing;
4. in the second semester of the 2012-2013 academic year, the final test.

The trainings conducted by the team in line with the previously established micro- and macro cycles by introducing new methods and means, were traced and quantified through the previously presented motor trials.

2.6 Results and Discussion

We present below (Table 1 and 2) the results obtained during the four tests:
Table 1 Trunk and lower limbs raise to 90° from dorsal lying for 30’’

<table>
<thead>
<tr>
<th>Testings</th>
<th>Initial testing</th>
<th>Control testing</th>
<th>Control testing</th>
<th>Final testing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2011-2012</td>
<td>2012-2013</td>
<td></td>
</tr>
<tr>
<td>Nr.</td>
<td>Surname</td>
<td>Training period</td>
<td>Competitional Period</td>
<td>Training period</td>
</tr>
<tr>
<td>crt</td>
<td>First name</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guards</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>B.A.</td>
<td>32</td>
<td>33</td>
<td>34</td>
</tr>
<tr>
<td>2</td>
<td>D.I.</td>
<td>37</td>
<td>37</td>
<td>37</td>
</tr>
<tr>
<td>3</td>
<td>C.S.</td>
<td>34</td>
<td>36</td>
<td>37</td>
</tr>
<tr>
<td>4</td>
<td>M.C.</td>
<td>36</td>
<td>36</td>
<td>36</td>
</tr>
<tr>
<td>Forwards</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>T.A.</td>
<td>33</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>6</td>
<td>C.L.</td>
<td>41</td>
<td>42</td>
<td>41</td>
</tr>
<tr>
<td>7</td>
<td>M.A.</td>
<td>37</td>
<td>38</td>
<td>38</td>
</tr>
<tr>
<td>8</td>
<td>B.A.</td>
<td>34</td>
<td>35</td>
<td>36</td>
</tr>
<tr>
<td>Centers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>G.A.</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>10</td>
<td>G.F.</td>
<td>43</td>
<td>43</td>
<td>44</td>
</tr>
<tr>
<td>11</td>
<td>M.C.</td>
<td>34</td>
<td>34</td>
<td>35</td>
</tr>
<tr>
<td>12</td>
<td>B.C.</td>
<td>31</td>
<td>33</td>
<td>33</td>
</tr>
</tbody>
</table>

After analyzing the results we find the following:
- Female athletes D. I. and G. A. had the same results at the first three tests.
- Four female athletes B.A., C. S., B.A. and GF had the same results (each) at the third and fourth tests.
- Female athlete T. A. obtained the same results at the last three tests.
- M.C. obtained the same result in the fourth test as compared to the initial testing.
- Except for female athlete MC, all the female athletes have achieved superior results at the last test compared to the first test.
- The best result was obtained by female athlete GF - 44.
- The weakest result was obtained by female athletes BA, TA and B.C. - 34.

We mention that the female athletes were not trained especially for this test.
Female athlete DI obtained the same result at the first three tests.
Female athletes B.A., C.S. MC and G. A. had the same results (each) at tests three and four.
C.L., GF and MC obtained the same result at the first two tests.
Female athlete B.C. obtained the same result at the fourth testing compared to the first testing.
Except for female athlete BC, all the female athletes achieved better results at the last test compared to the first test.
The best result was obtained by female athlete C.L. - 58.
The weakest result was obtained by female athlete B.A. - 45.

Figure 2 Trunk and lower limbs raise at 90° from dorsal lying for 30”

Correlogram 1 Trunk extension from facial lying for 30” - Correlogram (XY)

Correlogram 2 Trunk and lower limbs raise to 90° from dorsal lying for 30” - Correlogram (XY)
We presented below (Table 3 and 4) the results obtained at the initial and final testing based on the determined statistical indicators: the arithmetic mean, the standard deviation, the coefficient of variability, the “Student” test calculated "t", the correlation coefficient "r":

Table 3 Trunk and lower limbs raise to 90° from dorsal lying for 30”

<table>
<thead>
<tr>
<th>The arithmetic mean</th>
<th>The standard deviation</th>
<th>Coefficient of variability</th>
<th>Student Test “t”</th>
<th>Coefficient of Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>initial</td>
<td>final</td>
<td>initial</td>
<td>final</td>
<td></td>
</tr>
<tr>
<td>35.50</td>
<td>37.08</td>
<td>3.55</td>
<td>3.09</td>
<td>10.01</td>
</tr>
</tbody>
</table>

The evaluation trial of the abdominal muscle strength, measured in the first semester of the academic year 2011 - 2012 (1) correlated with the same trial in the second semester of the academic year 2012-2013 (4) shows that:

- The arithmetic mean is of 35.50, the standard deviation of 3.55 for the initial test and the final test, the arithmetic mean is of 37.08 and the standard deviation is of 3.09;
- The coefficient of variability in the first case is of 10.01% and for the second one is of 8.33%. This shows that this group is homogeneous, the variability being substantially equal to 10%;
- Calculating the Student Test "t" to verify the null hypothesis, we find that the value of the "t" is of 6.09. Comparing it with the value in Fisher Table, for 0.01 as significance threshold and frequency n-1 of the selected sample, we find that the calculated "t" has a greater value than the "t" of the table.

We can say that the difference is significant, so the null hypothesis is rejected.

- The correlation coefficient is of 0.97. The sum of initial test is of 426.0 and for the final test is of 445.0. We can see getting of better results, the variations occur in the same direction, so the correlation is direct, significant and the coefficient is positive.

Table 4 Trunk extension from facial lying for 30”

<table>
<thead>
<tr>
<th>Arithmetic Mean</th>
<th>Standard Deviation</th>
<th>Coefficient of variability</th>
<th>Student Test “t”</th>
<th>Coefficient of correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>initial</td>
<td>final</td>
<td>initial</td>
<td>final</td>
<td></td>
</tr>
<tr>
<td>50.08</td>
<td>51.92</td>
<td>4.27</td>
<td>4.63</td>
<td>8.53</td>
</tr>
</tbody>
</table>

The evaluation trial of the back muscle strength, measured in the first semester of the academic year 2011 - 2012 (1) correlated with the same trial measured in the second semester of the academic year 2012-2013 (4) shows that:
The arithmetic mean is of 50.08, the standard deviation of 4.27 for the initial test and for the final test the arithmetic mean is of 51.92 and the standard deviation is of 4.63;

- The coefficient of variability in the first case is 8.53% and for the second is of 8.92%. This shows that this group is homogeneous, the variability being substantially equal to 10%;

- Calculating the Student Test "t" to verify the null hypothesis, we find that the value of "t" is of 7.61. Comparing it with the value in the Fisher Table, for 0.01 as significance threshold and the frequency n-1 of the selected sample, we find that the calculated "t" has a value greater than "t" of the table.

We can say that the difference is significant, so the null hypothesis is rejected.

- The coefficient of correlation is of 0.98. The sum of initial test is of 601.0 and for the final test of 623.0. We can see a trend of obtaining better results, the variations occur in the same direction, so the correlation is direct, significant and coefficient is positive.

**Trials Correlation from the Final Tests**

The sum for the evaluation trial of the back muscle strength (30") is of 623.0 and for the evaluation trial of the abdominal muscle strength (30") is of 445.0, and the obtained correlation coefficient is $r = 0.66$. We establish the existence of a trend of simultaneous increase of the results, the players who do well in extensions (30") usually do well in what regards the abdomen trials (30"). In this case, there results a positive correlation.

**3. Conclusions**

The comparison of data obtained during the experiment indicates significant differences from a statistical viewpoint, between the initial and final tests. The progress achieved between initial and final testing at the two control trials which were applied, proves the effectiveness of the operational structures which were used. Therefore, the hypothesis of the experimental approach was confirmed.

The introduction of a wide range of resources, rationalized during the training lessons, increased the level of development of abdominal and back muscle strength, which led to an improved basic motor capacity of the female basketball players.

Applying the developed programs contributed significantly to reaching the athletic shape specific to high performance basketball and to achieving better results in university competitions held with the UPB women's basketball team.

Practicing university level basketball, in an organized manner under the specialists' guidance, leads to the somatic - functional development of the university youth.
REFERENCES