CONTENT

Preparation in judo, energy and biomechanical characteristics
Laurențiu BOCIOACĂ........................................................................................................5

A sociological perspective of the healthy communities pilot initiative– impact upon the parents of disabled children
Aura BOTA, Laura Cătălina STOICA..................................................................................11

Sedentarism – epidemy of today’s society
Erwah ALNABLSI...........................................................................................................21

Choice of optimal solution on improving performance under conditions of uncertainty
Vlad OLESCU, Viorel COJOCARU, Isabella SIMA..........................................................24

Study on the execution times of women weightlifting athletes for the two-hand clean and jerk technique
Daniel Constantin MURĂREȚU, Răzvan-Liviu PETRE, Marian Daniel TEODORU.........27

Study concerning the identification of the force level expression of the lower limbs in tennis players
Mihai ILIE........................................................................................................................32

Improvement of motor qualities and skills in persons with down syndrome by practicing adapted gymnastics exercises
Cristina Elena MORARU, Raluca Mihaela HODORCA, Dumitru VASILESCU, Adriana ALBU.......................................................................................................................37

A study of psychomotor ability at children aged 10-14
Nicolae NEAGU, Alexandra-Camelia GLIGA...................................................................42

The implementation results of the licensing system for coaches training players under 13
Alina Daniela MOANȚĂ, Iulian Gabriel GHIȚESCU, Mihăiță Alin SĂFTEL.......................50

Study on the ways of increasing the adherence of school age children in thoracolumbar scoliosis treatment
Corina PREDESCU, Mihaela APOSTU..............................................................................56

The incidence of spine deficiencies among disabled students from special education system in Bucharest corrected by kinetotherapy exercises
ȘUȚĂ Vicol Eduard, MARINESCU Gheorghe, TĂTARU Tiberiu, OPREA Laurențiu, ȘUȚĂ Lizia Ioana.........................................................................................................................59

Influences of Pilates apparatus exercises on the improvement of coxarthrosis condition
Andrei-Marius ISPAS, Sabina MACOVEI..........................................................................64

Research with regards on the importance of physical preparation for the discipline 10m air rifle men, at the European level
Cătălin ȘERBAN, Corina ȚIFREA....................................................................................69

The importance of physical exercise in maintaining the quality of life in postmenopausal women
Codruța LENCU, Renata NICULA....................................................................................73
Algorithmic program - support in learning of "Danilova Forward" on beam
   Silvia Alexandra STROESCU.................................................................81

Indirect communication in physical ducation
   George DINA Liliana Dina, Cezar Hantău.................................................................87

Objective and subjective in the assessment of fitness level of the young population in the academic technical environment using the eurofit and alpha-fit test batteries
   Liliana BECEA, Raluca PELIN, Carmen GRIGOROIU.................................................................90

Evaluating conditional abilities: speed and strength in the Physical education class for pre-teens
   Enescu George Alexandru Platini, Niculescu Marian.................................................................96

The importance of electronic devices in tennis performance
   Rareș STÂNESCU..................................................................................................101

Using computer software to determine an attack hit model for women’s junior teams
   Adin-Marian COJOCARU, Marilena COJOCARU.................................................................107

The use of the mirror for stimulating the hand grip strength through visual feedback
   Nicolae Horațiu POP, Judit MARIAN, Camelia-Manuela MÎRZA.................................................................113

The utilization of critical swimming speed in training the aerobic capacity of young swimmers
   Adrian RĂDULESCU, Gheorghe MARINESCU, Laurențiu TICALĂ.................................................................119

Hyperactivity\impulsivity amelioration effects of a fencing training program on children diagnosed with attention deficit hyperactivity disorder
   Lydia Hatuel CZUCKERMANN, Iacob HANȚIU.................................................................128
PREPARATION IN JUDO, ENERGY AND BIOMECHANICAL CHARACTERISTICS

Laurențiu BOCIOACĂ*

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Abstract. Judo, an Olympic combat sport, includes techniques based on maximum efficiency. The biomechanics specific to fighting actions and the characteristics of energy consumption are considered increasingly important by specialists. The purpose of this paper is to determine the aspects underpinning the classification of fighting techniques, from a biomechanical standpoint, and the energy consumption corresponding to different techniques. The research subjects are performance and top performance athletes, male and female, aged 19 to 25 years. In conducting the research, there were used general and specific training and assessment methods. For the biomechanical assessment of combat techniques, it was used the dynamic analysis and the system of leverages and couple of forces, the force distribution in relation to movement trajectory, the method of spherical and cylindrical symmetry analysis. Data regarding the biomechanical analysis have as a main landmark the actions performed in the coxofemoral joint, considered fundamental actions in judo. There are presented data on the energy consumption in judo-specific demands and the energy released in different areas of the body. To determine the energy consumption, there have been used thermodynamic methods, and the data presented relate to the calorimetric assessment through the comparative analysis of oxygen uptake with the motor activity and caloric energy released. Energy consumption is determined using the thermographic system. Conclusions prove the importance of adaptive effects occurred in the investigated athletes, regarding the role of biomechanical aspects in increasing the efficiency of technical executions and its close relationship with energy efficiency in top performance preparation.

Keywords: judo, training, biomechanical analysis, energy consumption.

Introduction

More and more studies prove that judoka athletes have very high exercise capacity, exceptional strength, increased speed of reaction and execution (Deliu, 2000), a very high level of intersegmental and intra-segmental coordination, spatial and temporal orientation, balance, as well as increased energy consumption (Sale & Jacobs, 1990). Recent studies have demonstrated the crucial importance of adaptations specific to anaerobic lactacid capacity in judoka athletes for winning the victory (Suarez & Davila, 2002). Other research regarding the importance of biomechanical analysis proves the very close relationship between technical preparation and energy efficiency specific to combat actions (Sacripanti, 1988).

Research purpose. In our paper, there are presented data collected during a macrocycle of preparation from a total of 20 male and female athletes aged between 19 and 25 years, of international and national level, members of judo teams within the Romanian Judo Federation. Data on the comparative biomechanical analysis for various technical actions, as well as data collected for the indicators of performance capacity and exercise capacity were made available to us by the Romanian Judo Federation. Data on the biomechanical analysis have as a main landmark the actions performed in the coxofemoral joint, considered fundamental actions in judo (Hantău & Bocioacă, 2008; Petre, 2014).

The research objective is to determine the athletes’ level of adaptation to the energy and biomechanical characteristics required by specific motor actions and to classify these characteristics.

Materials and methods

To determine the energy consumption, there have been used thermodynamic methods, and the data presented relate to the calorimetric assessment through the comparative analysis of oxygen uptake with the motor activity and caloric energy released. The research data consider the relationship according to which 30 grams of oxygen consumed correspond to 150 calories (Imamura et al., 2007). Data were collected in two stages, namely at the beginning and after 12 months of activity. Data processing was achieved by calculating the following descriptive statistical indicators: central parameters and dispersion parameters (arithmetic mean, standard deviation, coefficient of variation, Student’s t-test).
Results

Table 1. Data recorded by the research subjects in the assessment of maximal aerobic capacity (VO$_2$max) for the initial testing and its conversion into calories consumed per weight class

<table>
<thead>
<tr>
<th>Item no.</th>
<th>Initials</th>
<th>Male/ Female</th>
<th>Weight Class (kg)</th>
<th>Calories</th>
<th>Initial Test VO$_2$ (gr. O$_2$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>D.A.</td>
<td>F</td>
<td>48</td>
<td>164</td>
<td>31</td>
</tr>
<tr>
<td>2</td>
<td>C.C.</td>
<td>F</td>
<td>57</td>
<td>164</td>
<td>28</td>
</tr>
<tr>
<td>3</td>
<td>R.S.</td>
<td>F</td>
<td>78</td>
<td>164</td>
<td>43</td>
</tr>
<tr>
<td>4</td>
<td>C.A.</td>
<td>F</td>
<td>52</td>
<td>164</td>
<td>38</td>
</tr>
<tr>
<td>5</td>
<td>C.M.</td>
<td>F</td>
<td>48</td>
<td>164</td>
<td>36</td>
</tr>
<tr>
<td>6</td>
<td>L.A.</td>
<td>M</td>
<td>95</td>
<td>164</td>
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</tr>
<tr>
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<td>M.A.</td>
<td>F</td>
<td>48</td>
<td>164</td>
<td>32</td>
</tr>
<tr>
<td>8</td>
<td>P.A.</td>
<td>F</td>
<td>48</td>
<td>164</td>
<td>30</td>
</tr>
<tr>
<td>9</td>
<td>S.N.</td>
<td>M</td>
<td>66</td>
<td>164</td>
<td>33</td>
</tr>
<tr>
<td>10</td>
<td>B.C.</td>
<td>F</td>
<td>52</td>
<td>164</td>
<td>28</td>
</tr>
<tr>
<td>11</td>
<td>G.V.</td>
<td>M</td>
<td>73</td>
<td>164</td>
<td>32</td>
</tr>
<tr>
<td>12</td>
<td>C.E.</td>
<td>F</td>
<td>52</td>
<td>164</td>
<td>33</td>
</tr>
<tr>
<td>13</td>
<td>S.C.</td>
<td>M</td>
<td>81</td>
<td>164</td>
<td>35</td>
</tr>
<tr>
<td>14</td>
<td>B.R.</td>
<td>M</td>
<td>66</td>
<td>164</td>
<td>30</td>
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<tr>
<td>15</td>
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<td>57</td>
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</tr>
<tr>
<td>16</td>
<td>F.L.</td>
<td>F</td>
<td>52</td>
<td>164</td>
<td>31</td>
</tr>
<tr>
<td>17</td>
<td>A.D.</td>
<td>F</td>
<td>52</td>
<td>164</td>
<td>35</td>
</tr>
<tr>
<td>18</td>
<td>N.V.</td>
<td>M</td>
<td>71</td>
<td>164</td>
<td>37</td>
</tr>
<tr>
<td>19</td>
<td>B.B.</td>
<td>M</td>
<td>100</td>
<td>164</td>
<td>43</td>
</tr>
</tbody>
</table>

Table 2. Data recorded by the research subjects in the assessment of maximal aerobic capacity (VO$_2$max) for the final testing and its conversion into calories consumed per weight class

<table>
<thead>
<tr>
<th>Item no.</th>
<th>Initials</th>
<th>Male/ Female</th>
<th>Weight Class (kg)</th>
<th>Calories</th>
<th>Final Test VO$_2$ (gr. O$_2$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>D.A.</td>
<td>F</td>
<td>48</td>
<td>164</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>C.C.</td>
<td>F</td>
<td>57</td>
<td>164</td>
<td>27</td>
</tr>
<tr>
<td>3</td>
<td>R.S.</td>
<td>F</td>
<td>78</td>
<td>164</td>
<td>41</td>
</tr>
<tr>
<td>4</td>
<td>C.A.</td>
<td>F</td>
<td>52</td>
<td>164</td>
<td>36</td>
</tr>
<tr>
<td>5</td>
<td>C.M.</td>
<td>F</td>
<td>48</td>
<td>164</td>
<td>36</td>
</tr>
<tr>
<td>6</td>
<td>L.A.</td>
<td>M</td>
<td>95</td>
<td>164</td>
<td>38</td>
</tr>
<tr>
<td>7</td>
<td>M.A.</td>
<td>F</td>
<td>48</td>
<td>164</td>
<td>30</td>
</tr>
<tr>
<td>8</td>
<td>P.A.</td>
<td>F</td>
<td>48</td>
<td>164</td>
<td>30</td>
</tr>
<tr>
<td>9</td>
<td>S.N.</td>
<td>M</td>
<td>66</td>
<td>164</td>
<td>31</td>
</tr>
<tr>
<td>10</td>
<td>B.C.</td>
<td>F</td>
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<td>164</td>
<td>27</td>
</tr>
<tr>
<td>11</td>
<td>G.V.</td>
<td>M</td>
<td>73</td>
<td>164</td>
<td>31</td>
</tr>
<tr>
<td>12</td>
<td>C.E.</td>
<td>F</td>
<td>52</td>
<td>164</td>
<td>33</td>
</tr>
<tr>
<td>13</td>
<td>S.C.</td>
<td>M</td>
<td>81</td>
<td>164</td>
<td>34</td>
</tr>
<tr>
<td>14</td>
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<td>66</td>
<td>164</td>
<td>31</td>
</tr>
<tr>
<td>15</td>
<td>D.S.</td>
<td>F</td>
<td>57</td>
<td>164</td>
<td>32</td>
</tr>
<tr>
<td>16</td>
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<td>F</td>
<td>52</td>
<td>164</td>
<td>31</td>
</tr>
<tr>
<td>17</td>
<td>A.D.</td>
<td>F</td>
<td>52</td>
<td>164</td>
<td>34</td>
</tr>
</tbody>
</table>
Table 3. Data on mean, standard deviations and t-test, results for movement time and knee extension force in Harai-Goshi – Initial testing

<table>
<thead>
<tr>
<th>Items</th>
<th>The action analyzed</th>
<th>Mean</th>
<th>SD</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leg angle</td>
<td>Knee-extended</td>
<td>55.13</td>
<td>6.63</td>
<td>-7.27</td>
</tr>
<tr>
<td>Body angle</td>
<td>Knee-extended</td>
<td>94.95</td>
<td>5.81</td>
<td>3.38</td>
</tr>
<tr>
<td>Tsukuri time</td>
<td>Knee-extended</td>
<td>0.21</td>
<td>0.03</td>
<td>1.14</td>
</tr>
<tr>
<td>Kake time</td>
<td>Knee-extended</td>
<td>0.24</td>
<td>0.04</td>
<td>1.17</td>
</tr>
<tr>
<td>Force of hands</td>
<td>Knee-extended</td>
<td>0.15</td>
<td>0.14</td>
<td>0.81</td>
</tr>
<tr>
<td>Force of sweeping</td>
<td>Knee-extended</td>
<td>0.4</td>
<td>0.18</td>
<td>0.15</td>
</tr>
<tr>
<td>Raise leg time</td>
<td>Knee-extended</td>
<td>0.26</td>
<td>0.5</td>
<td>3.12</td>
</tr>
</tbody>
</table>

Table 4. Data on mean, standard deviations and t-test, results for movement time and knee extension force in Harai-Goshi – Final testing

<table>
<thead>
<tr>
<th>Items</th>
<th>The action analyzed</th>
<th>Mean</th>
<th>S.D.</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leg angle</td>
<td>Knee-extended</td>
<td>53.13</td>
<td>6.53</td>
<td>-7.12</td>
</tr>
<tr>
<td>Body angle</td>
<td>Knee-extended</td>
<td>91.95</td>
<td>5.71</td>
<td>3.18</td>
</tr>
<tr>
<td>Tsukuri time</td>
<td>Knee-extended</td>
<td>0.26</td>
<td>0.13</td>
<td>1.12</td>
</tr>
<tr>
<td>Kake time</td>
<td>Knee-extended</td>
<td>0.22</td>
<td>0.14</td>
<td>1.13</td>
</tr>
<tr>
<td>Force of hands</td>
<td>Knee-extended</td>
<td>0.12</td>
<td>0.24</td>
<td>0.61</td>
</tr>
<tr>
<td>Force of sweeping</td>
<td>Knee-extended</td>
<td>0.4</td>
<td>0.28</td>
<td>0.15</td>
</tr>
<tr>
<td>Raise leg time</td>
<td>Knee-extended</td>
<td>0.27</td>
<td>0.7</td>
<td>3.22</td>
</tr>
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</table>

Table 5. Statistical data on the main indicators of the experimental group for the performance capacity characteristics – Initial testing

<table>
<thead>
<tr>
<th>Parameters</th>
<th>M</th>
<th>SD</th>
<th>Cv</th>
<th>t-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>18</td>
<td>8.43</td>
<td>0</td>
<td>0.25</td>
</tr>
<tr>
<td>Experience</td>
<td>21</td>
<td>6.97</td>
<td>0</td>
<td>0.13</td>
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<tr>
<td>Conditioning factor (%)</td>
<td>46</td>
<td>2.3</td>
<td>6.25</td>
<td>0.15</td>
</tr>
<tr>
<td>Strength-Velocity(%)</td>
<td>54</td>
<td>2.3</td>
<td>1.2</td>
<td>0.03</td>
</tr>
<tr>
<td>Coordination (%)</td>
<td>65</td>
<td>3.02</td>
<td>3.1</td>
<td>0.03</td>
</tr>
<tr>
<td>Endurance (%)</td>
<td>48</td>
<td>2.31</td>
<td>2</td>
<td>0.05</td>
</tr>
<tr>
<td>Intellectual aptitude</td>
<td>64</td>
<td>1.07</td>
<td>1.1</td>
<td>0.05</td>
</tr>
<tr>
<td>Moral aptitude</td>
<td>67</td>
<td>0.42</td>
<td>2.2</td>
<td>0.01</td>
</tr>
<tr>
<td>Mental aptitude</td>
<td>73</td>
<td>1.33</td>
<td>2.6</td>
<td>0.01</td>
</tr>
<tr>
<td>Technical and tactical skills</td>
<td>70</td>
<td>2.2</td>
<td>1.8</td>
<td>0.01</td>
</tr>
<tr>
<td>Hygienic factors</td>
<td>34</td>
<td>2.16</td>
<td>3.5</td>
<td>0.11</td>
</tr>
<tr>
<td>Aerobic capacity</td>
<td>68</td>
<td>5.62</td>
<td>1.9</td>
<td>0.10</td>
</tr>
<tr>
<td>AL capacity</td>
<td>43</td>
<td>0.19</td>
<td>2.7</td>
<td>0.06</td>
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<tr>
<td>AA capacity</td>
<td>38</td>
<td>1.2</td>
<td>1.8</td>
<td>0.02</td>
</tr>
</tbody>
</table>
Table 6. Statistical data on the main indicators of the experimental group for the performance capacity characteristics – Final testing

<table>
<thead>
<tr>
<th>Parameters</th>
<th>M</th>
<th>SD</th>
<th>Cv</th>
<th>t-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>19</td>
<td>8.43</td>
<td>0</td>
<td>0.25</td>
</tr>
<tr>
<td>Experience</td>
<td>22</td>
<td>6.97</td>
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<td>0.13</td>
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<tr>
<td>Conditioning factor (%)</td>
<td>46</td>
<td>2.3</td>
<td>6.25</td>
<td>0.15</td>
</tr>
<tr>
<td>Strength-Velocity (%)</td>
<td>54</td>
<td>2.3</td>
<td>1.2</td>
<td>0.03</td>
</tr>
<tr>
<td>Coordination (%)</td>
<td>65</td>
<td>3.02</td>
<td>3.1</td>
<td>0.03</td>
</tr>
<tr>
<td>Endurance (%)</td>
<td>48</td>
<td>2.31</td>
<td>2</td>
<td>0.05</td>
</tr>
<tr>
<td>Intellectual aptitude</td>
<td>64</td>
<td>1.07</td>
<td>1.1</td>
<td>0.05</td>
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<td>Moral aptitude</td>
<td>67</td>
<td>0.42</td>
<td>2.2</td>
<td>0.01</td>
</tr>
<tr>
<td>Mental aptitude</td>
<td>73</td>
<td>1.33</td>
<td>2.6</td>
<td>0.01</td>
</tr>
<tr>
<td>Technical and tactical skills</td>
<td>70</td>
<td>2.2</td>
<td>1.8</td>
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</tr>
<tr>
<td>Hygienic factors</td>
<td>34</td>
<td>2.16</td>
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<tr>
<td>Aerobic capacity</td>
<td>68</td>
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<tr>
<td>AL capacity</td>
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<td>2.7</td>
<td>0.06</td>
</tr>
<tr>
<td>AA capacity</td>
<td>38</td>
<td>1.2</td>
<td>1.8</td>
<td>0.02</td>
</tr>
</tbody>
</table>

Fig. 1 illustrates the graphical evolution of data for maximal oxygen consumption corresponding to each weight class, in the initial testing.

Fig. 1. Graphical representation of data for maximal oxygen consumption corresponding to each weight class – Initial testing

Fig. 2. Graphical representation of data for maximal oxygen consumption corresponding to each weight class and its conversion into calories consumed – Final testing
In Fig. 4, it is shown the graphical evolution of data on the extended knee force in the biomechanical analysis specific to Harai-Goshi technique, in the final testing.

Fig. 5 shows the graphical evolution of data on the importance of characteristics specific to performance capacity in the initial testing.
Discussions and conclusions

The data presented in this paper demonstrate the importance of performance capacity for winning the victory in judo competitions. The biomechanical characteristics of techniques and the assessment of angular forces in the specific joints highlight the adaptation to high speed and coordination movements, which is proved by the fact that the statistical indicators, the values of standard deviation and t-test are lower in the final testing. The values of energy characteristics and those of exercise capacity increase at the end of the research, demonstrating an improved level of adaptation to judo-specific demands and the amplification of efficiency in combat actions. Results achieved by the research subjects in the assessment of maximal aerobic capacity (VO$_2$ max) and the correspondence of data on the calories consumed show an increased efficiency in oxygen utilization at the end of the experiment, which demonstrates the low values of calories consumed. In the opinion of most coaches, the physical conditional factors, the motor qualities of strength-speed and coordination, along with the speed of reaction and execution, have a strategic importance in judo preparation. This majority trend in the data obtained after assessing the performance capacity characteristics prove the deep change in the conception about preparation of both judo athletes and specialists, to avoid the unnecessary energy and time consumption through efficient preparation adapted to the competitive demands.

Data obtained by us on the significant increase in the anaerobic capacity and aerobic capacity, for the performance judoka athletes, are confirmed by similar research (Blais & Trilles, 2004; Deliu, 2000; Bocioacă, 2007; Petre, 2014; Imamura et al., 2007) revealing important physiological adaptations of the specific shape (Hantău & Bocioacă, 2008) in order to obtain high sports performances in judo.

References


A SOCIOLOGICAL PERSPECTIVE OF THE HEALTHY COMMUNITIES PILOT INITIATIVE– IMPACT UPON THE PARENTS OF DISABLED CHILDREN

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Abstract. This study, part of an international project, commissioned by Special Olympics International and coordinated by the University of Cape Town, aims at revealing the social impact of the Healthy Communities pilot programme that Special Olympics Romania has been developing since 2012. This initiative is an on-going, community-integrated network which facilitates access to health and well-being services, education and daily support for athletes with intellectual disabilities, via six healthcare medical disciplines. In this paper, we are interested in identifying the opinions of parents with disabled children regarding access to medical services. In this respect, the focus group method was used, aiming at providing accurate information about all the side-problems encountered in the process of accessing health services for disabled children. The study, which took place in June 2015, focused on 15 parents at sporting events in Bucharest and Targu-Mures, which held the Special Olympics National Games. We chose to apply the focus group method to gather information so we could comment on parents’ beliefs, attitudes, concerns and worries about the health of their disabled children. We also wanted to capture data on how parents perceive and know how to use available health services for their children. The study also looks at the way healthcare professionals provide services to people with intellectual disabilities and how those services could actually be improved. A qualitative approach lead us to the idea that although important progress has been made, there are still many health aspects which remain unaddressed by mainstream medical services, which are often unable to adapt to the special needs of this segment of the population.

Keywords: Healthy Communities programme, medical services, intellectually disabled children, social impact

Introduction

This study, part of an international project commissioned by Special Olympics International and coordinated by the University of Cape Town, aims at revealing the social impact of the Healthy Communities pilot programme that Special Olympics Romania has been developing since 2012.

In an integrative vision, this organization has conceived a wide variety of programmes dedicated to the intellectually disabled, such as educational, sports- and health-oriented or aiming at raising awareness and building communities, each having a huge impact at an individual and social level. Having this comprehensive vision helps families, broader communities, local leaders, law enforcement and others to band together to change attitudes and support athletes (Koehler, Kiss, & Vinereanu, 2014).

As one of the above mentioned programmes, Healthy Communities is an on-going, community-integrated network which facilitates access to health and well-being services, education and daily support for athletes with intellectual disabilities, via six healthcare medical disciplines (Opening Eyes, Special Smiles, Healthy Hearing, Health Promotion, Fit Feet, Fun Fitness), so that health disparities between disabled and non-disabled can be alleviated (Lurie, 2002; Fiscella et al., 2000). In order to have an objective viewpoint on the way this programme is implemented and its effectiveness worldwide, a transnational evaluation tool was created, Romania being one of the target-countries involved.

As one of the above mentioned programmes, Healthy Communities is an on-going, community-integrated network which facilitates access to health and well-being services, education and daily support for athletes with intellectual disabilities, via six healthcare medical disciplines (Opening Eyes, Special Smiles, Healthy Hearing, Health Promotion, Fit Feet, Fun Fitness), so that health disparities between disabled and non-disabled can be alleviated (Lurie, 2002; Fiscella et al., 2000). In order to have an objective viewpoint on the way this programme is implemented and its effectiveness worldwide, a transnational evaluation tool was created, Romania being one of the target-countries involved.

Starting in 2012, Special Olympics Romania has organized 35 Healthy Communities testing events, often held in conjunction with sport competitions. Within this context, feedback from the athletes, parents, coaches, therapists is certainly more than useful for further tailoring this complex programme to the varying needs of the disabled community. Generally speaking, this transnational evaluation addresses the processes, outcomes and impact for which measures should be subsequently taken.

The study concerning the evaluation of the Healthy Communities program is designed to allow a broad perspective of the aspects and issues that intellectually disabled children face during their formative years. We used a macro-type vision (social environment determinants) that leads us to a micro-type analysis which depicts the precise phenomena and mechanisms which impact the children and their families.
Materials and methods

Given the Special Olympics complementary programmes, whose specific configuration requires a mix of research methods, this study in its extensive version aims at both a quantitative research applied to several types of respondents (coaches, health professionals, volunteers), and a qualitative approach addressed to the sport practicing children with intellectual disabilities as well as their parents.

The present study embraces only a part of the qualitative inquiry and aims at identifying the parents’ opinions regarding the problems they face on a regular basis in their effort to maintain or improve the health status of their disabled children (Dowling, 2014).

Research tools

In order to achieve a better understanding of the barriers which limit the access of disabled children to specialized healthcare services, we chose to use the focus group technique, having as a working instrument an interview guide which allowed the gathering of relevant data for the purpose of this research. This guide was conceived by the Disabilities Studies Program, within the University of Cape-Town, this being applied in Romania, Peru, Thailand, Malawi and three American states, Wisconsin, Florida and New York, in order to pick up on the common and differential notes between different countries and regions.

The focus group was a semi-structured one, with open but also focused questions, that made it possible to gather complex information about the life situations encountered by the parents throughout the years, regarding their concerns about the health issues of their children, difficulties they have faced in accessing medical services, ways of handling regular problems, impact of the Healthy Communities pilot initiative, participation in awareness, training and sharing-experience events and, last but not least, the role of the physical and sports activities in raising the potential of the disabled children. We were also interested in finding out the parents’ suggestions about how health services could be improved in Romania, and how they could be oriented more closely to the special needs area.

The interview guide comprised ten main topics, which allowed the differentiation of sub-themes, all having a strong social content, delving into the often difficult social circumstances in which the disabled children and their parents find themselves. Being a flexible technique, the focus group facilitated both an honest delivery of opinions and valid results in an operational way. The group dynamics throughout the discussions engendered a mutually encouraging atmosphere amongst the parents, one which brought to the surface aspects which would have been unlikely raised with an individual approach.

From a technical point of view, the authors/facilitators recorded the opinions of the respondents on audio tape, obviously after receiving permission from those in attendance. Subsequently, the information was transcribed and systematized according to the main topics of interest, so that analysis and interpretation could be comprehensively achieved.

In terms of the specific methods used, we chose the content analysis technique (applied to the transcripts), to identify certain classifications and patterns which allow the understanding of the myriad of issues addressed. Given the quantity of transcribed text, data was systematized and then coded according to the essential concepts of the working tool so that we could ultimately focus on the mechanisms behind the cues used in the focus groups. In order to be able to grasp a global perspective, but also to sort, categorize and analyze the data, we used the Nvivo 11 software for the qualitative data processing and to establishing the connections between the different characteristics mentioned by the respondents.

Subjects

Within this study, 24 subjects were involved, all parents of intellectually-disabled children participating in training sessions or early motor development programmes, organized by Special Olympics Romania. Although the subjects in the four focus groups were not chosen through sampling procedures (Scârnece, 2006), they represent an active part of the parents’ community, whose children are included in the Healthy Communities project. Our long experience in working in this area could help us assume that the opinions expressed in these focus groups are representative of the wider population they are part of, being thus possible to be extrapolated on a larger scale (McConkey, 2014).

The respondents, female in the majority, come from all geographical regions, having different ages (from 25 to 60 years old), professions and financial status.

The study was conducted between March-July 2015, the data being collected in Bucharest and Targu-Mures, during the regular Special Olympics events and the Special Olympics National Games.
Results

Fig. 1 represents a global analysis of the information provided in the focus groups, through a specific function allowing the recording of the most frequently used 1000 words. By means of this instrument, we noticed that the most frequent word used by the parents was “problems”, with 81 appearances. Also, the word “medical doctor” was used 22 times in the Bucharest sample and 24 times in Targu-Mures sample. The frequency of “health” was 15 in Bucharest and 20 in the Targu-Mures groups. All three words express the themes of parents’ concerns regarding the health of their children.

Fig. 1. The most frequently used words, during focus groups

In order to understand the motivation for the repetitive use of these words, their semantic connections were analyzed. Fig. 2 emphasizes the fact that parents identify the Down syndrome pathology as being one of the problems they encounter. Also, in Annex 1, one can see that parents frequently bring up problems related to dental care, nutrition, and the thyroid gland. This endocrine issue was mentioned 12 times, which clearly indicates that although this common pathological issue in intellectually-disabled subjects is well documented, few facilities for dealing with it exist anywhere in Romania. Controlling the secondary pathology is the key-element for preventing more severe health problems.

Fig. 2. Semantic connections – “Down syndrome”

Another variable which often came up in the discussions was the way financial status represents an important barrier to accessing the best therapy for the disabled children. Annex 2 shows that around the “money” word there is a wide variety of collocations, a fact which demonstrates that this is an important topic of discussion. In order to illustrate the way money could restrict access to health services, we extracted in Fig. 3 an experience which one of the respondents mentioned when having to solve a specific orthopedic issue.
Fig. 3. Semantic connections – “Financial status”

Fig. 4 extracts an example of the main themes discussed in the Targu-Mures focus group, whilst Fig. 5 emphasizes the key topics from the Bucharest focus groups. Both figures show that the “money” concept was a key discussion point and that relates to the continuous efforts to access financial support for different types of therapies that children have to follow for a better chance to improve their condition.

Fig. 4. Main words Targu-Mures – Example

Fig. 5. Main words Bucharest – Example
Assessing health services was another important theme of this study. We were interested in understanding the way parents perceive them and also to discover if they were aware of the medical facilities that legislation has made available for those people with special needs. Almost all parents remarked on the lack of a government body which should be assigned to providing information and advising on the available legislation, logistic and financial provisions, which were widely considered insufficient for the complex problems of people with such limiting conditions. Fig. 6 offers an insight into a health issue (conveyed by a parent), requiring a sum almost five times higher than the one reimbursed by the medical insurance system (the difference being provided by the family).

The statement below was made by a mother who brought up the fact that once a child with Down syndrome reaches the age of adulthood, access to medical services becomes a lot more difficult. This suggests that support for disabled adults is not the same as that for those under the age of 18, although there is nothing to support the idea that there is any improvement in health conditions after this age (Fig. 7).

Fig. 8 and 9 addressed some of the fears and concerns that parents have regarding their children’s wellbeing.

Almost all parents were interested in the way they should handle disabled children’s sexuality. The majority of those asked felt that they would like to receive more information that would help them deal with their children’s sexual issues, a fact which suggests that these issues need addressing more thoroughly in the Special Olympics Health Forums events.
Besides the general clinical signs which are mentioned by almost all the respondents, each parent has his own concerns. Fig. 9 addresses a mother’s real fear related to a complicated surgical procedure (cardiac catheterization) that her daughter has to undergo. According to the transcripts, the reasons for these concerns and the difficulty in solving these major issues are closely connected to the lack of specialists willing to take on fully the responsibility of treating a Down syndrome patient. A lot of regions are deprived of doctors in different specializations, so parents and children from small cities or rural areas have to travel long distances to attend a consultation at a clinic. Having arrived there, they have to queue for hours with their children in critical condition. Under these circumstances, hoping for a doctor who might also be competent in special needs or a specialized clinic in this domain would be rather utopic.

Another theme that was brought up during the focus groups was the way parents try to maintain or improve the health status of their children. In this regard, most of them stress the importance of healthy nutrition, combined with systematical physical activities performed over the longer term. In close connection to this topic, Annex 3 presents the word collocations of “Special Olympics”, which reveal the parents’ attitude towards the Special Olympic organization. In Fig. 10 we emphasized one of the mothers’ opinions regarding the role of Special Olympics in motivating children to be actively involved in physical activities, with a positive impact upon their motor, cognitive and social behaviour. Fig. 11 depicts the causal relationship between participation in sports events and gaining functional independence in daily activities. As a matter of fact, the phrases most commonly connected to “Special Olympics” in Annex 3 are argumentative for the positive effects of the complementary programmes that this organisation provides in our country. Parents embrace all efforts which could result in a better quality of life for their children.

In brief, this qualitative approach lead us to the idea that although important progress has been made, there are still many health aspects which remain unaddressed by mainstream medical services, which are often unable to adapt to the special needs of this segment of the population.

Conclusions

The results of this evaluation emphasize the fact that parents with disabled children face a myriad of problems with different connotations: health, educational, social, legislation-related or financial.

Most of the respondents are concerned about the difficulty of access to quality health services, the deterioration of the children’s health status, the precarious financial status which often deprives the child of quality therapeutic or educational programmes, and the lack of information about handling sexuality in disabled young people.

Improving parents’ knowledge and tailoring the information to their needs is something this study has indicated as of the utmost importance, as is the necessity of a government body which can reduce the clear disparity in the physical health and social status of the disabled by enforcing the proper legislation.

A strain on financial resources was mentioned in the focus groups as an obstacle to accessing quality health services, despite the parents’ continual efforts to overcome this situation.
The positive effects of the Special Olympics complementary programmes stress the importance of joining forces to carry them to a wider range of communities, in school settings and sports clubs, so that more people with intellectual disabilities can have access to these kinds of activities.

Evaluation results will also be used to identify unanticipated outcomes within funded communities, to continuously improve programme design, and to identify and appropriately address communities’ programmatic and technical assistance needs.

References


Annex 1. Words collocation for “problems”
Annex 2. Words collocation for “money”

Annex 3. Words collocation for “Special Olympics”
Annex 4. Words collocation for “medical”

Text Search Query - Results Preview

- every year we have
  - give my son a
to certify her disability,
- control to know what dose
- evaluation made by Special Olympics,
  - especially to the muscle
  - Indeed it is very
  - Special conditions are needed
- evaluations have
  - a positive effect
  - you ever found
  - made by Special Olympics
  - she learned that she
to be at the
- exam. My son has some
  - examination twice to establish his
  - examinations be improved? What suggestions
  - field, the doctors could make
  - personnel, and also the poor
  - problems. Every spring and autumn
  - screening and physical training programs
  - screenings 1 2: Dermatologic exam could
  - services were available. The priority is
  - Mother 4. The priority is
- setting. I was kicked out
  - system in Romania offered us
tests with our family doctor.
SEDENTARISM – EPIDEMY OF TODAY’S SOCIETY

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Abstract. In the current socio-economic conditions of globalization, people face an accelerated pace and complexity of daily activities, which causes increased levels of stress exerted on the body. The result is an increased incidence of serious diseases. The research related to sedentary behavior and its implications on individual lives should constitute and it actually is, in many countries, a public health priority. Conceptualizing and accurately measuring the inactivity level are the premises of a valuable research. Undoubtedly, the epidemic of inactivity in contemporary society is not easy to discern and refute. Sedentary behavior has ample reasons, of different natures, being inextricably linked to the family, social, cultural, educational, geographic and economic environment of the evaluated individual. The topic is very broad and none of these factors can be ignored and not accounted for in statistics or in-depth research.

Keywords: sedentary behavior, epidemic, health priority, proactivity, reactivity

Introduction

In the current socio-economic conditions of globalization, people face an accelerated pace and complexity of daily activities, which causes increased levels of stress exerted on the body (Satcher & Lurie, 2010). The result is an increased incidence of serious diseases. Many of these diseases are being treated and their real, actual causes ignored. Practicing sports and physical exercises in general, engaging in energy consuming daily activities such as walking small distances to work/office instead of using the car and/or climbing stairs instead of taking the elevator a couple of floors up or down seem not to have much in common with the high incidence rate of heart and lung conditions. Nevertheless, the real culprit is obvious and paradoxically hidden in the same time to the naked uninformed eye. The epidemic of sedentary behavior will continue to contaminate the populace at large unless awareness on the importance of adopting a proactive lifestyle is brought into the limelight by specialists (Biddle, 2008). The way in which sedentary behavior and high levels of stress are going hand in hand becomes clearer everyday and many medical and holistic professionals establish links between them and the risk of cardiovascular and respiratory diseases (Alkhatib, 2016). A proactive behavior and a healthy lifestyle seem to be the key factors towards longevity, functionality and quality of life.

Issues addressed

In 2012, Carnegie Mellon University in the US conducted a study to analyze the direct relationship between stress levels and degree of illness of the population. The researchers found that, when subjected to a harmful stimulus, there is an inflammation at organic level that the body cannot counter. Thus, the development and progression of various diseases is stimulated.

WHO statistics (WHO, 2002) show that between 60 and 85% of the world population has a sedentary lifestyle both in developed countries and the emerging ones, physical inactivity being viewed as a leading cause of disease and disability.

The research related to sedentary behavior and its implications on individual lives should constitute and it actually is, in many countries, a public health priority. Conceptualizing and accurately measuring the inactivity level are the premises of a valuable research.

One of the shortcomings of research on the sedentary lifestyle nowadays is that researchers have not adequately defined and measured, in a scientifically rigorous manner, the sedentary behavior. A common problem is the lack of clarity when referring to sedentary behavior and/or sedentary people, who are often identified and associated with people who have low levels of physical activity.

Lack of physical exercise could have serious implications on health, physical inactivity being one of the top 10 causes of death and disability worldwide. Also, it is estimated that about two thirds of children have a sedentary lifestyle, which jeopardizes their growth and development.

Healthy People 2010 Magazine states that a sedentary individual “denotes a person who is relatively inactive and have a lifestyle characterized very much by sitting on their chair” (Satcher & Lurie, 2010). Also, it establishes a correlation between a sedentary lifestyle and overweight, as well as the role that lifestyle plays in successfully decreasing body weight. Many studies focus on the analysis of the behavior of people who repeatedly and
continuously watch TV programs and constantly engage in video or computer games, ignoring other reasons leading to inactivity. Very often, these reasons can be of a psychological and/or psycho-emotional nature, more difficult to analyze, observe and quantify in research studies, but they play a central role in this epidemic in the contemporary society. Recent studies (Collins, 2009, p. 57) have shown that sedentary lifestyle effects on individual health and general well-being are extremely important, playing an indirect role on the death rate, the similar to the role of drinking and smoking.

According to Alkhatabi (2016, p. 21), individuals who use less than 10% of daily energy consumption in moderate to high intensity activities should be classified as sedentary.

The confusion derives in particular from very different definitions of sedentary individual as an inactive or physically non-active individual, which distinguish him from the individual who is engaged in sedentary behaviors. An individual with health problems becomes physically inactive, trying to protect himself from the effects of his affection, but he is not sedentary in essence. It would be inaccurate to refer to sedentary behavior in case of lack of physical activity, because there is strong evidence that these two behaviors are independent and have different effects on the individual health.

For example, a person with a degenerative spine disease, uniformed by the specialist about the possibility to improve his wellness through systematic exercise, will tend to protect his body/spine by non-movement. In our professional experience of more than ten years, we saw many people, especially females, fitting this pattern. Non-active behavior, in most cases, is justified by the pain that movement would cause them during exercise. Practice has shown that a person who receives timely expert advice and chooses to exercise, complementary to the recommended medication, recovers faster and has better long-term results. In this case, a non-active person, due to physical disorders, adopts a pro-active behavior and is no longer a part of the population statistically described as victims of an inactivity epidemic.

Defining sedentary people as people having levels of deficiency in physical activity is inaccurate and can lead to erroneous evaluation attempts concerning the sedentary behavior concept. We would rather support the classification and designation of people with low levels of physical activity as insufficiently-active rather than sedentary. Sedentary behavior is “a distinct class of behaviors characterized by low levels of energy consumption” (Biddle, 2008, p. 232). This last definition is more specific and suggests sets of distinct areas of behavior, beyond the presence or absence of physical activity in subjects’ lives. A sedentary adult behavior, for example, often comes from a child’s sedentary behavior, which took over the behavioral pattern of related family/social environment. This idea is extensively discussed in the specialized literature, which covers this area of age.

A person who engages in sedentary behavior is one that does not recognize, accept and/or consider the practice of systematic physical exercise as valuable and beneficial. These individuals focus specifically on their career, allocating most of their time to professional activities, considering unnecessary the time spent in physical activity. In these cases, physical inactivity could be countered by education/correct information of the large population about the benefits of practicing physical exercise every day, even for relatively short periods of time, which can be included in their work program, wherever they are practiced (office, home, park, gym etc.). Research thus oriented could greatly reduce inactivity epidemic in the contemporary society, with effects and deep roots in the declining level of health for a significant part of the population aged between 35 and 50 years.

Thus, we can separate, from a behavioral viewpoint, two major, distinct categories of people, who seem to have similar lifestyles. Undoubtedly, the epidemic of inactivity in contemporary society is not easy to discern and refute. Sedentary behavior has ample reasons, of different natures, being inextricably linked to the family, social, cultural, educational, geographic and economic environment of the evaluated individual. The topic is very broad and none of these factors can be ignored and not accounted for in statistics or in-depth research.

Sedentary lifestyle epidemic has an undeniable psycho-affective and emotional side and its importance is often minimized. Prophylaxis of sedentary effects cannot put aside or neglect these essential aspects of individual behavior. A clear direction in this relatively new exploratory size is not easy and is also difficult to quantify.

It has been hypothesized that some sedentary behaviors such as continuous/constant TV watching discourages active involvement in physical activity and can lead to obesity. There is also evidence that TV watching stimulates consumption of unhealthy foods.

A meta-analysis found a significant negative relationship between the use of TV and video games consoles and body fat in children and youth, although the effects were quite small. The relationship between watching TV and playing video games and exercise was also negative. A group analysis of sedentary behavior supports the conclusion that watching TV programs does not necessarily disrupt the importance of physical activity for young people. They can have both increased levels of physical activity and sedentary pursuits.
Discussions and conclusions

Research on sedentary behavior and its influence on the modern individual is, in our opinion, extremely important and necessary, a real priority in the management of public health policies at national and international levels. The conceptualization and measurement methods related to sedentary lifestyle indicators belong to a detailed research of a high scientific quality. A major shortcoming of the research conducted so far on sedentary behavior is the lack of clear definitions and complex indicators for assessment of sedentary lifestyle, meeting all possible stages of this contemporary epidemic in the daily life of modern individual.

Man is, by nature, in charge of his own life. The behavior of each individual is a function of the decisions they adopt and, accordingly, he can subordinate his feelings to a personal value system. Each person takes the initiative and responsibility to determine an event. Thus, one can have a reactive or proactive behavior.

In recent years, fostering a proactive behavior, especially in a professional environment, has been studied with great interest. Subjects with a proactive behavior do not relate to circumstances, conditions or preconditions to make a decision. Their conduct is the result of their own conscious choice, based on a personal system of values, and not the product of conditions based on feelings.

Since by its nature, the human being is proactive, adopting a lifestyle influenced by conditioning is the result of his conscious decision to accept such conditions as parameters to influence his behavior. In this situation, proactivity turns into reactivity.

*Reactive behavior* is characterized by a thought which is always in crisis, seeking solutions after the problems occur. Usually, a reactive individual is dominated by constant stress. He spends a lot of time solving the crisis and is not a person open to changes. Also, he is never taking control to determine changes in the events, but will intervene with small adjustments or will expect the solution to come from another source.

The reactive individual is influenced by socio-cultural environment of his activity. When external events are positive and act in his favor, he will experience a state of physical and psychological comfort. Otherwise, he becomes defensive and protective. These individuals build their emotional lives around the behavior of other people, being driven by feelings, circumstances, conditions and environment.

In such circumstances, it is important that a specialist in physical education and sports be able to select and individualize a training plan, opting for those working methods that are suitable to the lifestyle and personality of the trainees.

References


CHOICE OF OPTIMAL SOLUTION ON IMPROVING PERFORMANCE UNDER CONDITIONS OF UNCERTAINTY

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Abstract. The sample of eight performance athletes has undergone a number of six tests, as a result of the implementation of the staff’s new training plan. Having already a confirmation of the effectiveness of our own final plan for physical training, we wanted to highlight which of the six tests shows best the growth in performance of the athletes for the long jump with impetus (Thompson, 2009). Optimizing decisions involves generally the choice of the most appropriate way to act from a multitude of possible variants. The hard part of this process, according to the data, is due to the lack of certainty of conditions over the effectiveness of the test. With the help of mathematical methods, on the basis of existing information, but transposed in an appropriate form, one can define the types of behavior so as to select the most viable strategy.

Keywords: optimal solution, performance, tests, mathematical method, uncertainty.

Introduction

The sample of eight performance athletes has undergone a number of six tests, as a result of the implementation of the staff’s new training plan. Having already a confirmation of the effectiveness of our own final plan for physical training, we wanted to highlight which of the six tests shows best the growth in performance of the athletes for the long jump with impetus (Thompson, 2009). The final plan for monitoring the effects of physical training on the athletes’ performance level used the following tests:
- 150m standing start run (T1) (Mackenzie, 2005, p.110);
- standing high jump (Sargent Test) (T2) (Mackenzie, 2005, p.128);
- standing long jump (T3) (Vasiliev & Ozolin, 1952, p.214);
- standing triple jump (T4) (Vasiliev & Ozolin, 1952, p.224);
- 30m run with released start (T5) (Mackenzie, 2005, p.197);
- Münich Fitness Test (MFT) (T6) (Rusch & Irrgang, 2005, pp.1-7).

Materials and methods

In compiling this mathematical model, the first phase was the one where we built the matrix, and then we used the created table and applied certain calculation methods to arrive at the optimal strategy (Albici, Teselios, & Tenovici, 2010).

Thus, the elements of the model are chosen:
- Strategies available, i.e. decision-making center alternatives, which will be noted further with V₁, V₂, ..., (Vᵢ), ..., VM; I = (1, m);
- States of nature, denoted by N₁, N₂, ..., ..., Nₙ: j = (1, n) and which, in the present model, are represented by eight athletes subject to testing.

We put in a table the m lines for strategies, and n columns for states of nature, and at the intersection of rows with the columns in each box, the results, and thus the appropriate matrix.

Results

Before considering the five rules of the corresponding decision of choosing optimal variant, the following table is presented—the matrix:
Thus, we use the following five rules:

- **The precautionary criterion (Rule of Abraham Wald)**

By applying the matrix analyzed for this criterion, we obtained:

\[
\max \{ \min \{ 16.98; 17.21; 17.11; 17.46; 17.68; 17.6; 17.27; 17.68 \} , \min \{ 76.12; 70.28; 73.23; 74.99; 69.82; 72.5; 78.04; 65.17 \} , \min \{ 2.78; 2.83; 2.95; 2.84; 2.83; 2.88; 3.05; 2.78 \} , \\
\min \{ 8.92; 8.84; 8.98; 8.68; 8.72; 8.65; 9.13; 8.62 \} , \\
\min \{ 68.5; 70.5; 69.71; 57.55; 73.57; 72 \} \} = \max \{ 16.98; 65.17; 27.88; 62.03; 68.5 \} = 68.5 \quad (1)
\]

From the above, it follows that the optimal variant of this algorithm is represented by T6 = Münich Fitness Test.

- **The criterion of optimism**

This criterion involves getting the best output, and thus we will choose the version with the highest win possible, regardless of the negative consequences that might lie in this thing.

Applying the formula issue, we obtained:

\[
\max \{ 17.68; 78.04; 3.05; 9.13; 2.72; 75.5 \} = 78.04 \quad (2)
\]

In this case too, we choose the optimal variant resulting from application of the above-mentioned criterion, noticing that it is T2 test – standing high jump.

- **Criteria weighted optimism**

Assuming \( \alpha = 0.5 \) as a mean value of the degree of optimism, it follows:

\[
\max \{ 0.5*16.98+0.5*17.68; 0.5*65.17+0.5*78.04; 0.5*2.78+0.5*3.05; \\
0.5*8.92+0.5*9.13; 0.5*2.03+0.5*2.72; 0.5*68.5+0.5*75.5 \} = \\
\max \{ 17.33; 71.60; 2.91; 5.72; 3.75; 72 \} = 72 \quad (3)
\]

It results from the calculations above that optimal decision is again the choice of T6 Fitness Test – Münich.

- **The criterion of mini max regret (criterion of Savage)**

The concept of regret is equivalent to setting the loss of opportunity. Both of these concepts represent an important economic notion, namely the “chance cost”, which demonstrates the extent of the loss incurred if it is not chosen the optimal variant. Thus, we calculated the matrix of sorrow:

\[
R_y = \begin{pmatrix}
59.14 & 53.07 & 56.12 & 57.53 & 53.82 & 57.9 & 60.77 & 54.32 \\
73.34 & 67.45 & 70.28 & 72.15 & 68.67 & 72.62 & 74.99 & 69.22 \\
67.2 & 61.44 & 64.25 & 66.31 & 62.78 & 66.85 & 68.91 & 63.38 \\
73.5 & 67.61 & 70.63 & 72.27 & 69.47 & 72.83 & 75.45 & 69.31 \\
7.62 & 0.28 & 2.73 & 5.99 & 0 & 0 & 4.54 & 0
\end{pmatrix} \quad (4)
\]

Still we minimized the greatest regret and achieved anticipatedly:

\[
\min \{ \max \{ 59.14; 53.07; 56.12; 57.53; 53.82; 57.9; 60.77; 54.32 \} ; \\
\max \{ 0.0; 0.0; 1.68; 3.0; 0.68 \} ; \\
\max \{ 73.34; 67.45; 70.28; 72.15; 68.67; 72.62; 74.99; 69.22 \} ; \\
\max \{ 67.2; 61.44; 64.25; 66.31; 62.78; 66.85; 68.91; 63.38 \} ; \\
\max \{ 73.5; 67.61; 70.63; 72.27; 69.47; 72.83; 75.45; 69.31 \} ; \\
\max \{ 7.62; 0.28; 2.73; 5.99; 0; 0; 4.54; 0 \} \} = \min \{ 60.77; 6.83; 74.99; 68.91; 75.45; 7.62 \} = 6.83 \quad (5)
\]

Calculations have shown that, by this criterion, optimal variant to be adopted is T2 test – standing high jump.
The criterion of Laplace (equal probability criterion)

This criterion implies that the probability is equal for all nature of states. Calculate the estimated value and choose the alternative with the highest estimated gain.

By doing the calculations for the present problem, we obtained:

\[
\max \left\{ \frac{16.98 + 17.21 + 17.11 + 17.46 + 17.68 + 17.6 + 17.27 + 17.68}{8}, \frac{76.12 + 70.28 + 73.23 + 74.99 + 69.82 + 72.5 + 78.04 + 65.17}{8}, \frac{2.78 + 2.83 + 2.95 + 2.84 + 2.83 + 2.88 + 3.05 + 2.78}{8}, \frac{8.92 + 8.84 + 8.98 + 8.68 + 8.72 + 8.65 + 9.13 + 8.62}{8}, \frac{2.62 + 2.67 + 2.6 + 2.72 + 2.03 + 2.67 + 2.59 + 2.69}{8}, \frac{68.5 + 70 + 70.5 + 69 + 71.5 + 75.5 + 73.5 + 72.5}{8} \right\} = \max \{17.37; 72.51; 2.86; 8.81; 2.57; 71.31\} = 72.51 \tag{6}
\]

Therefore, in the latter case too, the optimal variant to be chosen is T2 – standing high jump.

Discussions and conclusions

In conclusion, we note that in the application of the five criteria for resolving this problem in conditions of uncertainty, the most approved, three of the five criteria presented, is that which refers to T2 in high jump on the place. Applying this mathematical modeling, readings have reconfirmed the importance of the need for developing explosive force to improve results in long jump with impetus. Furthermore, the results showed that the speed of development, as well as improving the general equilibrium must be pursued with equal importance in the framework of the development of training plans.

References


STUDY ON THE EXECUTION TIMES OF WOMEN WEIGHTLIFTING ATHLETES FOR THE TWO-HAND CLEAN AND JERK TECHNIQUE

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Abstract. The high level of performances achieved by women weightlifters leads specialists in the field to new reflections. Thus, one of the most important factors that contribute to obtaining valuable performances is the execution time. This research is part of a broader study aimed to investigate weightlifters (of both genders and different classes) regarding certain moments related to the execution times which characterize the weight lifting techniques. In order to achieve the intended purposes, there were selected seven women weightlifters of international value, on the occasion of the European Weightlifting Championships that took place in Bucharest, between 6 and 12 April 2009, at the “Ioan Kunst Ghermănescu” Polyvalent Hall. The selected female athletes were from various countries, namely Poland, Turkey, Bulgaria, Moldova, Italy, France and Romania, and were aged 15 to 27 years. We mention that this study is a continuation of a research on the execution times for the two-hand technique, which has the final goal to achieve a comparison between the Romanian athletes and those from other countries.

Keywords: investigation; execution time; women weightlifting athletes.

Introduction

The sport of weightlifting, through its increased performance-related exigencies, leads to a reconsideration of preparation. In this regard, we propose computerized assistance and video equipment as technical means of research within the specific preparation. Sports performance results from the interrelation of a particularly large number of factors, whose weight is different both structurally and conjecturally (Epuran, 2013, p. 249). Behavior can be modeled through computer programs derived from observations: in this case, the research process underpinning the program starts from behavior observation, which is susceptible to generate a theory (Paraschiv, Tănase, & Manea, 2014). Important contributions to the study of intermediate execution times for the weightlifting techniques have been brought by the following researchers: V.I. Fronov, S.I. Lenkov, H.N. Efimov and M.P. Vangas. We mention that the Italian weightlifting school has developed a model that divides the snatch style into 4 periods and 8 phases, and the clean and jerk style, also into 4 periods and 8 phases, when barbell is moved from the floor to the shoulders, and 3 periods and 6 phases, when barbell is moved from the shoulders to overhead (Urso, 2011, p. 28). The video recordings were processed using the AviSynth software program, which was made available to us by the managerial staff of the National Institute for Sport Research. It is about a frame server for Windows, developed by Ben Rudiak-Gould and Edwin van Eggelen, under the GNU GPL license (AviSynth, 2014). Some authors consider that the speed of lifting barbell depends on its weight and the athlete’s sports mastery. With greater weight, speed decreases, and the duration of initial acceleration decreases in a direct relationship with sports mastery (Дворкин, 2005, p. 230). Application of the video method by the experts, too, has revealed that the level of technical preparation improved for each indicator assessing the phases of technical procedures (Ulăreanu, 2014, p. 108). Hiskia (1997) used a system for the measurement and analysis of performances in weightlifting, including technical execution, based on a system called “V-Scope VS-120” with infrared signals and ultrasounds emitted by a sensor attached to the end of barbell. Through special software, it is achieved the real-time three-dimensional analysis of the path, movement, speed and acceleration of the barbell lifting action, and others). The athletes’ level of preparation for competition is related to some sufficiently stable characteristics, which are not subjected to sudden fluctuations (motor qualities, possibilities of the most important functional systems, level of technical and tactical preparation etc.) (Platonov, 2015, p. 386). Taking into account the rapid progression of sports performances, it is necessary to reconsider all preparation factors and, obviously, the level of barbell lifting technique, specifically the identification of the time during which the barbell is lifted.

Objectives

1. To check the possibilities of using the computerized imaging technique in the barbell lifting technique for the two-hand clean and jerk event.
2. To identify the execution times of women weightlifting athletes for the clean and jerk event through recordings and measurements performed with the AviSynth software program.
Hypothesis: The identification of execution times for the two-hand clean and jerk event allows comparing the female athletes and consequently making correlations and observations on the achieved performances.

Materials and methods

Subjects and methods

The research was conducted in two main phases: the 1st phase, from 03 to 13 April 2009, which was intended for the selection (seven female athletes of international value belonging to various European clubs, namely: Poland, Turkey, Bulgaria, Moldova, Italy, France and Romania; the selected athletes were competing for 48kg weight class and were aged 15 to 27 years) and video recording of the athletes; the 2nd phase, from October 2015 to March 2016, when the results were processed and analyzed using the AviSynth software program. The processing of data obtained from recordings (ordering the data, number of frames per execution, transforming frames into seconds etc.). Drawing conclusions and making observations (based on the obtained results).

Results

To facilitate the identification of the terms mentioned in the tables below, we give the following explanations:
Time 1 (first contact of foot sole with the competition platform); Time 2 (feet are planted under the barbell axis); Time 3 (hands grasp the barbell); Time 4 (barbell is lifted from platform); Time 5 (barbell is fixed overhead); S (successful attempt); F (failed attempt).

This research is part of a broader study, a fact revealed in the structure of Tables 2, 3 and 4, which capture both the value of concentration times for each athlete, but particularly the topic of the paper, namely studying the execution times of women weightlifting athletes for the two-hand clean and jerk technique, in our case the seven athletes competing for 48kg weight class within the European Championships. The research results highlight the following aspects: Structure of two-hand clean and jerk technique and duration of times - first attempt (Table 2). Average execution speed for the first attempt is 10.70s. The difference between the fastest and slowest execution speed, for the first attempt, is 6.54s.; Structure of two-hand clean and jerk technique and duration of times - second attempt. Average execution speed for the second attempt is 11.46s. The difference between the fastest and slowest execution speed, for the second attempt, is 5.76s. (Table 3); Structure of two-hand clean and jerk technique and duration of times - third attempt. Average execution speed for the third attempt is 12.72s. The difference between the fastest and slowest execution speed, for the third attempt, is 7.16s. (Table 4); Execution speed (in frames), which represents the difference between barbell lifting from the competition platform (T4) and barbell fixing/lowering at the referee’s signal (T5) (shown in Table 5), highlights the execution times of women weightlifters for the two-hand clean and jerk technique, in our case the seven athletes competing for 48kg weight class. To note that 90% of the studied athletes were successful in the first attempt. The difference between barbell lifting from the competition platform (T4) and barbell fixing/lowering at the referee’s signal (T5) - second attempt is shown in Table 6. After analyzing the structure of two-hand clean and jerk technique for the second attempt, it is noted that only 3 of the 7 female athletes have managed to lift the proposed weights. The very high execution times of the athlete from France are significant for this overview and are revealed in Tables 8, 9 and 10. The difference between barbell lifting from the competition platform (T4) and barbell fixing/lowering at the referee’s signal (T5) - third attempt is shown in Table 7. To note that the percentage of success for the third attempt is again 3 athletes who have managed to lift the proposed weights.

<table>
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<tr>
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<th>Competition number</th>
<th>Initials</th>
<th>Country</th>
<th>Date of birth</th>
<th>Body weight</th>
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<tr>
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<td>FRA</td>
<td>12.01.1988</td>
<td>47.88</td>
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Table 2. Structure of two-hand clean and jerk technique and duration of times – first attempt

<table>
<thead>
<tr>
<th>Item no.</th>
<th>Initials</th>
<th>Country</th>
<th>Time 1</th>
<th>Time 2</th>
<th>Time 3</th>
<th>Time 4</th>
<th>Time 5</th>
<th>Barbell weight</th>
<th>Successful/Failed attempt</th>
</tr>
</thead>
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<td>23948</td>
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<td>24581</td>
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<td>36398</td>
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</table>

Table 3. Structure of two-hand clean and jerk technique and duration of times – second attempt

<table>
<thead>
<tr>
<th>Item no.</th>
<th>Initials</th>
<th>Country</th>
<th>Time 1</th>
<th>Time 2</th>
<th>Time 3</th>
<th>Time 4</th>
<th>Time 5</th>
<th>Barbell weight</th>
<th>Successful/Failed attempt</th>
</tr>
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<td>F</td>
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<td>38373</td>
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Table 4. Structure of two-hand clean and jerk technique and duration of times – third attempt

<table>
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<tr>
<th>Item no.</th>
<th>Initials</th>
<th>Country</th>
<th>Time 1</th>
<th>Time 2</th>
<th>Time 3</th>
<th>Time 4</th>
<th>Time 5</th>
<th>Barbell weight</th>
<th>Successful/Failed attempt</th>
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Table 5. Difference between barbell lifting from the competition platform (T4) and barbell fixing/lowering at the referee’s signal (T5) – first attempt

<table>
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<tr>
<th>Item no.</th>
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<th>Time 5</th>
<th>Barbell weight</th>
<th>Successful/Failed attempt</th>
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Table 6. Difference between barbell lifting from the competition platform (T4) and barbell fixing/lowering at the referee’s signal (T5) – second attempt

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<th>Item no.</th>
<th>Initials</th>
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Table 7. Difference between barbell lifting from the competition platform (T4) and barbell fixing/lowering at the referee’s signal (T5) – third attempt

<table>
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<th>Item no.</th>
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<th>Time 5</th>
<th>Barbell weight</th>
<th>Successful/Failed attempt</th>
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</table>

Table 8. Identification of subjects and results achieved for the execution time – transformation of frames into seconds for the first attempt – clean and jerk event

<table>
<thead>
<tr>
<th>Item no.</th>
<th>Country</th>
<th>Date of birth</th>
<th>Body weight</th>
<th>Barbell weight (kg)</th>
<th>Attempt</th>
<th>Frames</th>
<th>Execution time</th>
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<tbody>
<tr>
<td>1</td>
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<td>BUL</td>
<td>22.06.1982</td>
<td>47.67</td>
<td>78</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
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<td>10.76</td>
</tr>
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<td>3</td>
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<td>12.01.1988</td>
<td>47.88</td>
<td>78</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>349</td>
<td>13.96</td>
</tr>
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<td>4</td>
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<td>15.10.1988</td>
<td>47.63</td>
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</tr>
<tr>
<td>6</td>
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<td>08.11.1992</td>
<td>47.88</td>
<td>94</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>F</td>
<td>F</td>
</tr>
<tr>
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<td>29.10.1983</td>
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<td>233</td>
<td>9.32</td>
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Table 9. Identification of subjects and results achieved for the execution time – transformation of frames into seconds for the second attempt – clean and jerk event

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<th>Body weight</th>
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<th>Attempt</th>
<th>Frames</th>
<th>Execution time</th>
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</thead>
<tbody>
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<td>80</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
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</tr>
<tr>
<td>2</td>
<td>BUL</td>
<td>22.06.1982</td>
<td>47.67</td>
<td>80</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>F</td>
<td>F</td>
</tr>
<tr>
<td>3</td>
<td>FRA</td>
<td>12.01.1988</td>
<td>47.88</td>
<td>81</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
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</tr>
<tr>
<td>4</td>
<td>ITA</td>
<td>15.10.1988</td>
<td>47.63</td>
<td>93</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>F</td>
<td>F</td>
</tr>
<tr>
<td>5</td>
<td>POL</td>
<td>19.02.1988</td>
<td>47.68</td>
<td>94</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>F</td>
<td>F</td>
</tr>
<tr>
<td>6</td>
<td>MDA</td>
<td>08.11.1992</td>
<td>47.88</td>
<td>94</td>
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<tr>
<td>7</td>
<td>TUR</td>
<td>29.10.1983</td>
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<td>108</td>
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Table 10. Identification of subjects and results achieved for the execution time – transformation of frames into seconds for the third attempt – clean and jerk event

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<th>Country</th>
<th>Date of birth</th>
<th>Body weight</th>
<th>Barbell weight (kg)</th>
<th>Attempt</th>
<th>Frames</th>
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</thead>
<tbody>
<tr>
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<td>3rd</td>
<td>273</td>
<td>10.92</td>
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<tr>
<td>2</td>
<td>ROU</td>
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<td>46.37</td>
<td>82</td>
<td>3rd</td>
<td>F</td>
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</tr>
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<td>3</td>
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<td>12.01.1988</td>
<td>47.88</td>
<td>84</td>
<td>3rd</td>
<td>430</td>
<td>10.04</td>
</tr>
<tr>
<td>4</td>
<td>ITA</td>
<td>15.10.1988</td>
<td>47.63</td>
<td>93</td>
<td>3rd</td>
<td>F</td>
<td>17.8</td>
</tr>
<tr>
<td>5</td>
<td>POL</td>
<td>19.02.1988</td>
<td>47.68</td>
<td>94</td>
<td>3rd</td>
<td>F</td>
<td>17.6</td>
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<tr>
<td>6</td>
<td>MDA</td>
<td>08.11.1992</td>
<td>47.88</td>
<td>96</td>
<td>3rd</td>
<td>251</td>
<td>17.8</td>
</tr>
<tr>
<td>7</td>
<td>TUR</td>
<td>29.10.1983</td>
<td>47.71</td>
<td>114</td>
<td>3rd</td>
<td>F</td>
<td>18.0</td>
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</table>

Discussions and conclusions

The research results have highlighted some aspects related to the execution technique for the two-hand clean and jerk event, among which we mention: average execution speed for the three statutory attempts; average execution speed for each attempt; the ratio between barbell weight and execution speed. Regarding the results achieved in this research, we note the following: average score of execution speed for the first attempt is 10.70s.; average score of execution speed for the second attempt is 11.46s.; average score of execution speed for the third attempt is 12.72s. The increase in barbell weight leads to increased execution speed. The difference between the fastest and slowest execution speed is 9.8s. Average execution speed for the three attempts is 11.62s. To determine the duration of times specific to the execution technique, we used the AviSynth software program. Computerized technology, specifically the AviSynth program, provides the best premises for a multifactorial analysis, with real impact on achieving top performances.

References


STUDY CONCERNING THE IDENTIFICATION OF THE FORCE LEVEL EXPRESSION OF THE LOWER LIMBS IN TENNIS PLAYERS

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Abstract. Strength is one of the motor skills whose level of expression can influence the motor behavior of the tennis player in a decisive manner and, consequently, the result obtained in competition. In this paper, we aim to emphasize the force level expressed by tennis players in case studies, in order to obtain and provide information about the way in which coaches work to increase it. The subjects of this research are tennis players aged between 16 and 19 years (two boys and two girls) legitimated within private sports clubs, participating in national, but also international tours. To identify the level of manifestation of lower limb strength, we used Kistler Quattro Jump platform that can measure jumping on both feet, considered as relevant tests for the research purpose. The types of the selected jumps were SJ, CMJ, CJb and SJs. Mechanical strength (CJB) in the lower limbs expressed an average value between 19.1 and 16.3 W/Kg and explosive force (SJ) presented averages falling between 14.9 and 12.5 W/Kg. The ability to use elastic energy in the concentric jump phase presented an interval ranged between 33.8% and 21.9% at CMJ tests, with an index of motor balance between the thigh and the calf muscles between 1.95 and 1.3. The results analysis achieved showed that the level of development of lower limbs force can be objectively measured and monitored using the platform Kistler Quattro Jump, the acquired data showing concrete information about the potential strength of the athletes enrolled in research.

Keywords: physical training, jumps, power, tennis.

Introduction

The level of motor skills expression has a decisive influence in sports results obtained in competitions. Therefore, it requires careful control and monitoring of the training process in terms of identification the effects of practice systems used to develop motor skills that can be addressed directly. Whether the motor action takes place horizontally or vertically, the mechanical work performed by athletes is influenced by the power gearing availability that is specific to the type of effort. The neuromuscular system accepts and expels rapid loading at high velocity through the coordination of both reflexes and these elastic and contractile components of muscle. Due to these facts the definition of “elastic strength” occurred as being the ability of the neuromuscular system to overcome resistance with a high speed of contraction (Muthusubramanian, 2013).

The American College of Sports Medicine highlighted the importance of strength training, along with aerobic exercises, as key elements to a well-rounded training program for healthy adults. It is well established that strength training benefits both physiologically and psychologically from a strength training program (Seshagiri et al., 2013). Power is the product of muscular force and velocity or as an instantaneous value during a given movement. The latter, often referred to as peak power (PP), is typically associated with explosive movements such as sprinting, jumping and throwing and may be an important variable associated with success in a given discipline. The measurement of Peak Power by strength and conditioning is an important consideration in the training process (Baljinder, Ashok, & Ranga, 2014).

The strength is one of the motor skills, whose level of expression can influence the motor behavior of the tennis player in a decisive manner and, consequently, the result obtained in competition.

Throughout, contractions of the lower extremity musculature, and thus interaction of the feet with the court, produce the ground reaction forces (GRFs) so central to successful stroke and movement production. During stroke technique has been observed to affect the magnitude and direction of the GRFs generated. (Elliott & Wood, 1983). Players typically align their upper and lower body segments so as to optimize the contribution of the GRFs to racquet velocity or court speed. The divergent play characteristics of different court surfaces nevertheless exhibit some influence over typical movement patterns and therefore lower limb joint kinetics (Bahamonde & Knudson, 2001, p. 102). From the training perspective, tennis players’ muscles need to be able to generate forces through varying ranges of motion, depending on court surface (Verstegen, 2003).

Tennis requires repetitive multidirectional movement patterns that can lead to lower extremity injury. Knowledge of population and age-specific strength parameters can be used during performance enhancement training and rehabilitation of tennis players (Ellenbecker et al. 2007). A high and constant state of muscle tension in the lower limbs is developed as a consequence of high uncertainty levels that depend on the possible reactions of the opponent (Pradas et al., 2011).
It has been suggested that tennis players require a mixture of speed, agility, and power combined with medium to high aerobic and anaerobic capacity. Thus, successful performance cannot be defined by one predominant physical attribute; tennis requires on a complex interaction of several physical components and metabolic pathways (Ulbricht, Fernandez, & Ferrauti, 2013). The modern game of tennis has evolved to a current fast-paced, explosive sport based on strength and power. The ability to generate force (strength) is an integral part of power production and, therefore, may be a key component in determining athletic success. Moreover, strength and power can represent specific or independent qualities of neuromuscular performance and, therefore, can be assessed and trained independently (Fernandez-Fernandez, Ulbricht, & Ferrauti, 2014).

The purpose of this research was to emphasize the force level of the lower limbs expressed by tennis players aged between 16 - 19 years, in case studies, in order to obtain and provide information about the way that the coaches are working for its increasing.

In order to fulfill this research goal we focused our approach on the following directions:

- the identification of the strength expression ways and characteristics that will be studied;
- the development of the working methodology in order to record and explain the acquired data;
- issuing some assessments regarding the results that will be obtained after the tests, from the strength expression level perspective.

In our research we started from the hypothesis that, if we will use the Kistler Quattro Jump platform, as an informational identification mean of the strength expression level, then we will be able to emphasize the way that the tennis players are answering to the stimuli that are used in training in order to improve this motor skill.

Materials and methods

The subjects of this research are tennis players aged between 16 and 19 years (two boys and two girls) being legitimated within private sports clubs, participating in nationally but also internationally tournaments.

To identify the level of lower limb strength manifestation we used Kistler Quattro Jump platform, a device that can measure tests jumping on both feet, considered as relevant tests for the purpose of this research. The types of the selected jumps were Squat Jump (SJ), Countermovement Jump (CMJ), Countermovement Jump with bent legs (CJb) and Continuous Jump with straight legs (SJs). These jumps can provide information about explosive force, using the elastic energy during concentric jump, mechanical strength, elasticity of muscles extensor legs and tolerance elasticity on impact.

The information that was collected by using the Kistler Quattro Jump platform let us to visualize the results from two perspectives:

- as graphics, which allowed us to identify each jump type and its repetition as curves;
- as data, which allowed us to put together, organize in tables and analyze each jump type as well as each repetition.

As research methods, we used the following research approaches: documentation, observation, testing and measurement, statistical analysis, graphical and tabular methods. The main statistical analysis parameters that we used were the average and the standard deviation.

Results

Tables 1 and 2 present the jump tests data recorded by the two male gender tennis players and they are emphasizing the averages of each jump test, regarding the specific parameters of the jump. As we can see, S1 shows better results than S2 in the Squat Jump and Counter Movement Jump tests at all parameters. In the case of Continuous Jump Bent Leg Reference S2 has a higher rise of center of mass - jump height (hf) than the S1 (41.7 cm vs. 40.6 cm) and is more powerful (21.4W/Kg vs. 20.8 W/Kg).
Table 1. The averages of the testing results for Squat Jump (SJ), Counter Movement Jump (CMJ) and Continuous Jump Bent Leg Reference (CJbref) concerning the boys (B) strength expression level

<table>
<thead>
<tr>
<th>Subj.</th>
<th>Squat Jump (SJ)</th>
<th>Counter Movement Jump (CMJ)</th>
<th>Continuous Jump Bent Leg Reference (CJbref)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1 (B)</td>
<td>64.6</td>
<td>-7.05</td>
<td>14.90</td>
</tr>
<tr>
<td>S2 (B)</td>
<td>56.5</td>
<td>-11.9</td>
<td>12.50</td>
</tr>
<tr>
<td>X</td>
<td>60.6</td>
<td>-9.5</td>
<td>13.8</td>
</tr>
<tr>
<td>σ</td>
<td>5.73</td>
<td>3.43</td>
<td>2.19</td>
</tr>
</tbody>
</table>

Fast Twitch Fibers (est.) 39.0 % FT
Effect of Prestretch (reuse of elastic energy) 33.80%

S1 (B) Fast Twitch Fibers (est.) 28.75 % FT
Effect of Prestretch (reuse of elastic energy) 20.46%

Mechanical strength showed within the Continuous Jump Bent Legs test (CJb - Table 2) of the lower limb expressed an average value between 19.1 and 16.3 W/Kg and explosive force (SJ - Table 1) presented averages falling between 14.9 W/Kg and 12.5 W/Kg. The ability to use elastic energy in the concentric jump phase presented an interval ranged between 33.8% and 21.9% at CMJ tests, with an index of motor balance between the thigh and the calf muscles between 1.95 and 1.3 (Table 2).

Table 2. The averages of the testing results for Continuous Jump Straight Legs (CJs) and Continuous Jump Bent Legs (CJb) concerning the boys (B) strength expression level

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Continuous Jump Straight Legs (CJs)</th>
<th>Continuous Jump Bent Legs (CJb)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>hf [cm]</td>
<td>Pavg [W/kg]</td>
</tr>
<tr>
<td>S1 (B)</td>
<td>40.8</td>
<td>37.6</td>
</tr>
<tr>
<td>S2 (B)</td>
<td>34.8</td>
<td>38.5</td>
</tr>
<tr>
<td>X</td>
<td>37.8</td>
<td>38.1</td>
</tr>
<tr>
<td>σ</td>
<td>±4.23</td>
<td>±0.67</td>
</tr>
<tr>
<td>S1 (B)</td>
<td>Leg Equilibrium Index: 1.95</td>
<td></td>
</tr>
<tr>
<td>S2 (B)</td>
<td>Leg Equilibrium Index: 1.30</td>
<td></td>
</tr>
</tbody>
</table>

Table 3. The averages of the testing results for Squat Jump (SJ), Counter Movement Jump (CMJ) and Continuous Jump Bent Leg Reference (CJbref) concerning the girls (G) strength expression level

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Squat Jump (SJ)</th>
<th>Counter Movement Jump (CMJ)</th>
<th>Continuous Jump Bent Leg Reference (CJbref)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S3 (G)</td>
<td>62.2</td>
<td>-2.6</td>
<td>15.7</td>
</tr>
<tr>
<td>S4 (G)</td>
<td>56</td>
<td>-7.1</td>
<td>13.5</td>
</tr>
<tr>
<td>X</td>
<td>59.1</td>
<td>-4.9</td>
<td>14.6</td>
</tr>
<tr>
<td>σ</td>
<td>±4.38</td>
<td>±3.18</td>
<td>±1.56</td>
</tr>
</tbody>
</table>

Fast Twitch Fibers (est.) 31.0 % FT
Effect of Prestretch (reuse of elastic energy) 2.50%

S3 (G) Fast Twitch Fibers (est.) 28.38 % FT
Effect of Prestretch (reuse of elastic energy) 5.78 %
Tables 3 and 4 are emphasizing the averages of the results recorded by the two female gender tennis players at the same jump tests. The rise of the center of mass - jump height (hf) shows greater values in S3 case, the same tennis player being more powerful in four of the five tests as we can observe the Pavg parameter (15.7 W/kg vs. 13.5 W/kg in SJ; 17.8 W/kg vs.15.1 W/kg in CJbref; 35.6 W/kg vs.26.1 W/kg in CJs and 16.2 W/kg vs. 13.8 W/kg in CJb).

Table 4. The averages of the testing results for Continuous Jump Straight Legs (CJs) and Continuous Jump Bent Legs (CJb) concerning the girls (G) strength expression level.

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Continuous Jump Straight Legs (CJs)</th>
<th>Continuous Jump Bent Legs (CJb)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>hf [cm]</td>
<td>Pavg [W/kg]</td>
</tr>
<tr>
<td>S3 (G)</td>
<td>32.6</td>
<td>35.6</td>
</tr>
<tr>
<td>S4 (G)</td>
<td>24.6</td>
<td>26.1</td>
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<tr>
<td>X</td>
<td>28.6</td>
<td>30.9</td>
</tr>
<tr>
<td>σ</td>
<td>± 5.66</td>
<td>± 6.72</td>
</tr>
<tr>
<td>S3 (G)</td>
<td>Leg Equilibrium Index:</td>
<td>2.16</td>
</tr>
<tr>
<td>S4 (G)</td>
<td>Leg Equilibrium Index:</td>
<td>1.49</td>
</tr>
</tbody>
</table>

Referring to the Fast Twitch Fibers (FT) indicator we can see that the boys show higher values expressed in percentage (39.0% - S1 (B) and 28.75% - S2 (B) comparing with 31.0% - S3 (G) and 28.38% - S4 (G). Looking on how much is the force benefit produced by pre-stretch indicator the boys recorded values between 33.80% - S1 (B) and 20.46 % - S2 (B) showing big differences comparing with the girls who obtained values between 2.50% - S4 (G) and 5.78% - S3 (G).

Discussions and conclusions

The strength level expression in tennis can be reached in many ways but is very important to find the best path that acquires the specific information the coach needs in order to provide the players the optimal exercises they need to have a healthy and proper training process. The results obtained during this research have showed that the data provided within our experimental work can guide the coaches in taking the best decision in terms of strength methodological approaches.

Referring to the equilibrium of the functional structure of the lower limb including the three joints (hip, knee, ankle) and the upper and lower leg, the tennis players values showed that only one (S3 (G)) presented a balance between the neuromuscular function of the total leg - upper and lower (2.16). The other three players have had values (S1 (B) = 1.95; S2 (B) = 1.30; S4 (G) = 1.49) which indicate that the neuromuscular function of the knee; ankle and lower limb are weaker than the hip and thigh (value < 2, Kistler, 2009). This information can help the coach to find the best exercises in order to achieve a balance between the way that the upper and lower leg are used to provide the specific necessary strength.

Comparing the data obtained in these jump tests, especially SJ and CMJ, with the ones conducted by aboard, in other sports, we can see that the tennis players from our experiment revealed higher values (Pradas et al., 2011).

The results analysis showed that the level of lower limbs strength development can be objectively measured and monitored using the platform Kistler Quattro Jump, the acquired data showing concrete information about the potential strength of the athletes enrolled in research.

References


IMPROVEMENT OF MOTOR QUALITIES AND SKILLS IN PERSONS WITH DOWN SYNDROME BY PRACTICING ADAPTED GYMNASTICS EXERCISES

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Abstract. Adapted physical activities highlight the qualities, skills, attitudes, values and behaviors that enable subjects with disabilities participate actively in their capacity of society members of. On one hand, they contribute to the increase in the quality of life and, on the other, to social integration and cohesion. The purpose of this study is to propose the development of a positive attitude toward performing and promoting long-term adapted physical exercises. The research hypothesis was the following: the use of adapted gymnastics exercises will lead to the improvement of motor skills level and of possibilities of acquiring motor qualities in persons with Down’s Syndrome.

Material and method. We used as subjects 10 persons aged between 16 and 30, diagnosed with Down’s Syndrome. The test applied consisted of covering an application track against the clock. The tests were applied in the period March 2015-April 2016. Gymnastics programs included drills such as jumps, walking and running through pegs, chin-ups, rolls, throws and catches etc. Findings. After processing the data of the 3 tests, we obtained the following values for mean and for standard deviation: at the initial testing 83.2” ± 24.34, at the intermediary testing 71.8” ± 18.43 and at the final testing 61.2” ± 14.54.

Conclusions. The general conclusion is that adapted gymnastics exercises contributed to the improvement of motor qualities and skills in persons with Down’s Syndrome, which confirms our working hypothesis.

Keywords: physical exercise, adapted gymnastics, trisomy 21.

Introduction

Adapted physical education and sports try to meet a new great challenge: supporting disabled subjects in acquiring skills that can make them independent, autonomous. This goal can be achieved by considering three important aspects: outlining a proper strategy, designing stimulating learning situations and using a specific teaching approach that facilitates learning.

The physical education syllabus should be modified for children with disabilities according to their degree of disability. This fact plays an important role in the process of social integration of the disabled children. (Ungureanu, 2014, p. 646)

Disability is the loss or limitation of opportunities to take part in the normal life of the community on an equal level with others due to physical or social barriers. Children with special needs may have physical, mental or intellectual disabilities: Autism, Down Syndrome, associated low intelligence quotient deficiencies. (Pehoiu, Moacă, & Stanescu, 2015, p. 1419)

Down Syndrome is a frequent diagnosis, accounting for about 33% of people with intellectual disabilities and is a chromosomal aberration by triple pair 21. It manifests itself by affecting the physical, mental and learning process. However, each child has their own level of impairment, psycho-motor level to be assessed and correctly classified. (Lauteslager, 2004, p. 11)

According to the International Organization of Disabled People (DPI), a disability is defined as “the result of the interaction between a person with an infirmity and the barriers pertaining to the social and attitudinal environment that s/he may encounter”. Disability is viewed as a problem of the entire society, which requires permanent preparation and adaptation to all the aspects of life in order to accept and to maintain these persons active in the life of society. (Ion-Ene, Rosu, & Neofit, 2014, p. 37)

The psychomotor characteristics of children with Down Syndrome are: possible difficulty in walking, severe motor delays that put the individual at a disadvantage, balance deficits that limit motor skills, poor muscle tone, hyperflexibility, heart conditions that could affect activity and fitness levels throughout the individual’s lifetime. On cognitive level, they have delayed mental or social skills and on affective level, they display stubbornness and refusal to talk when not fully understanding what is expected of them or when trying to gain control over their lives, will talk to oneself in an uncomfortable or confusing situation.
Some important things that may affect a student’s performance in physical activities include visual problems, mild to moderate hearing loss, possible cardiovascular irregularities. (Flixercise, 2012, p. 17)

For children with DS, it is widely recognized that the development of movement patterns and the acquisition of motor skill proficiency can be a slow and discouraging process. Although some children can attain a competence level that is somewhat comparable to their peers, motor milestones are generally delayed, and, in certain aspects of motor skill performance, children and adults with DS show a “lack of finesse” often described as “clumsy”. For children with DS, discovering the joy of movement can be a frustrating and difficult task. From a perceptual-motor perspective, the motor features of this observed “clumsiness” are “not straightforward … and sometimes puzzling”. This awkward form of movement can add to feelings of frustration as movement and movement sequences in action become inefficient and thus ineffective as related to the task. (Jobling, Virji-Babul, & Nichols, 2006, p. 35)

Materials and methods

Many children with Down Syndrome are late to reach the early motor milestones such as grasping, rolling, sitting, standing and walking. That is why it may be important to start adapted physical activities early. (Sacks & Buckley, 2003, p. 131)

The purpose of this study is to propose the development of a positive attitude toward performing and promoting long-term adapted physical exercises at the children with Down Syndrome.

The research hypothesis was the following: the use of adapted gymnastics exercises will lead to the improvement of motor skills level and of possibilities to acquire motor qualities in persons with Down Syndrome.

We used as subjects 10 persons aged between 16 and 30, diagnosed with Down Syndrome. The test applied consisted of covering an application track against the clock. The application track included as follows: 1. six jumps executed on both feet, from hoop to hoop, 2. running through six pegs placed on a 6-m distance, 3. Pull-ups on the flat bench, 4. getting past a vault box, 5. walking on the knees and arms through four vertical hoops, 5. rolling to the side on an inclined plane, 6. a 3-m run finalized by touching a designated object. There were 3 tests applied in the period March 2015-April 2016. Gymnastics programs included drills such as jumps, walking and running through pegs, chin-ups, rolls, throws and catches etc. The adapted gymnastics sessions lasted for 90 - 100 minutes and they were organized twice a week.

The components of this framework for children with Down Syndrome include:

• reviewing the personality traits and dispositions for exercising;
• examining exercise motivation;
• identifying exercise barriers;
• the effects of exercise on the improvement of mental health;
• factors that affect adherence and non-adherence to physical exercises;
• the effect of cognitive and behavioral strategies on exercise performance and other psychological and emotional factors;
• the use and effectiveness of exercise interventions on exercise performance, adherence and other psycho-behavioral outcomes;
• exercise dependence/addiction, and future directions in applied physical exercises. (Anshel, 2007, p. 9)

The processing of results included the calculation of the mean, the standard deviation and the coefficient of variation. We compared the results obtained using the Student’s t test for correlated small samples.

Results

After processing the data of the three tests, we obtained the following values for mean and for standard deviation: at the initial testing 83.2” ± 24.34, with a coefficient of variation of 29.25%, at the intermediary testing 71.8” ± 18.43, with a coefficient of variation of 25.66% and at the final testing 61.2” ± 14.54, with a coefficient of variation of 23.75%. The coefficient of variation ranging between 15 and 30% indicates an average dispersion of values and a mean that is representative enough. (Table 1)
The results obtained are very important because they allow the highlighting of improved motor performances in persons with Down syndrome, after executing certain adapted gymnastics exercises. Between the results of the initial and the final testing, the Student’s t test allows the highlighting of statistically significant differences for p<0.01 (Df=9, t = 6.458). Between the initial and the intermediary testing, the results are statistically significant for p<0.01 (Df=9, t = 5.44), while between the intermediary and the final testing, the results are statistically significant for p<0.01 (Df=9, t = 7.097). The systematic practice of adapted gymnastics allows the improvement of motor skills for these persons. This outcome is essential for the adjustment to daily activities and for the improvement of self-serving skills. (Table 1)

Further, we present a graphical representation of individual values obtained by females in the three tests (Fig. 1), a graphical representation of individual values obtained by males in the three tests (Fig. 2) and a representation of average value and standard deviation obtained in the three tests by the experimental group (Fig. 3).

![Fig. 1. Representation of individual values obtained by females in the three tests](image-url)
Discours and conclusions

Persons suffering from Down Syndrome have distinct physical features and, although the Syndrome is permanent, most of those stricken by it may lead a normal and active life, if they benefit from adequate medical care. (Biwi, 2011, p. 9)

The physical therapists learn how to incorporate work on fine motor skills into everyday activities and to emphasize tasks that children can use throughout life: play, self-help, various activities for prehension and computer use. Parents learn strategies that can help children handle various sensory problems so they can continue to learn daily living skills. (Bruni, 2006, p. 32)

Adapted physical activity will be able to synthesize these materials to gain a perspective of the variety of forces, influences and movements that have taken persons with disabilities from abandonment, obscurity, persecution and segregation towards their full inclusion and participation in society. (Steadward, 2003, p. 56)

Encouraging people to replace their sedentary lifestyle with adapted physical activity has been a major challenge over the years. Viewed as an auxiliary method for physical therapy – that ensures the rehabilitation of less developed functions and the attaining of functional independence, adapted physical activities consider the subject in his capacity of social being, capable of exerting an active role in his own training and development process.

In this respect, adapted gymnastics brings an important contribution to both the development of motor capacity and the level of cognitive and affective development. Through practice, subjects improve on many levels: situation...
analysis, problem solving, decision making. Hence, it becomes possible to stimulate intellectual activity, which is responsible for acquiring knowledge regarding certain motor qualities, skills or activities.

As a way to conclude, we underscore that adapted gymnastics exercises contributed to the improvement of motor qualities and skills in persons with Down Syndrome, which confirms our working hypothesis.

References
A STUDY OF PSYCHOMOTOR ABILITY IN CHILDREN AGED 10-14

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Abstract. Psychomotor learning plays an important role in the ontogenetic development of the child. Throughout the educational process, the psychomotor ability has a main role in the formation of motor behaviors. Mental representation of the body schema, spatial orientation and proprioceptive coordination are the fundamental components of psychomotor behaviors in conscious and unconscious motor actions. The evolution of psychomotor level is influenced by several biological and psychological factors such as: nervous maturation, experiential learning and motor behaviors. Our purpose is to compare the psychomotor profiles and interpret the differences occurred by gender, age and individual fitness. The research methods were some psychomotor tests applied to 320 children aged 10-14. The subjects included in our research were divided in to five groups, based on age and grade. Data analysis was performed by age, sex and individual fitness. All groups underwent a psychomotor assessment including psychomotor tests such as “Matorin”, dynamic balance and spatial orientation, to highlight proprioceptive coordination ability, dynamic balance capacity, kinesthetic sense and spatial perception. The correlations between psychomotor parameters registered in trained and untrained subjects and the differences occurred by sex and age were analyzed. In order to validate our results, we calculated some statistical parameters. The investigation of psychomotor profile of children leads to the identification of the levels of their momentary development according to age, sex and individual fitness. Thus, we can intervene by differentiated psycho-pedagogical means in motor and psychomotor early education.

Keywords: psychomotor ability, proprioception, kinesthesia, balance.

Introduction

The term “psychomotoric” (fr. psychomotricité) means combining motor functions with psychical functions, as an effect of the nervous system development and education, (Wauters-Krings, 2012, p.9). Gathering a number of concepts such as the psychic, body, motion, space, temporality, memory and psychomotor ability covers an area of particular elements, representing a true “field of scientific study”. This term was introduced in 1872 by the German physiologist Leonardo Landois. Nowadays, we reached the complex knowledge of the psychomotor ability and we are trying to discover the real connection between the spatial and temporal orientation, body schema and laterality. Child’s psychomotor education should be understood and addressed in all its complexity, so that body awareness and the position related to space must be a permanent concern (Albu et al., 2006, p.5). As Arcan claims (cited by Albu et al., 2006, p.9), the behavior of a person is strongly influenced by the motor and psychological aspects. Basically, the movement is not a simple mobilization of body segments, but an action performed with a well-defined purpose. The body exists and is manifested in space and time. The evolution of a child is highlighted by the level of his ability to improve actions strictly related to spatial and temporal dimension (Albu et al., 2006, p.57). We consider, therefore, psychomotor behavior as a relational behavior correlated to the ambient. Any performed movement requires correction of the posture, which is based on the information of the relationship with the environment. There are three types of information that the individual accesses to obtain such data: vestibular information, information from mechanoreceptors and visual information (Lee & Lishman, 1975, p.83). “The perception of space starts with locating everything in the environment that is related to one’s own body through visual, kinesthetic and auditory analyzers” (Radu & Ulici, 2003, p.98). On the one hand, coordination is correlated to the movement capacity and, on the other hand, “it depends on the other motor qualities” (Moldovan & Enoiu, 2011, p.141). Eyesight provides more information than mechanoreceptors or any other system. “Without visual information, locomotion is dangerous or impossible” (Lee & Lishman, 1975, p.85). Moreover, the view is the most important and powerful source of information, proven experimentally by putting it into conflict with other proprioceptive factors.

Visual functions of proprioception, as an integrated component of balance, cannot be stopped voluntarily, excluding closing the eyes. Somesthesia (based on the sense of posture, position in space and balance of the body) and kinesthesia (sense of body movement) are two different things, (Neagu, 2012, p.87,121). Somesthesia and proprioception are a part of the body’s cognitive spatial perception, and kinesthesia is more a behavioral component. Proprioceptive sense arises from receptors in the muscles, tendons and joints (Subasi, 2014, p.4). For example, a neuron connected to receptors in the elbow joint sends a certain number of impulses when it is arched. “If the elbow joint is flexed 45°, it will send 40 impulses per second, and at a 60° flexion - 90 impulses per second” (Russ, 2007). We speak here of a cycle consisting of specialized structures and mechanisms from which and through which sensory perceptual information is received. The process of signaling to the brain starts when these
The pupils are characterized by their sensitivity to the environment, which should occur regarding the psychomotor ability when referred to the age range of up to 10–12 years. The motor system needs to take into account the size of one’s limbs and their strength in order to program adequately the movement to perform” (De Vignemont, 2006, p.4). Moreover, body schema represents a functional map of the body. The age range of up to 10–12 years is extremely important in forming new behavioral skills (not only physical and motor ones), in the growth and physical development, the development of skills (not only physical and motor ones), the development and maturation of mental processes. Many studies have found that motor skills formed during that period have a high degree of stability in the “motor memory” (Neagu, 2010, p.131). Formed, strengthened and improved during this period, they will never be “forgotten”. The plasticity of the child at this age is maximal, a period in which the kinesthetic analyzer is in a high process of maturation. The child “absorbs” and stores much faster and easier any information, be it motor or not. The condition is that the “transmission” has a certain continuity, to respect the fundamental principles of education and training, as well as the educational and formative actions that need to have the most appropriate tools and teaching methods. Our study follows the relationship between external factors and heredity. The two hypotheses from which we started in realizing this study were that no difference should occur regarding the psychomotor ability when referred to gender, and when referred to the fitness activity, the psychomotor ability should be better developed in children with sport activity. “The pupils are characterized by their body’s possibilities of adaptation and response to the specific demands of school physical education” (Dragu, Dobrota, & Ploşteanu, 2011, p.158). Associate Professor Elin Reikerås and Professor Thomas Moser of the Reading Centre at the University of Stavanger have studied young children’s motor skills and early gender differences. The results of the recent study show that there are large differences in motor skills between girls and boys – this time in favor of the girls (Halsan, 2014). In many studies and papers, the approach of the psychomotor ability is contextualized only in the individual’s motor disorganization. Far fewer, regarding the number and level of investigation, are the studies on normal or gifted child’s psychomotor ability. The investigation of psychomotor profile of children leads to identifying the levels of their momentary development in relation to age, sex and individual fitness.

Materials and methods

This study was developed over a period of three weeks (8–26 February 2016) at the “Alexandru Ioan Cuza” Middle School of Tîrgu Mureş, on a total number of 346 children, boys and girls, pupils from 4th to 8th grade. The subjects were divided into four subgroups, two related to gender (Table 1) and two related to the individual fitness status (Table 2). From the total of subjects, 316 participated in the “Matorin” test and 306 in the Spatial perception and dynamic balance Test.

Table 1. The included subjects and their distribution by age and test participation

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Applied tests</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>Total/ age</td>
</tr>
<tr>
<td>(MU=years)</td>
<td>(MU=No.)</td>
</tr>
<tr>
<td>10</td>
<td>69</td>
</tr>
<tr>
<td>11</td>
<td>94</td>
</tr>
<tr>
<td>12</td>
<td>61</td>
</tr>
<tr>
<td>13</td>
<td>66</td>
</tr>
<tr>
<td>14</td>
<td>56</td>
</tr>
<tr>
<td>Total</td>
<td>346</td>
</tr>
<tr>
<td>%</td>
<td>100%</td>
</tr>
</tbody>
</table>
Table 2. The included subjects and their percentage distribution by individual status – athlete/non-athlete

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Applied tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (MU=years)</td>
<td>Total / Age (MU=No.)</td>
</tr>
<tr>
<td>10</td>
<td>69</td>
</tr>
<tr>
<td>11</td>
<td>94</td>
</tr>
<tr>
<td>12</td>
<td>61</td>
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<tr>
<td>13</td>
<td>66</td>
</tr>
<tr>
<td>14</td>
<td>56</td>
</tr>
<tr>
<td>Total</td>
<td>346</td>
</tr>
<tr>
<td>%</td>
<td>100%</td>
</tr>
</tbody>
</table>

All subjects included in our study proved, with a medical certificate, that they were not in evidence with chronic diseases or any associated pathology. It was considered an athletic subject the subject who attended a sport program in an organized way, at least twice a week, in their extracurricular activities. This study was developed by performing two tests, namely the “Matorin” test and the Spatial perception and dynamic balance test. The system of methods used was accepted and performed with consideration and pleasure by subjects.

“Matorin” test. General coordination can be measured through this test (Fig. 1), which consists in a jump around the longitudinal axis of the body, in order to achieve the broadest possible rotation (Epuran, 2005, p. 371). The jump was performed to both the left and right sides, noting the best value (measured in degrees) for each side. The subjects were allowed to choose the direction of their first jump. They were required to maintain balance during the test, to land in approximately the same place and the same position as the start one (Vaida, 2011, p.58). Also, we investigated the influence of the dominant leg on the results and the preferred direction of the first jump.

Fig. 1. “Matorin” test

Spatial perception and dynamic balance test

The test was performed in the purpose of determining the proprioception and spatial perception level, coordination ability and the dynamic balance of the subjects and their proprioceptive coordination (Fig. 2 and Fig. 3). The subjects were asked to follow by walking a straight 12-meter line drawn on a flat surface with adhesive tape. The walking was performed without visual aids (with blinded glasses), asking the subjects to stop when they thought they had reached the end of the 12-meter line. Prior to performing the test, each subject was asked to visualize the position of the endpoint and the organization of space (actual route, direction of movement, landmark line and endpoint, and the fact that, on a considerable distance, no other objects or sport equipment occurred). The test was held in a 40-meter length and 20-meter width gym hall. Also, the subjects were not disturbed by any noise or other inconvenient factor. Length deviations – from the endpoint – occurred after the subject stopped.
(←with “-” endpoint, with “+”→) and width deviations (left ↓ right) were individually recorded for each subject. Also, “0” deviations from the direction of movement or the endpoint were recorded.

Also, “0” deviations from the direction of movement or the endpoint were recorded.

**Results**

*Matorin* test

Following the application of “Matorin” test, the average of individual values on right side turning jump is 214° for the girl subgroup (n_0 = 144) and 219° for the boy subgroup (n_B = 172). We found that, from the total number of investigated subjects in this test (n_S = 316), girls represented 44.94%, and boys, 55.06%. Athletes (n_A= 110) achieved an average of 219°, and non-athletes (n_NA = 206), an average of 210°. In the same test, athletes (n_A= 110) represented 34.81% of the total of investigated subjects, and non-athletes (n_NA = 206), 65.19%. (Table 3)

<table>
<thead>
<tr>
<th>Range of rotation angles (MU=degrees)</th>
<th>Girls</th>
<th>Boys</th>
<th>Athletes</th>
<th>Non-Athletes</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. Range average (MU=degrees)</td>
<td>No. Range average (MU=degrees)</td>
<td>No. Range average (MU=degrees)</td>
<td>No. Range average (MU=degrees)</td>
<td></td>
</tr>
<tr>
<td>&lt; 90</td>
<td>0 0</td>
<td>1 0</td>
<td>0 0</td>
<td>1 0</td>
</tr>
<tr>
<td>91-120</td>
<td>0 0</td>
<td>0 0</td>
<td>0 0</td>
<td>0 0</td>
</tr>
<tr>
<td>121-150</td>
<td>2 140</td>
<td>0 148</td>
<td>1 150</td>
<td>1 140</td>
</tr>
<tr>
<td>151-180</td>
<td>8 173</td>
<td>4 178</td>
<td>1 180</td>
<td>11 174</td>
</tr>
<tr>
<td>181-210</td>
<td>9 204</td>
<td>5 214</td>
<td>1 210</td>
<td>13 201</td>
</tr>
<tr>
<td>211-240</td>
<td>10 234</td>
<td>8 235</td>
<td>5 235</td>
<td>14 227</td>
</tr>
<tr>
<td>241-270</td>
<td>13 265</td>
<td>10 274</td>
<td>6 269</td>
<td>17 261</td>
</tr>
<tr>
<td>271-300</td>
<td>28 289</td>
<td>24 295</td>
<td>17 298</td>
<td>37 277</td>
</tr>
<tr>
<td>301-330</td>
<td>41 319</td>
<td>73 328</td>
<td>42 327</td>
<td>69 309</td>
</tr>
<tr>
<td>331-360</td>
<td>32 350</td>
<td>41 348</td>
<td>31 357</td>
<td>42 334</td>
</tr>
<tr>
<td>&gt; 360</td>
<td>1 380</td>
<td>6 384</td>
<td>6 374</td>
<td>1 390</td>
</tr>
<tr>
<td>Subgroups - average values</td>
<td>144 214</td>
<td>172 219</td>
<td>110 219</td>
<td>206 210</td>
</tr>
</tbody>
</table>

Following the application of “Matorin” test, the average of individual values on left side turning jump is 212° for the girl subgroup (n_0 = 144) and 225° for the boy subgroup (n_B = 172). We found that, from the total number of investigated subjects in this test (n_S = 316), girls represented 44.94%, and boys, 55.06%. Athletes (n_A= 110) achieved an average of 231°, and non-athletes, an average of 218°. In the same test, athletes (n_A= 110) represented 34.81% of the total of investigated subjects, and non-athletes (n_NA = 206), 65.19%. (Table 4)
Table 4. Result distribution in “Matorin” test– Left side turning jump

<table>
<thead>
<tr>
<th>Range of rotation angles (MU=degrees)</th>
<th>No.</th>
<th>No.</th>
<th>No.</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(MU=degrees)</td>
<td>(MU=degrees)</td>
<td>(MU=degrees)</td>
<td>(MU=degrees)</td>
</tr>
<tr>
<td>&lt; 90</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>65</td>
</tr>
<tr>
<td>91-120</td>
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<td>0</td>
<td>1</td>
<td>120</td>
</tr>
<tr>
<td>121-150</td>
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<td>133</td>
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<td>176</td>
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<td>181-210</td>
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<td>198</td>
<td>7</td>
<td>194</td>
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<tr>
<td>211-240</td>
<td>6</td>
<td>231</td>
<td>6</td>
<td>225</td>
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<td>241-270</td>
<td>15</td>
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<td>266</td>
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<td>271-300</td>
<td>20</td>
<td>289</td>
<td>33</td>
<td>280</td>
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<tr>
<td>301-330</td>
<td>46</td>
<td>320</td>
<td>52</td>
<td>319</td>
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<td>331-360</td>
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<td>56</td>
<td>349</td>
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<tr>
<td>&gt; 360</td>
<td>2</td>
<td>375</td>
<td>2</td>
<td>378</td>
</tr>
<tr>
<td>Subgroups –average values</td>
<td>144</td>
<td>212</td>
<td>172</td>
<td>225</td>
</tr>
</tbody>
</table>

“Matorin” test shows us that the average of girls’ individual values on right side turning jump is 214°, and left side turning jump, 212° → Δ(RSG - LSG) = 2. The average of boys’ individual values on right side turning jump is 219°, and left side turning jump, 225° → Δ(RSB - LSB) = -6. The average of athletes’ individual values on right side turning jump is 219°, and left side turning jump, 231° → Δ(RSA - LSA) = -12. The average of non-athletes’ individual values on right side turning jump is 210°, and left side turning jump, 218° → Δ(RSNA - LSNA) = -8. (Table 5)

Table 5. Differences between subgroup averages in “Matorin” test– Right side turning jump / Left side turning jump

<table>
<thead>
<tr>
<th>Subject categories</th>
<th>Girls (RA)</th>
<th>Boys (RA)</th>
<th>Athletes (RA)</th>
<th>Non-Athletes (RNA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range average</td>
<td>No. (MU=degrees)</td>
<td>No. (MU=degrees)</td>
<td>No. (MU=degrees)</td>
<td>No. (MU=degrees)</td>
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<tr>
<td>Right side average</td>
<td>214</td>
<td>219</td>
<td>219</td>
<td>206</td>
</tr>
<tr>
<td>Left side average</td>
<td>212</td>
<td>225</td>
<td>231</td>
<td>-</td>
</tr>
<tr>
<td>Δ(RS - LS)</td>
<td>2</td>
<td>-6</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Δ(RA - RNA)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

The difference between the averages of girls’ individual values and boys’ individual values is Δ(RSG - RSB) = -5, for right side turning jump. For left side turning jump, the difference between the averages of girls’ individual values and boys’ individual values is Δ(LSG - LSB) = -13. The difference between the averages of athletes’ individual values and non-athletes’ individual values is Δ(RSA - RSNA) = 9, for right side turning jump. For left side turning jump, the difference between the averages of athletes’ individual values and non-athletes’ individual values is Δ(LSA - LSNA) = 13. (Table 6)

Table 6. Differences between group averages in “Matorin” test– Gender and status of subjects - athletes/non-athletes

<table>
<thead>
<tr>
<th>Subject categories</th>
<th>Girls(G)</th>
<th>Boys(B)</th>
<th>Athletes(A)</th>
<th>Non-Athletes(NA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range average</td>
<td>Δ(G-B) (MU=degrees)</td>
<td>Δ(G-B) (MU=degrees)</td>
<td>Δ(A-NA) (MU=degrees)</td>
<td>Δ(A-NA) (MU=degrees)</td>
</tr>
<tr>
<td>Direction of turning jump</td>
<td>Range average</td>
<td>Range average</td>
<td>Range average</td>
<td>Range average</td>
</tr>
</tbody>
</table>
This test, the appreciation of distance investigation (spatial perception), revealed that girls’ deviation average with “+” was 117 cm, and deviation average with “-” was 167 cm. Boys’ deviation average with “+” was 137 cm, and deviation average with “-” was 160 cm. The average of deviations with “+” for athletes was 119 cm, and the average of deviations with “-” was 142 cm. The average of deviations with “+” for non-athletes was 142 cm, and the average of deviations with “-” was 169 cm. (Table 7)

On the dynamic balance investigation, the average of “right” deviations for girls was 57 cm, and the average of “left” deviations was 49 cm. The average of “right” deviations for boys was 56 cm, and the average of “left” deviations was 44 cm. The average of “right” deviations for athletes was 49 cm, and the average of “left” deviations was 44 cm. The average of “right” deviations for girls was 62 cm, and the average of “left” deviations was 52 cm. (Table 7)

On the appreciation of distance investigation (spatial perception), the distribution of subjects’ deviations by gender and individual status is presented in Table 8.

On the dynamic balance test, the distribution of subjects’ deviations by gender and individual status is presented in Table 9.
Table 9. Subjects’ deviation distribution in Dynamic balance test, by gender and individual status – athletes/non-athletes

<table>
<thead>
<tr>
<th>Test</th>
<th>Deviation distribution type</th>
<th>Girls (MU=No.)</th>
<th>Boys (MU=No.)</th>
<th>Athletes (MU=No.)</th>
<th>Non-Athletes (MU=No.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Deviation “0”</td>
<td>49</td>
<td>60</td>
<td>45</td>
<td>67</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>36.30%</td>
<td>35.09%</td>
<td>38.14%</td>
<td>35.64%</td>
</tr>
<tr>
<td>Dynamic balance</td>
<td>Deviation to “right side”</td>
<td>40</td>
<td>58</td>
<td>42</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>29.63%</td>
<td>33.92%</td>
<td>35.59%</td>
<td>29.25%</td>
</tr>
<tr>
<td></td>
<td>Deviation to “left side”</td>
<td>46</td>
<td>53</td>
<td>31</td>
<td>66</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>34.07%</td>
<td>30.99%</td>
<td>26.27%</td>
<td>35.11%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>306</td>
<td>135</td>
<td>171</td>
<td>118</td>
</tr>
<tr>
<td>Down</td>
<td>%</td>
<td>100%</td>
<td>44.12%</td>
<td>55.88%</td>
<td>38.56%</td>
</tr>
</tbody>
</table>

Discussions and conclusions

A first general conclusion that emerges from our investigation, such as an interpretation and analysis of recorded results, is that the two hypotheses from which we started were confirmed, as follows:

a. No significant differences occurred between the development level of psychomotor ability, from the perspective of the two applied tests, between girls and boys aged 10-14;
b. The subjects practicing sports activities in an organized way present more developed psychomotor ability than those who do not have any additional motor activities.

Other specific conclusions that we have drawn from our research are:

a. In the “Matorin” test, only six subjects, representing 1.90% from 316 investigated subjects, achieved rotations greater than 360°;
b. The athletes represent only 34.81% from all the investigated subjects, and the non-athletes represent 65.19%, with daily activities such as sedentary ones;
c. In the “Matorin” test, most individual values are within a range of 271°-360°, as follows: 31.33% of girls; 44.62% of boys; 29.11% of non-athletes, and the highest percentage – 48.11% of athletes; this conclusion supports the confirmation of one of the hypotheses;
d. Moreover, in the “Matorin” test, there are no significant differences between individual right side turning jump values and left side turning jump values, related to subject’s dominant leg;
e. In the Spatial perception test, the average of deviations with “-” (162 cm)is by 33 cm (25.58%) higher than the average of deviations with “+” (129 cm), although the length of the gym hall was 40 meters, and it did not generate a protective reflex of the subjects, in terms of movement without visual control;
f. In the Dynamic balance test, we did not find any significant differences of lateral deviations from direction between subgroups of subjects: boys ↔ girls, athletes ↔ non-athletes;
g. The biggest difference regarding the deviations from the direction line or the endpoint were recorded in non-athletes(61.44%) compared to athletes (38.56%).

Acknowledgements

Our thanks go to the management staff and the physical education teachers from “Alexandru Ioan Cuza” Middle School of Tîrgu Mureș, for their support in conducting our research on a considerable sample of subjects (n = 346).

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THE IMPLEMENTATION RESULTS OF THE LICENSING SYSTEM FOR COACHES TRAINING PLAYERS UNDER 13

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Abstract. Basketball coaches training features in Romania, through various aspects of interest, represent a particularly vast research and reflection domain. The Romanian Basketball Federation implements, since 2014, a licensing program for coaches on various aspects of training, which aims at a unitary preparation for them in order to implement the training strategy of the national teams. The licensing program applied by the Romanian Basketball Federation for the 4 levels of training (License “C”: for mini basket, U13; License “B”: for U14, U16 championships; License “A”: for U18, U20, 1st League championships; License “AA”: for National League), began in 2014 and was held in several forms; regional training sessions held by the FR Basketball, annual internships organized by the FR Basketball FIBA international internships. During 2014-2017, coaches framing is covered by the interest of a particular category of instruction, the value of coaches and their design activity. The present study offers an analysis of the results obtained during the theoretical testing of the coaches, who took these tastings during 2014-2015, according to under 13 training category. The study results offer information regarding the knowledge level based on 8 training features: the ball technique, technique without the ball, training planning, physical training, regulation, methodical-tactical individual psychological training.

Keywords: coach, progress, licensing, training.

Introduction

The puzzle in coaching and training the staff specialized in Sports represents a high point of interest for developing performance sports in Romania. In the 2014 basketball year, there were approximately 500 coaches who were training children at different competitions for different levels, according to the age category.

The literature addresses different aspects of training the players and less on the coach’s level of preparation for different sports fields. However, some of these studies address different aspects such as their efficiency based on the different aspects of training (Fung, 2003).

The coaches involved in performance sports need to have specialized knowledge and also in other domains, a fact mentioned by other authors as well, while doing some specialty studies (Jones, Housner, & Kornspan, 1995; Armour & Collins, 1998; Moon, 1999; Lyle, 2002).

In basketball, FIBA recommends the national federations to organize training classes for coach’s improvement. The strong countries, with notable results, have developed their own systems to train coaches according to their development necessities.

For example, the Italian Basketball Federation, through the coach’s national committee, organizes monthly internships for developing coaches, which covers different aspects of training them (FIP, 2015).

Developing the basketball game, driven by growing the spectacular character of the game practiced by teams of seniors by attracting foreign players, increased exposure and amenity for children, local development of logistics, availability of parents to invest for competitive sports should be coupled with an interest of coaches to continuously improve in order to increase the quality of education.

The Romanian Basketball Federation has identified a number of concerns related to preparing trainers in the field, with repercussions on the preparation of national teams to participate in competitions (FRB, 2014):

- Low interest of coaches for lifelong learning and increase the training quality;
- The lack of a uniform system of education, training and evaluation of coaches.

All these have resulted in a low level of performance of the Romanian junior and senior players, visible during the international competitions at various levels and unable to promote junior players to senior teams.

As a result, the Romanian Basketball Federation implemented starting with 2014, a licensing coaches program, designed on 4 levels, divided based on the players’ age and distinct training, as follows:

- License “C”: for players who play in the youth basket championships, mini basket, U13
- License “B”: for players who play in the U14, U16 championships
- License “A”: for players who play in the U18, U20, 1st League championships
- License “AA”: for players who play in the National League

The objectives of this licensing program were:

- Improving the level of specific knowledge of the coaches for the age level they work with;
- Assuring a framework for professional development and evaluation of the coaches in the system;
- General growth of the coaching process quality C;
- Supporting the presence and promoting the players with a high sports value.

**Materials and methods**

The licensing program applied by the Romanian Basketball Federation, for the 4 levels of training, began in 2014 and was held in several forms; regional training sessions held by the FR Basketball, annual internships organized by the FR Basketball FIBA international internships.

During 2014-2017, coaches framing is covered by the interest of a particular category of instruction, the value of coaches and their design activity.

In 2014, the “C” licensing program was held for the coaches working with Under-13 youth teams and included a total of 22 hours of training adapted to the requirements of the age-specific training, with the following content:

- Psychopedagogy – 2 hours;
- General and specific sports training category U-13 – 4 hours
- General and specific regulation concepts – 2 hours
- General and specific physical training age designed – 4 hours
- Attack and defense techniques: content and methods – 10 hours

There were centralized training sessions conducted in four geographical locations: Bucharest, Cluj, Iasi.

The training content was designed so as gives the coaches the opportunity to use methodical tools corresponding to the requirements of age and level of understanding of children and the creation of a national training strategy, through and theoretical and methodical-tactical lessons.

The coach’s evaluation was done through 3 aspects:

- Activity in the basketball domain – maximum 10 points
- Methodical – tactical evaluation – maximum 50 points
- Written evaluation – maximum 40 points

The minimum requirement for participating in the licensing courses to obtain the license “C” was to hold the book coach and a minimum of 1-year experience as a coach.

Analyzing the results of licensing program implementation for 2014-2015, there were taken into account the results obtained during written evaluation, which was attended by 193 coaches for all the coaches who have promoted and obtained the license “C”.

**Research purpose**

The main purpose of the research was to analyze the knowledge of coaches corresponding to the U-13 category, in the light of the results achieved during the tests carried out by the FR Basketball in 2014 and 2015.

For the analysis the following indicators were taken into account:

- The difficulty of the calculated grids (depending on the number of technical and tactical questions in each grid);
- The structure of grids: share questions at the 8 categories of questions identified by us – the ball technique, technique without the ball, physical training, regulation, training planning, individual psychological methodical and tactical training;
- The correct answers: the percentage of correct answers for each of the 8 categories of questions.

**Results**

In order to evaluate the coaches 8 kinds of grids were prepared, each containing 32 questions, with scores between 0.5 and 3 points. The number of respondents for each type of grid is shown in Fig.1.
Fig. 1. The number of respondents for each type of grid

Regarding the grid difficulty (Fig. 2), it was revealed that all grids had difficulty exceeding 50%, 6 of them were in the range 61-68%, and the last two, between 50-57%. Grids C7 and C8 were applied to 6 coaches.

Fig. 2. The difficulty of applied grids

The grids structure was determined on one hand by the instruction characteristics for this age and on the other hand by the training content conducted during the 22 hours of centralized training (Fig. 3).
Another approach to the carried out analysis, aimed the coach’s correct answers to the 8 categories of questions. In our analysis we highlighted general aspects referring to the percentage of coaches’ correct answers (Fig. 4), but also the response analysis to three of the categories that should enjoy of the coach’s attention in training junior Under-13: ball technique (Fig. 5), technique without the ball (Fig. 6) and methods (Fig. 7).
Discussions and conclusions

Centralizing and analyzing the results achieved during the theoretical basketball testing of the coaches in order to obtain the license “C”, highlighted important aspects of the content testing and the coaches’ level of education.

Regarding the number of respondents and the grids applied difficulty, it is noticed that out of the 8 grids applied, 6 of them were applied to 97% of all coaches licensed, the other two being grids in English, for the foreign coaches working in Romania.

The grid difficulty determined by the number of technical and tactical questions in each grid was above average, 61% of all answers from all grids.

The grid structure aimed the most important aspects from the Under-13 juniors training content. Out of all the questions contained in the 8 grids, most of the questions checked the knowledge of coaches on technique with the ball. At this age, the technique training is the training main focus, the growth characteristics, the development and drivers of basketball causing about 60% of total training hours with a technical content.

In terms of volume, we find on the 2nd place the questions concerning the methodology of training, representing 25% of the total questions with reference to: specifying the main techniques usually used to train players, instruction individuality, setting drives required for each technical process. The knowledge of the planning exercise aspects accounted for 16% of all questions. Planning the training ensures the united drive and ongoing relationships between the training content aspects model, which it distributes in smaller sequences in the lesson plans. Mastery coach actually derived models to draw up prepared planning and implementation of methodological issues into practice.

The other training aspects are represented by:
- Without ball technique – 8%
- Physical training – 6%
- Regulation – 6%
- Methodical – tactical training – 3%
- Psychological training – 3%

Analyzing the grid content we can estimate that in the future, it is necessary that the other two aspects of training: technique without the ball and physical training can allocate a higher number of questions, so as to achieve an appropriate balance assessment of knowledge concerning the technique with the ball and the one without the ball, between planning the training and physical training. Of course, the methodical aspects complete a complex picture and unity of training juniors.

The coaches’ knowledge is highlighted through the correct answers analysis recorded to the 8 categories of questions. The complete picture of the answers to the 8 categories of questions is the following (Table 1):

<table>
<thead>
<tr>
<th>No.</th>
<th>Question content</th>
<th>Maximum result</th>
<th>Minimum result</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.</td>
<td>Ball technique</td>
<td>86.04%</td>
<td>68%</td>
</tr>
<tr>
<td>9.</td>
<td>Methods</td>
<td>77.42%</td>
<td>53.36%</td>
</tr>
<tr>
<td>10.</td>
<td>Training planning</td>
<td>91.67%</td>
<td>57.58%</td>
</tr>
<tr>
<td>11.</td>
<td>Without ball technique</td>
<td>83.78%</td>
<td>43%</td>
</tr>
<tr>
<td>12.</td>
<td>Physical training</td>
<td>97.30%</td>
<td>43%</td>
</tr>
<tr>
<td>13.</td>
<td>Regulation</td>
<td>92.22%</td>
<td>23.92%</td>
</tr>
<tr>
<td>14.</td>
<td>Tactical training</td>
<td>100%</td>
<td>1.6</td>
</tr>
<tr>
<td>15.</td>
<td>Psychological training</td>
<td>70.27%</td>
<td>4%</td>
</tr>
</tbody>
</table>

Table 1. The answers to the 8 categories of questions

References
STUDY ON THE WAYS OF INCREASING THE ADHERENCE OF SCHOOL AGE CHILDREN IN THORACOLUMBAR SCOLIOSIS TREATMENT

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Abstract. Introduction: Scoliosis is a condition frequently encountered in school age children, which unfortunately does not benefit in our country from appropriate prophylactic measures. Also, currently there are few statistical data on the incidence of this pathology among school age children in Romania compared to those referring to its incidence in the EU countries. Materials and methods: We have achieved this study starting from the assumption that enhancing the adherence to the thoracolumbar scoliosis treatment mostly in children can be done by using modern communication technologies. Thus, out of the 55 children diagnosed with scoliosis in “Motivation” Rehabilitation Clinic, in 2014, only 17 underwent continuous treatment. For 2015, we changed our approach related to the treatment algorithm and, at the end of the 10 free sessions, we provided each child with a written program of 30-minute exercises that they had to perform at home, three times a week. We checked its execution by sending the children and their parents SMS messages. Depending on the responses, we tried to guide parents in finding an incentive for their children, to become more dedicated to the rehab programs. Also, we introduced a video monitoring system through which parents could watch, in the waiting room, how their children were working. Results: At the end of 2015, 37 of the children were performing the program at home and 80% of the parents were appreciating as extremely useful the communication established and the monitoring system as well. Conclusions: We can increase the treatment adherence for this pathology by using modern communication technologies, provided that we customize and permanently adapt this dialogue to the needs of each child.

Keywords: scoliosis, treatment, communication, efficiency.

Introduction

Scoliosis is a condition frequently encountered in school age children, which unfortunately does not benefit in our country from appropriate prophylactic measures. The explanation for this could be the lack of national screening programs and, why not, the lack of programs offering information regarding the long-term consequences of ignoring this affection. Also, currently there are few statistical data on the incidence of this pathology among school age children in Romania compared to those referring to its incidence in the EU countries.

Infantile scoliosis is rare in North America and is more common in Europe (Koutourakis et al., 1997), the frequency of infantile scoliosis, especially the worst forms, dropping in the last 20 years. Some authors have incriminated the effect of improving socio-economic conditions, a change of food habits, with a favorable effect of folic acid intake, the custom of sleeping infants in the ventral decubitus or most important, the increase in the amount of therapeutic exercises performed by the subjects investigated (Stagnara, Mollon, & Demauroy, 1990).

Materials and methods

We have achieved this study starting from the assumption that the treatment of thoracolumbar scoliosis can improve mostly in children by using modern communication technologies. Thus, the main purpose of this paper is to identify the technological resources which allow us to maintain a permanent feedback with children diagnosed with thoracolumbar scoliosis in “Motivation” Rehabilitation Clinic. Another objective of the research is to inform the parents about the negative consequences of an inconsistent, sporadic treatment for this disease.

Taking into consideration that all diagnosed children had a Cobb angle below 30 degrees, not requiring therefore wearing a corset, our goal was to get the children used to carry out a regular kinetic program. We wanted to validate the use of text messages as a method of monitoring the execution of physical therapy program at home.

Given the fact that it is a long-term treatment, this paper does not aim to validate individualized kinetic therapy programs, which are tailored depending on the functional status of each child, but it rather attempts to implement a lifestyle that incorporates such programs. Generally speaking, the routine monitoring in school environment and the evolution of socio-economic conditions changed the profile study of scoliosis. Today, the prognosis is placed before scoliosis reaches 30 degrees (Huang, 1997).

Idiopathic scoliosis are not stabilized at the end of the growth period but are rather continuing to undergo changes, in a slower rhythm (Ojoga, 2009), and therefore we consider appropriate initiating early kinetic in an individualized approach (Astrand, 1987).
The patients should be informed about the long-term consequences of giving up the treatment. In “Motivation” Rehabilitation Clinic, in 2014, 55 children aged between 9 and 16 years were diagnosed with thoracolumbar scoliosis.

In all these children, the Cobb angle measurement showed values below 30 degrees. They all followed an individualized kinetic program according to their functional status and the type of scoliosis. The session duration was 50 minutes and the frequency 2-3 times every week.

At the end of the 10 free sessions settled by House of Health Insurance from Bucharest, despite the fact that it seemed like everyone had understood the importance of continuing the kinetic therapy sessions, only 17 (30%) underwent continuous treatment afterwards. The majority explained the abandon of the treatment by the lack of free time, busy schedule at school or minimizing the effects of physical therapy.

For 2015, we changed our approach concerning the treatment algorithm and, at the end of the 10 free sessions, we provided each child with a written program of 30-minute exercises duration that they had to perform at home, three times a week.

We approached the treatment of the children from several perspectives, trying to empower the children and inform the parents on the importance of consistent treatment for this pathology.

Thus, we organized small groups (10 participants) briefing sessions in which we explained to the parents the benefits of continuing regular execution of the kinetic program at home and we urged them to contact us each time they had questions.

We mentioned that the regular monitoring of patients with idiopathic thoracolumbar scoliosis is extremely important to prevent the algic symptoms, the stiffness and to make a viable therapeutic decision at the right time. Using the help of scientific arguments, we argued the frequently spread idea to dismantle the myth that the idiopathic scoliosis is stabilized at the end of growth and therefore no longer requires particular attention (Goldberg & Dowling, 2003).

Given the fact that the evolution risks are related to the child’s age, to the puberty stages, bone maturation, the point of curvature and the value of angulations, we considered appropriate presenting the parents, the 3 types of corsets (Lioness in France, Milwaukee and Boston in the USA) which are fundamental for the orthopedic therapy of scoliosis (Herring, 2002). We have also explained to them that the disease is not genetically transmitted (Miller, 2000), but the etiological factors which allow under certain circumstances the appearance of this morphological phenomenon (Hobatho & Perie, 2005).

We have handed letters to the children, addressed to their school medical physician and the school physical education teacher in which we explained the diagnosis and asked them to support us by making it possible for the child to carry out the kinetic program during physical education classes.

We checked its execution by sending the children and their parents text messages. Depending on the responses, we tried to guide parents in finding a solution. Also, we introduced a video monitoring system through which parents could watch, in the waiting room, how their children were working in Motivation rehabilitation clinic. We applied at the end of the year, the “satisfaction” questionnaires both to the children and the parents.

Results and discussions

At the end of 2015, 37 (67.27%) of the children were performing the program at home and 80% of the parents were appreciating as extremely useful the communication established and the monitoring system as well.

Unfortunately, only 26% of children continued the kinetic program during physical education classes. It is our opinion that this is explained by the parents’ desire to protect their children, often by exempting them from physical education classes, by lacking collaboration with the physical education teachers and last but not least by the fear that the child will be labeled as sick or disabled.

We discovered an increase in the financial resources that are being allotted to kinetic treatment, as the percentage of those who continued treatment in the clinic increased from 30% in 2014 to 42% in 2015. The video monitoring proved to have different results, in different age groups; in 9-13 years age group the results emphasized that the children were more attentive and receptive to the therapeutic indications, knowing that the parents also supervised them.

In the group aged 13-16, most children did not want to be monitored by their parents. In order to avoid a psychological discomfort we decided to ask for their consent in this matter. We explained to the parents that we will respect their choices and over time we noticed an improvement of the communication between children and therapists.
We developed and applied the “satisfaction” questionnaires to both the children and their parents. Each questionnaire included three items; the first one subject-specific and two, common through which we tried to find the usefulness of both information sessions and the video monitoring.

The analysis of the children’s responses to the first item, “What do you think it was the most important benefit of text messages received?”, showed that: 61% of children felt more motivated to make the kinetic program at home, knowing that someone advises them from a distance, 28% of children have considered text messages an opportunity to check their posture and 11% said that they considered it a pressure factor in making their exercises.

With the first item from the parents questionnaire, which could be somewhat embarrassing, we tried to find out “What are the reasons the child did not follow a constant treatment?:” 54% of parents admitted the lack of time as the main cause of inconsistency, 38%, the lack of financial resources and only 8% said they were not informed about the necessity of a constant treatment.

By analyzing the answers to the second item, “How do you appreciate the utility of text messages?”, we found out that 67% of the patients considered it a very useful method, 23% useful and only 10% believed it as less useful. Surprisingly, by analyzing the answers their parents gave to the same question, we discovered that 86% felt that the method was very useful and 24% useful.

The video monitoring system, as said before, was considered beneficial by the majority (76%). The age of those 24% who believed it to be inappropriate was between 13 and 16 years old. Predictably, 95% of the parents considered the video monitoring as a very good idea.

Discussions and conclusions

The treatment for scoliosis represents a challenge for every recovery physician not because of the program complexity, but through the attempt to identify the best methods to motivate both the parents and the children, to undergo a continuous treatment.

The results of this study demonstrate that we can change these children’s lifestyle by monitoring their regular kinetic activities for this pathology, using modern communication technologies – text messages.

Also, the results of the applied questionnaires showed both for the children and the parents, the importance of being informed by means of communication, which allows a permanent feedback between the therapist and the subjects involved.

References
THE INCIDENCE OF SPINE DEFICIENCIES AMONG DISABLED STUDENTS FROM SPECIAL EDUCATION SYSTEM IN BUCHAREST CORRECTED BY KINETOTHERAPY EXERCISES

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Abstract. The aim of the research was to emphasize the incidence of spine deficiencies in students involved in the recovery program within the kinetotherapy classes carried out in special schools in Bucharest. We wanted to point out that, among the three categories of children with disabilities enrolled in special education from Bucharest (children with mental retardation, children with hearing impairments and children with visual impairments), there are statistical differences related to the incidence of spine deficiencies. Research sample consisted of students enrolled in special education from 14 schools. Thus, there were formed three groups of students: students with mental retardation, students with hearing impairments and students with visual impairments. Also, students with mental retardation were separated in two groups depending on the degree of deficiency: students with mild/moderate mental retardation and students with severe/profound mental retardation. Another criterion for forming working groups was the school level. Thus, each category was divided into subjects enrolled in primary education and subjects enrolled in secondary education. The comparison made between the groups revealed that, in terms of the incidence of spine deficiencies, there is correlation between the type of physical deficiency and the type and degree of disability.

Keywords: special education system, primary and secondary education, physical deficiencies.

Introduction

In this paper, we intend to present the spine physical deficiencies of the students involved in the kinetic program recovery carried out in special schools from Bucharest. This study is a pilot ascertaining study, data centralization at the level of special education system conducting to management decisions. In this respect, we consider appropriate to achieve an overview of the special education system.

There are 14 schools in Bucharest where children with disabilities are enrolled at primary and secondary level. Each of the 14 special schools enrolled children by type of deficiency. There are schools for students with mental deficiency, schools for students with hearing impairments and schools for students with visual impairments.

This year, it is aimed to match the curriculum and educational plans according to the Strategic Priorities of the Ministry of Education, to the sectorial action plans for 2016 and to note 31680/06.04.2016 of the Ministry of Education and Scientific Research regarding the development of the curriculum in secondary schools. We believe necessary to know about the incidence of physical deficiencies to students with disabilities in order to develop the curriculum in accordance with students’ needs and also to include a number of hours per class in the curriculum.

We mention that such a study was achieved in the school year 2012-2013 at the level of special education in Bucharest, whose survey results were presented to the Methodical Commission of Kinesiotherapy Teachers from Bucharest.

The results of a study on the prevalence of chronic diseases in children and youth from communities were presented in the Health National Report of Children and Youth from Romania published in 2011 by the National Institute of Public Health. Thus, between 2005 and 2011, studying the prevalence of chronic diseases in the population aged between 3 and 22 years old, it was found that after ocular diseases, stature-weight hypotrophy, rickets and obesity sequelae and spinal deformities represent the 5th cause of disease.

Studies on the incidence of physical deficiencies were presented at international level and among people with disabilities and were done on different categories of subjects: children with Down syndrome, autistic people and obese persons.

Aim of the research

Our aim is to improve the kinesiotherapeutic recovery process in special education, by detecting spine physical deficiencies in students with disabilities aged between 7 and 18 years old. The purpose of research is to establish
the incidence of spine physical deficiencies in students with disabilities enrolled in the special education schools from Bucharest in order to adapt proper design and planning documents.

Objectives of the research

The objectives of this research are:
1. Setting the level of knowledge by summarizing some general information about the physical deficiencies in children with disabilities.
2. Evaluation of body attitudes to children with disabilities enrolled in special education.
3. Centralization of data on the involvement of children from special education from Bucharest in the kinesiotherapeutic program.
4. Comparing the incidence of physical deficiencies in students with disabilities respecting the criterion which aimed to define the type of deficiency.
5. Highlighting the percentage differences in terms of spine physical deficiencies between students with mental deficiency, hearing and visual impairments.

Hypothesis of the research

Detecting physical deficiencies in students with mental deficiency, students with hearing impairments and students with visual impairments allows the identification of some differences in percentage, in terms of incidence for the three categories of subjects.

Materials and methods

Scientific research tasks

The tasks set after the formulation of research objectives were:
1. Reading the literature and finding information related to the right and poor posture of the body.
2. Providing evidence, measurements and assessment tests through which we will detect the spine deficiencies.
3. Detecting general or segmental spine deviations as a result of the assessment of body posture in children with disabilities.
4. Setting up a database with information on the existence physical deficiencies in students with disabilities involved in the kinesiotherapeutic program at the level of special education in Bucharest.
5. Establishing the number of subjects involved in the kinesiotherapeutic program at the level of special education in Bucharest, for each of the spine deficiencies.
6. Fixing the percentages of subjects involved in the recovery program, for each type of the physical disabilities and each type of subject (mental deficiency, hearing and vision impairments).
7. Data analysis, processing and interpretation.
8. Formulation of final conclusions.

Research sample. Experimental groups

To achieve the research a total number of 2033 children enrolled at the 14 schools offering special education services for students with disabilities in Bucharest for primary and secondary level were involved. Of the 14 schools, 11 schools educate 1701 students with mental deficiency and 2 schools educate 200 students with hearing impairments and 1 school educates 132 students with visual impairments. It should be noted that the group of students with mental deficiency consists of 972 students with mild/moderate mental deficiencies and 729 students with serious/severe/profound mental disability. We mention that the assessment was carried out during kinesiotherapeutic program in the initial assessment at the beginning of the school year 2015-2016. The group of subjects consisted of all students with disabilities from special education schools in Bucharest enrolled at primary and secondary level (Table 1).
In this section we will present the discipline kinesiotherapy within the curricula and special education system. The program of activities with students with disabilities enrolled in special education system is imposed by the curriculum as in the case of the other schoolchildren. Thus, at present, the activity in special schools is conducted according to curriculum 4928/08.09.2005 for special education institutions which educate children with serious/severe/profound deficiencies, to curriculum 4927/08.09.2005 for special education institutions which educate children with mild/moderate disabilities at primary level and to curriculum 5329/01.09.2008 for special education institutions which educate children with mild/moderate disabilities at secondary level.

In the three curricula in force and only in the special education there is the 8th curriculum called Specific and Compensation Therapies. For students with mild/moderate disabilities, the disciplines from the curriculum called Specific and Compensation Therapies are: Kinesiotherapy, Psycho-diagnosis, Educational Counseling and Guiding and Specific Therapies and Activities. For students with serious/severe/profound disabilities in the same curriculum there are the following disciplines: Language Disorders Therapy, Kinesiotherapy and Psycho-diagnosis, Counseling, Therapy and Intervention Programs.

In conclusion, the discipline Kinesiotherapy is provided in the curricula for all types and degrees of deficiency. Thus, classes of students with mild/moderate visual impairments have one hour of kinesiotherapy per week and classes of students with serious/severe/profound deficiencies have two hours of kinesiotherapy per week.

Kinesiotherapy teachers make an assessment of all schoolchildren at the beginning of each school year during the initial assessment. In the first two weeks during the assessment of musculoskeletal apparatus it is carried out the assessment of physical growth and development by subjective methods – somatoscopy – and by objective methods - instrumental somatoscopic examination. In the third week, the last stage of the initial assessment for students individual records of evaluation are established where all the information obtained in the anamnesis conducted with family members appear, information obtained from the files of children from the Internal

<table>
<thead>
<tr>
<th>Educational institution</th>
<th>Enrolled students</th>
<th>MD P-4</th>
<th>MD 5-10</th>
<th>SD P-4</th>
<th>SD 5-10</th>
<th>Total No. MD</th>
<th>Total No. SD</th>
<th>Total no. Kinesio therapy hours</th>
<th>Total no. of involved students</th>
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<tr>
<td>Special School no 1</td>
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<td>28</td>
<td>30</td>
<td>44</td>
<td>51</td>
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<td>552</td>
<td>318</td>
<td>411</td>
<td>972</td>
<td>729</td>
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<td>Visual Impairments</td>
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</table>

Note: MD – children with moderate mental deficiency, MS – children with severe mental deficiency, P-4 – children enrolled in preparatory class-4th grade, 5-10 – children enrolled in 5th grade-10th grade

Assessment methods

Table 1. Distribution of students by type of deficiency, sufficiency degrees and levels of education
Commission of Assessment. The assessments are: somatometry,prehension assessment, walking agility, articular amplitude assessment, and muscle strength and effort capacity assessment.

When the teacher discovers diseases of the locomotor system, he directs students to the school doctor or the general practitioner in order to confirm the diagnosis and to present the associated disease which appears in the medical records.

Results

The data presented herein have been centralized as a result of the work carried out by a number of 25 kinesiotherapy teachers from 14 special education institutions from Bucharest.

Table 2. The number of students involved in the kinesiotherapeutic program allocated on types and degrees of deficiency, levels of education and diseases

<table>
<thead>
<tr>
<th>Type of deficiency</th>
<th>School level</th>
<th>Kyphosis</th>
<th>Lordosis</th>
<th>Kyphosis and lordosis</th>
<th>Scoliosis C</th>
<th>Scoliosis S</th>
<th>Kyphosis and scoliosis</th>
<th>Neurological diseases</th>
<th>Other diseases</th>
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</thead>
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<tr>
<td>MD</td>
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<td>16</td>
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<td>3</td>
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<td>5 – 10</td>
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<td>38</td>
<td>11</td>
<td>15</td>
<td>26</td>
<td>41</td>
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<tr>
<td>SD</td>
<td>P – 4</td>
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<td>8</td>
<td>5</td>
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<tr>
<td></td>
<td>5 – 10</td>
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<td>2</td>
<td>5</td>
<td>7</td>
<td>4</td>
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<tr>
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<td>6</td>
<td>4</td>
<td>6</td>
<td>14</td>
<td>6</td>
<td>5</td>
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<tr>
<td>Hearing</td>
<td>P – 4</td>
<td>9</td>
<td>19</td>
<td>5</td>
<td>0</td>
<td>4</td>
<td>0</td>
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<td>3</td>
<td>3</td>
<td>6</td>
<td>12</td>
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<tr>
<td>GEN. TOTAL</td>
<td></td>
<td>16</td>
<td>41</td>
<td>9</td>
<td>3</td>
<td>7</td>
<td>3</td>
<td>9</td>
<td>22</td>
</tr>
</tbody>
</table>

Abbreviations: MD – children with moderate mental deficiency; MS – children with severe mental deficiency; P – children enrolled in preparatory class; 4th grade; 5 – 10 – children enrolled in 5th grade-10th grade; Visual – children with visual impairments; Hearing – children with hearing impairments

Taking into consideration that the three groups of subjects involved in the research (students with mental disability,students with visual impairments and students with hearing impairments) does not consist of an equal number of students, we consider necessary to transform the number of students with a particular diagnosis in percentages, related to the total number from that category.

Table 3. The incidence of diagnoses in students involved in the kinesiotherapeutic program at the level of special education in Bucharest

<table>
<thead>
<tr>
<th>Type of deficiency</th>
<th>Kyphosis</th>
<th>Lordosis</th>
<th>Kyphosis and lordosis</th>
<th>Scoliosis C</th>
<th>Scoliosis S</th>
<th>Kyphosis and scoliosis</th>
<th>Neurological diseases</th>
<th>Other diseases</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMD TOTAL</td>
<td>4.11%</td>
<td>3.49%</td>
<td>1.64%</td>
<td>3.90%</td>
<td>1.13%</td>
<td>1.54%</td>
<td>2.67%</td>
<td>3.08%</td>
</tr>
<tr>
<td>SMD TOTAL</td>
<td>3.97%</td>
<td>3.97%</td>
<td>2.60%</td>
<td>3.29%</td>
<td>1.78%</td>
<td>1.23%</td>
<td>12.20%</td>
<td>5.62%</td>
</tr>
<tr>
<td>Mental deficiency</td>
<td>4.05%</td>
<td>3.70%</td>
<td>2.05%</td>
<td>3.64%</td>
<td>1.41%</td>
<td>1.41%</td>
<td>6.76%</td>
<td>4.17%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>5.30%</td>
<td>3.03%</td>
<td>4.54%</td>
<td>3.03%</td>
<td>4.54%</td>
<td>10.60%</td>
<td>4.54%</td>
<td>3.78%</td>
</tr>
<tr>
<td>Hearing TOTAL</td>
<td>8%</td>
<td>20.5%</td>
<td>4.5%</td>
<td>1.5%</td>
<td>3.5%</td>
<td>1.5%</td>
<td>4.5%</td>
<td>11%</td>
</tr>
</tbody>
</table>
Discussions and conclusions

Analyzing the data in Table 1 we can say that out of the 2,033 students enrolled at primary and secondary education in special education institutions from Bucharest a number of 582 students representing a rate of 28.62% of all students were involved in the kinesiotherapeutic program.

The conduct and organization of kinesiotherapeutic program is different in terms of the number of students in a working group depending on the type of deficiency. Thus, in a number of 310 per week there were involved 433 students with mental deficiencies (1.39 average students involved in the activity) and for students with visual impairments 42 hours involving 52 students (1.23 students involved in the activity).

For students with hearing impairments 97 students are involved within the 40 hours (2.42 students involved in the activity). The low average regarding the composition of working groups for students with mental deficiency and visual impairments can be justified by the low space orientation capacity of the two categories of students and the desire to ensure children’s safety during the lesson, while for students with hearing impairments, knowing the sign language goes beyond the barriers of communication. Also, low average on the composition of working groups for students with mental deficiency is due to the large number of students with neurological problems, students that usually work individually.

Comparing the data in Table 3 we can say that the hypothesis of the research is confirmed according to which the incidence of physical deficiencies is different in children with disabilities enrolled in primary and secondary education depending on the type of deficiency.

It can thus be seen that for students with mental deficiency is the most common disease are the neurological disorders and the most common disorder of the locomotor apparatus is kyphosis. Students with visual impairments show an increased kyphosis, while students with hearing impairments show an increased lordosis.

Comparing the results of students with mild/moderate mental deficiency with the results of students with severe/profound mental disability, as distinct categories within students with mental deficiency, we noticed a strong incidence the second category of students with neurological disorders. In terms of physical deficiencies, in the two categories, we can observe similar incidences.

The present research is the first step in deepening knowledge of incidence of physical deficiencies to students with disabilities. All the obtained information will guide the development of organizational strategies for kinesiotherapy discipline at the level of School Inspectorate of Bucharest.

We intend to make a further research in to be checked if there are mathematical statistical correlations between the incidence of physical deficiencies and disability type and degree of children enrolled in special education system.

References


INFLUENCES OF PILATES APPARATUS EXERCISES ON THE IMPROVEMENT OF COXARTHROSIS CONDITION

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1National University of Physical Education and Sports, 140 Constantin Noica Street, Bucharest, Romania
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Abstract. Exercises using Pilates apparatus can be adapted to any person, regardless of age, physical fitness or motor experience, since they act for the muscle toning, posture optimization, improvement of various disorders and physical imbalances, improvement of body and mental balance, development of suppleness. In parallel, they stimulate active, conscious participation, the desire for correct execution and success. One of the joint dysfunctions that can be improved through Pilates apparatus exercises is osteoarthritis of the hip joint or coxarthrosis, in the phases in which surgical intervention is not recommended. The natural course of this disease leads to progressive decrease in hip mobility, permanent pain and incapacity to carry out everyday activities without help. For this reason, it is very important for the patient to slow down as much as possible the rapid progression of the disease. Its prophylaxis can be achieved by avoiding the risk factors, especially obesity, joint stiffness and sedentary lifestyle. The purpose of the paper is to present a system of exercises designed for people with coxarthrosis, so as they get and maintain body weight within normal limits, develop joint mobility and strengthen the muscle groups that stabilize it. This paper is based on our practical experience and the case study of a male subject diagnosed with bilateral coxarthrosis, who, after more than 1 year of exercises on Pilates apparatus, has significantly improved his physical fitness.

Keywords: apparatus, Pilates, coxarthrosis, improvement.

Introduction

Osteoarthritis of the hip joint is a form of degenerative rheumatism which, even in early stages, creates a real discomfort for people suffering from it. A non-inflammatory joint disorder, osteoarthritis usually occurs at middle and older ages, affecting both of the genders (Crețu, 2003, p.172).

Once established, chronic diseases with a long-term progression cannot be fully cured. The treatment, when surgical intervention is not recommended, aims to alleviate as much as possible the symptoms and pain to delay degenerative progression in the joint and to improve its functionality (STV, 2016).

One of the joint dysfunctions affected by these degenerative processes is the hip. Osteoarthritis is considered one of the most incapacitating diseases, with spontaneous developments that may lead to disability. With a classification in three stages, namely the initial, advanced and final ones, coxarthrosis affects the gait and balance of the body, reduces mobility, gives the body a vicious postural attitude and may lead to ankylosis. The treatment is complex, including medication, thermotherapy, massage therapy, electrotherapy, kinetotherapy. One of the most recommended means is physical exercise, which is beneficial both in the treatment phases and as a prophylactic means. The kinetic programme aims to improve muscle strength, increase hip stability and develop mobility in the hip joint (Crețu, 2003, pp.182-193).

A possibility of intervention through physical exercise in order to improve coxarthrosis condition is provided by the Pilates equipment. Although this method has been developed over time rather in the sphere of sports and fitness maintenance activities, it originates in the endeavors of Joseph Pilates, the inventor of a kinetic intervention system for the bedridden wounded in the World War I. A male nurse by profession, he created a system of springs and straps attachable to beds, which allowed patients to move without affecting their wounds. The invention was subsequently materialized in the construction of some accessories as spectacular as they were efficient in improving the locomotor apparatus functioning (Dufur & Riveccio, 2006, p.11). Among them, Cadillac and Reformer have already become famous, and also the Barrel Chair and EXO Chair.

The purpose of this exercise system and accessories was to create a smart gymnastics for the body and mind, so as each movement, accurately localized, to be both controlled and efficient. Due to its benefits, since 2000, by the decision of an American jury, Pilates is not any longer only a body shaping method, like many others, but a form of autonomous physical activity, just as Yoga (Dufur & Riveccio, 2006, p.9).

It addresses a wide variety of population, from sedentary people to athletes, dancers, active persons who want to improve their fitness, pregnant women, menopausal women, persons with joint disorders and osteoporosis etc. (Smith, Kelly & Monks, 2014, pp.48-54; Dufur & Riveccio, 2006, p.15). Actually, the benefits of Pilates exercises are recognized in the medical world, being recommended to people with muscle and joint dysfunctions as a preventive and rehabilitation activity (Tache, 2011a).
In consensus with those presented and based on our practical experience gained at the SHAPE ART PILATES Studio, we considered it appropriate to initiate a case study on the influences of individualized programmes using Pilates equipment to improve coxarthrosis condition. The exercise systems observe the therapeutic prescriptions for muscle group toning and joint stabilization, regaining joint mobility, as well as restoring and maintaining body weight within normal limits.

**Materials and methods**

As a main research method, it was used the case study, because we took into account the particularities of each practical intervention, as well as the value of the method, which provides a systematic knowledge of the behavior of those investigated (Epuran & Marolicaru, 2006, pp.51-52). For our subject, it revealed the individuality of reactions and the progression of improvements. At the same time, the research used documentation, the observation method, necessary to permanently monitor the subject’s reactions and to rationally process the data (Epuran, 2005, p.204), and also the survey method, through a questionnaire.

The study was conducted in the period from December 2014 to March 2016 and included 90 preparation sessions using Pilates equipment, within the SHAPE ART PILATES Studio in Bucharest.

The subject, a male aged 57 years, voluntarily consented to participate in the study. At the beginning of the programme, his weight was 87 kg and he was experiencing real dysfunctions when walking. During gait, he was displaying a kyphotic attitude at the thorax level, and his tiptoes were oriented in ward, the left foot more than the right one. He was complaining of moderate lumbar pains and severe pain in the hips. After the completion of a preparation period including 40 sessions and wishing to have an official diagnosis made, the subject was persuaded to take a medical examination by magnetic resonance imaging (MRI), which was performed on 15.07.2015. The diagnosis of referral from the family physician was lumbar sciatica, but the MRI result for the examined anatomical region was: anterior spondylolisthesis is of L5 on S1, caused by osteoarthritis, and bilateral coxarthrosis.

To measure and assess the patient’s progress and reactivity to the training programme on Pilates apparatus, we used the survey method. Knowing that osteoarthritis of the hip is accompanied by pain, we wanted to see to what extent the pain could be reduced. In this regard, we used the Roland-Morris Low Back Pain Questionnaire (CNSMF, 2005, pp.84-85). In medical practice, this questionnaire is used to assess the disability caused by low back pain, but we consider it appropriate for assessing pain caused by coxarthrosis, too. The questionnaire was initially applied on 15.01.2015, after completing the first 5 working sessions on the Reformer apparatus, and on 30.03.2016, at the end of the 90 preparation sessions. In both testing stages, the subject filled in a questionnaire referring to lumbar pain, and another one referring to pain in the coxofemoral joints.

In parallel, the subject was monitored through an observation sheet recording his progress. Observations were also used to permanently modify the exercise programme, adapting it to the subject’s possibilities and progress made.

The preparation programme was conducted during 30 sessions on the Reformer apparatus, which has the advantage of providing a wide variety of possibilities to mobilize the muscles and joints in lying (on the back and sideways) positions. Thus, it was attempted to not exert any additional pressure on the hip joint and lumbar region.

The apparatus is equipped with a carriage sliding back and forth, and a system of springs and straps that allows adjusting the resistance and precisely dosing the effort, the exercise difficulty being ensured by one’s body weight and the spring resistance (at a low, average or hard level). Due to the system of springs, the muscle contraction is equally concentric and eccentric and specifically exerts the intramuscular and intermuscular coordination, as well as the deep stabilizing muscles of the body (John, 2007, pp.2-3).

Subsequently, with the improvement of subject’s fitness, there were approached exercises also performed in the lying position on the Cadillac apparatus and sitting on the EXO Chair. After completing 70 sessions, it was possible for the subject to work in standing positions, his physical condition allowing it.

**Exercises included in the programme** primarily aimed to:

- tone the core muscles at the level of power center (“powerhouse”, as stipulated in the Pilates terminology, which includes the abdominal, lower back and pelvis muscles - Isacowitz & Clippinger, 2011, p.41);
- tone the posterior body muscles and increase their elasticity;
- improve mobility in the coxofemoral joints;
- achieve the awareness and accuracy of execution;
- know and control one’s own body.
Exercises were performed symmetrically, aiming to remove imbalances in the muscles and joints. Each session lasted 1 hour, of which 10 minutes to prepare the body for effort, 40 minutes the exercise programme and finally 10 minutes allotted to stretching exercises. The average dosage was between 7 and 10 exercises, each with many variants of engaging the muscles, with 10 repetitions on average. The practice was slowly controlled, without sudden executions and with very short breaks necessary only to change position or the resistance of springs.

Results

The study results show improvements in the movement ability of the subject, revealed by the observation method and the responses to Roland-Morris questionnaire.

In the observation sheet of the subject, it is recorded positive evolution of his body weight that, from 87 kg at the beginning of the activity, has reduced to 80 kg during the study, therefore a weight loss of 7 kg.

From the observation of postural attitude and the progression of gait, we have found an improvement in the spine position, as well as improved balance and support stability, his tiptoes regaining normal position. Data identified in the specialized literature referring to standard posture of the feet recommend a support presenting a distance of 3 inches/8 cm between the heels and an 8- to 10-degree angle of the tiptoes relative to the median axis with a total of 20 degrees (Kendall Peterson et al., 2005, p.63). Fig. 1 shows the position of feet for our subject when standing, according to the indications given in the previously mentioned work. Testing is done on a rectangular area graded with angles on both sides of the median axis, marking the place where to put the heels at a distance of 8 cm (Kendall Peterson et al., 2005, p.87). The initial assessment was carried out in January 2015, and the final one in March 2016. The comparison between the two positions reveals an improved posture of the feet. Initially, the opening between the tiptoes was smaller than 20 degrees, but subsequently it has returned to normal limits.

![Initial assessment](image1.png) ![Final assessment](image2.png)

Fig.1. Assessment of the position of feet in standing

The results from Roland-Morris questionnaire, shown in Table 1, reveal visible differences between the initial and final testing of the two body areas for which the pain assessment has been done.

<table>
<thead>
<tr>
<th>No.</th>
<th>Items</th>
<th>LUMBAR</th>
<th>HIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I stay at home most of the time because of my low back/hip pain.</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2.</td>
<td>I change my position frequently to try to alleviate my low back/hip</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>pain.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>I walk more slowly than usual because of my low back/hip pain.</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>4.</td>
<td>My low back/hip pain hinders me to do the jobs that I usually do around the house.</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>5.</td>
<td>Because of my low back/hip pain, I use a handrail to get upstairs.</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>6.</td>
<td>My low back/hip pain often leads me to lie down to rest.</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>7.</td>
<td>Because of my low back/hip pain, I have to hold on to something to get out of a chair.</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>8.</td>
<td>Because of my low back/hip pain, I try to find other people to do things for me.</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Because of my low back/hip pain, I get dressed more slowly than usual.

Because of my low back/hip pain, I only stand for short periods of time.

My low back/hip pain hinders me to bend and kneel down.

Because of my low back/hip pain, I find it difficult to get out of a chair.

My low back/hip is painful almost all the time.

I find it difficult to turn over in bed because of my low back/hip pain.

Because of my low back/hip pain, my appetite is not very good.

I have trouble putting on my socks (stockings) because of my low back/hip pain.

Because of my low back/hip pain, I only walk short distances.

Because of my low back/hip pain, I find it difficult to get out of a chair.

Because of my low back/hip pain, I sleep less well.

Because of my low back/hip pain, I get dressed with help from someone else.

My low back/hip pain leads me to sit down for most of the day.

Because of my low back/hip pain, I avoid heavy jobs around the house.

Because of my low back/hip pain, I am more irritable and bad tempered with people than usual.

Because of my low back/hip pain, my low back/hip pain leads me to go upstairs more slowly than usual.

Because of my low back/hip pain, I find it difficult to turn over in bed because of my low back/hip pain.

Because of my low back/hip pain, I stay in bed most of the time.

According to the instructions of Roland-Morris questionnaire, the subject was asked to check the assertion appropriate for him, given that pain in the low back or hips makes it difficult to carry out certain activities. The improvement occurred over time is quantified by the percentage analysis of scores, where each Yes response gets 1 point, and each No response gets 0 points. The higher the score the more severe the disability is, and a score > or = 14 indicates a severely disabled person (CNSMF, 2005, pp. 84-85).

In the case of our subject, the initial score for the low back pain was 9, and at the end, 4 (a 5-point improvement), for which it was calculated an improvement of 55.55% (5/9 x 100). For the hip pain, the initial score was 15, emphasizing a severe condition. In the final testing, it was recorded a score of 4 points, representing an improvement by 11 points equivalent to an improvement of 73.33% (11/15 x 100).

Discussions and conclusions

Analyzing the data obtained from the questionnaire responses, corroborated with the information mentioned in the observation sheet of the subject, we can find improvements in his movement ability, accompanied by decreased painful symptoms, a better quality of support, posture, gait, and also an increased joint mobility at the hip level.

According to the literature data, all muscle imbalances lead to the onset of osteoarticular dysfunctions, with consequences on posture, affecting both the support and locomotion (Cordun, 2009, p. 187). The causes of hip dysfunctions are due to asymmetries in the muscle tone, joint exertion, poor postural attitude, functional disorder (Centrul de Yumeiho, 2016). These issues were also highlighted in the case of our subject, and the results of completing the exercise programme on Pilates apparatus have proven their efficiency. This confirms the recommendations of literature referring to the benefits of using Pilates method (Tache, 2011a). We believe that such results are rendered possible by the special opportunities of working in a very controlled way and in conditions of symmetry, due to the construction of apparatus and the offer in exercises performed in the lying position, which develop the stabilizing muscles of torso and lower limbs, without creating tensions in the affected areas, namely the lumbar and coxofemoral ones.

Postural imbalances influence the support base, an aspect found in our subject at the beginning of the preparation programme, when his tiptoes were oriented inward. Regaining the almost normal position of the foot influences thus the stability and mobility of the hips (Cordun, 2009, p. 191; Kendall Peterson et al., 2005, p.63). Consequently, improving this aspect was one of the objectives of the exercises used.

In conclusion, we can assert that:
The results obtained with our subject allow us to consider that exercises using Pilates equipment can represent a viable and efficient option, with real benefits on improving some osteoarticular disorders, such as coxarthrosis.

Due to its construction and various possibilities of using the accessories, Pilates equipment provides individualized kinetic programmes. They can slow down the disease progression, improving functionality of the locomotor apparatus, in parallel with reducing painful symptoms, which create discomfort, fatigue and reduce the state of wellbeing.

We consider that for our subject the exercises using Pilates equipment are beneficial for improving coxarthrosis condition in the stages where surgical intervention is not recommended.

Acknowledgements

Our thanks to the subject who agreed to participate in the study and also the SHAPE ART PILATES Studio that provided the necessary conditions to develop the preparation programme on Pilates equipment.

References


RESEARCH WITH REGARDS ON THE IMPORTANCE OF PHYSICAL PREPARATION FOR THE DISCIPLINE 10M AIR RIFLE MEN, AT THE EUROPEAN LEVEL

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Abstract. Shooting is a discipline in which notable results have been achieved in both national and international competitions, the performance being driven by a series of factors, among which, lately, the physical factor stands out. The 10m air rifle event, 60 shots, is an event in the competition calendar of the International Shooting Sport Federation (ISSF) ever since 1966, when the first World Championship Wiesbaden in Germany took place, and also in the Olympic Games circuit since 1984, in Los Angeles. On top of that, this discipline is also taking place within competitions like the World Championship, the World Championship final, continental championships and other national or international competitions. It is well known the fact that in sport shooting in general, as well as during the 10m air rifle event, the accuracy of the technical elements execution plays an essential role in obtaining exceptional results. These results depend to a large extent on the approach of the physical component in the overall preparation of the athlete. In this regard, our scientific approach aims to highlight the importance of knowing the particularities of the physical component during the preparatory period, specific to the discipline 10m Air Rifle Men, at the European level, as well as the precise ways of implementing it in relation to the other components of training. Once highlighted these aspects, the area of interest will be directed to optimizing the training strategies, with direct implications on performance capacity.

Keywords: shooting sport, rifle, physical training.

Introduction

Sports performance is defined as “a bio-psycho-social value achieved in an official competition, as a result of a capacity with multiple determinations and appreciated on the basis of rigorous criteria or scales. It can be a valuable individual or collective result obtained in a sports competition and expressed in absolute figures, considering the official scale system or the place in the ranking. This means both the process and outcome of an action which, in specialized terms, represents craftsmanship, a task accomplished as well as possible, being dependent on the interrelationship of endogenous factors (predispositions, skills) with exogenous (environmental) factors expressed in the quality of training, motor conditions, motricity and influence of social factors”. (Dragnea, 1996, p. 61).

Shooting is a discipline in which notable results have been achieved in both national and international competitions, the performance being driven by a series of factors, among which, lately, the physical factor stands out.

The 10m air rifle event, 60 shots, is an event in the competition calendar of the International Shooting Sport Federation (ISSF) ever since 1966 when the first World Championship Wiesbaden in Germany took place, also in the Olympic Games circuit since 1984, in Los Angeles. On top of that, this discipline is also taking place within competitions like the World Championship, the World Championship final, continental championships and other national or international competitions.

It is well known the fact that in sport shooting in general, as well as during the 10m air rifle event, the accuracy of the technical elements execution plays an essential role in obtaining exceptional results. These results depend to a large extent on the approach of the physical component in the overall preparation of the athlete.

General physical condition “certainly plays a role when shooters reach the higher performance levels, if not before. When two shooters are at the same standard in terms of technique, the fitter of the will have a clear advantage. He will have bigger reserves and stay out of the read for longer. A stronger heart beats more slowly, recovers more quickly and stays closer to its average rate when the shooter is under psychological pressure”. (Reinkemeier, 2015, p. 7)

Materials and methods

The questionnaire was conducted during 2014-2015, in collaboration with Mr. Carbunaru Marian, coach of the Olympic team, sport shooting.

The surveyed people were athletes participating in the following competitions:
- Grand Prix Cyprus: March 2014;
- Grand Prix Sarlposzusta-HUN: May 2014;
- World Cup Munchen – Germany: June 2014;
- World Championships Lonato – Italy: September 2015.

**Objective:** Our scientific approach aims to highlight the importance of knowing the particularities of the physical component during the preparatory period, specific to the discipline 10m Air Rifle Men, at the European level, as well as the precise ways of implementing it in relation to the other components of the training.

**Goals:**
- Theoretical analysis of the literature;
- Preparation of the questionnaire;
- Identification of priority aspects in training athletes at the European level;
- Analysis, processing and interpretation of data using graphs.

**Premise:** The information collected from the specialty literature, in conjunction with interpretation of the results of the questionnaire applied, will highlight the fact that during the preparatory period, the physical component requires a particular approach in comparison with other components of training.

**Research methods**

**Observation method:** through its content and many forms of presentation, observation is one of the most appropriate methods to explore the natural environment. As a scientific method of research, it consists in “tracking deliberately, carefully and methodically the aspects of facts, processes, events and the accurate and systematic recording of their various manifestations, as they behave in natural, normal conditions, in order to present them in their essential aspects in an existing situational context” (Niculescu, 2002, p. 316).

**Questionnaire method**

The questionnaire “represents a logical and psychological succession of written questions or graphical images with stimulation function with regards on the assumptions of the paperwork, which, through the administration of research operators or through self-administration, determines from the investigated person a verbal or non-verbal behavior to be recorded in writing” (Chelcea, 1975, p. 140).

The objective of the questionnaire, as a research tool, is to measure behavioral or attitudinal characteristics of the subjects or to probe them. Analysis of the responses is both quantitative and qualitative. The objectives of this paper depend on the assumptions made and the problem studied.

Subjects’ responses are evaluated by scales. Questions should be clear, precise and understood by the subjects, unambiguously formulated and not suggesting a particular response.

The questionnaire has the following advantages:
- it offers rapidly and easily guiding information of prospective nature, psychosocial echoing and opinion trends;
- inhomogeneity of the sample of respondents is assured through randomization;
- sincerity of responses can be promoted by anonymity;
- it can capture the influence of a systematic (facilitator or disruptive) factor, before the effects are factually visible.

**Statistical method:** a scientific discipline specialized in numerical and graphical study of various phenomena, the statistics involves the collection and sorting of data in any field (social, biological and physical), being able, from numerical expressions and using some calculations, to extract conclusions with regards on the regularities of the domain in question.

Inside the behavioral sciences (psychology, pedagogy, physical education and sports), the statistics features a proper object and appropriate methods dealing with “knowledge of the structural and dynamical behavior of a population (group) in conjunction with the main socio-economic, cultural and medico-biological factors, with the purpose to specify the trends of this fact, according to the educational activity whose effectiveness must be manifested” (Niculescu, 2002, p. 321).
Results

From the questionnaire on the “weight and importance of physical training in sport shooting, sample air rifle 10m, male” during the preparatory period, two questions, namely: “How many days of training per week are allocated for training components?” and “What is the importance of physical training in the general training?”, obtained the following responses:

Table 1. The days allocated for training during one week, for each training component, at the European level

<table>
<thead>
<tr>
<th>Training components</th>
<th>Germany</th>
<th>Italy</th>
<th>Cyprus</th>
<th>Hungary</th>
<th>Serbia</th>
<th>Russia</th>
<th>Romania</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical</td>
<td>3.03</td>
<td>2.90</td>
<td>3.30</td>
<td>2.70</td>
<td>3.17</td>
<td>3.50</td>
<td>1.83</td>
</tr>
<tr>
<td>Technical</td>
<td>4.78</td>
<td>3.93</td>
<td>6.12</td>
<td>4.50</td>
<td>4.08</td>
<td>4.75</td>
<td>4.25</td>
</tr>
<tr>
<td>Psychological</td>
<td>1.97</td>
<td>1.56</td>
<td>2.79</td>
<td>2.03</td>
<td>2.71</td>
<td>2.73</td>
<td>0.70</td>
</tr>
<tr>
<td>Tactical</td>
<td>1.83</td>
<td>1.17</td>
<td>1.73</td>
<td>1.80</td>
<td>1.80</td>
<td>1.77</td>
<td>1.25</td>
</tr>
</tbody>
</table>

Chart 1. Number of days per week allocated for each training component, at the European level

Table 2. Importance of physical training during general training

<table>
<thead>
<tr>
<th>Importance</th>
<th>No. of athletes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very high</td>
<td>Germany: 25</td>
</tr>
<tr>
<td>High</td>
<td>5</td>
</tr>
<tr>
<td>Medium</td>
<td>3</td>
</tr>
<tr>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>No importance</td>
<td></td>
</tr>
</tbody>
</table>
Discussions and conclusions

Within each country included in the study, as shown in Chart 1, we see that the average number of days allocated within a week for technical training of the athletes is two or even three times higher than those allocated to other types of training. The next type of training which is allocated a significant number of days during a week is the physical training. This is followed by the psychological training and after by the tactical one. By countries, Russia and Cyprus have the highest number of days allocated for technical preparation, 3.5 and 3.3 respectively. Days allocated weekly in Romania for physical training of the sportsmen practicing 10m air rifle sample is the lowest, being equal to 1.83 days per week. We note that the number of sportsmen enrolled in this study is equal to 30 within each country.

As can be seen in Chart 2, the biggest importance on physical training in general training is allocated by the athletes from Germany (25 of them give very high importance and 5 of them high importance); these are followed by the athletes from Italy (18 very high, 9 high, 3 medium). Athletes from Romania allocated the lowest importance to physical training in the general training compared to athletes from the other countries surveyed - respectively 8 athletes give high importance, 12 athletes give medium importance and 10 athletes give low importance.

The general conclusion detached from the questionnaire highlights that in the preparatory period, physical training is an important component of training for the surveyed European athletes. Unlike these, the athletes from Romania allocate less time for the physical component, which calls for a different future approach, based on a training methodology adapted to current requirements specific to sample air rifle 10m and specific to the training profile of the shooter.

References

THE IMPORTANCE OF PHYSICAL EXERCISE IN MAINTAINING THE QUALITY OF LIFE IN POSTMENOPAUSAL WOMEN

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Abstract. Menopause is a physiological stage in the natural biological cycle of women that corresponds to the end of ovarian activity, marking the permanent stopping of the menstrual cycle. Diagnosis is retrospective, after a period of 12 months of amenorrhea without the detection of a pathological cause; the biological marker that indicates the onset of menopause is the follicle-stimulating hormone (FSH) with values higher than 40 mU/ml. Physical exercise has an important impact on the whole body, mediated by the endocrine and neuroendocrine system. Physical activity causes a number of stimuli that can induce a cascade of biochemical and hormonal changes. Aging is accompanied by an alteration of the neuroendocrine system response to physical exercise-induced stimuli. Physical exercise has a beneficial effect on carbohydrate, lipid and bone metabolism, on the cardiovascular, nervous and endocrine systems. In early postmenopausal women subjected to moderate physical exercise, an increase of estrogen hormone levels concomitantly with a reduction in the levels of cortisol (a stress response hormone) has been found, which might explain the improvement of neurovegetative symptoms; other hormonal changes are taken into consideration. Given that one third of a woman’s life is spent in menopause, through the magnitude of clinical manifestations (endocrine, somatic and psychological) secondary to estrogen deprivation, this physiological period becomes a real public health problem; physical activity in this critical period is an imperative necessity.

Keywords: menopausal women, lifestyle, physical activity.

Introduction

Menopause is a physiological process in the life of women, a stage in which many endocrine, somatic, metabolic and psychological changes occur due to cessation of ovarian follicular activity. The onset of menopause is between 40 and 55 years; diagnosis is retrospective, after 12 months of amenorrhea without detection of a pathological cause; menopause is associated with an increase of follicle-stimulating hormone (FSH) and a reduction of estradiol (E₂) (Kim et al., 2015). As a result of the increase of the mean life expectancy, about a third of a woman’s life is spent in menopause. Although menopause is not a disease, but only a stage in life, due to estrogen deprivation many clinical metabolic disorders can unfortunately develop, which are sometimes severe.

Over the past 20 years, many clinical or experimental (animal) model studies have demonstrated the protective metabolic and organic action of ovarian steroids. The significant reduction of these hormones in the postmenopausal period makes women particularly vulnerable to cardiovascular diseases, neuropsychic dysfunctions, neurodegenerative diseases – Alzheimer’s disease, osteoporosis, metabolic diseases (dyslipidemia, diabetes mellitus, hepatic steatosis), musculoskeletal alterations, immune dysfunctions (Turgeon et al., 2006).

Hormone therapy (HT) with estrogen might prevent or improve certain symptoms. Many studies have shown the risk of HT for breast and uterine cancer and thromboembolic accidents. As a result, HT indications have been significantly reduced. Thus, the use of alternative therapeutic means with an impact on the complex of clinical metabolic disorders is required. The change of lifestyle, if needed, physical exercise and diet are effective means that allow women to have a normal and balanced life in the postmenopausal period (Spangenberg et al., 2012).

Our review focuses on three major clinical biochemical aspects in postmenopause, correlated with the hormonal profile: neuropsychic dysfunctions, adipose tissue/metabolic disorders, and osteoporosis. The importance of lifestyle change, particularly the role of physical exercise as a HT alternative or associated therapy in improving postmenopausal disorders that significantly affect the women’s quality of life is discussed.

From an endocrine point of view, some explanations of the terms used in this review are required. Menopause represents the last physiological endometrial bleeding episode as a result of ovarian follicle exhaustion. Postmenopause follows menopause; early postmenopause refers to the first four years after menopause, and late postmenopause lasts until the age of 70, when senescence begins. In this review, the term “menopause” refers in fact to the postmenopausal period (Lencu, 2009). The hormonal spectrum of this period is characterized by an increase of plasma gonadotropins – FSH and LH and a decrease of gonadal estrogen and progesterone. In postmenopause, the source of estrogen hormones is extraglandular, adipose tissue having an important contribution.
Topic addressed

Neuropsychic dysfunctions due to the reduction of estrogen levels in postmenopause

Over the past decades, many clinical, laboratory animal and cell culture studies have demonstrated the role of ovarian steroids in the normal development of central nervous system functions and structures (Turgeon et al., 2006). Estradiol (E₂) is involved in the maintenance of normal neuronal morphometry, synapse formation and function, morph functional relations between neurons, astrocytes and microglia (Toran-Allerand, 2005; Garcia-Segura & McCarthy, 2004).

Experimental model studies support the concept of E₂ as a neuroprotective factor against numerous aggressions that can induce cell death: hypoxia, neurotoxic drugs, cerebral contusion, mitochondrial function inhibition, suppression of glucose metabolism, alteration of nitric oxide (NO) production, following substances such as β amylloid-peptides (Rusa et al., 1999; Pike, 1999). Estrogens reduce the effects of oxidative stress by antioxidant action and lipid peroxidation inhibition (Vedder et al., 1999).

A number of randomized clinical trials using HT in postmenopause have demonstrated an improvement of verbal memory and global cognitive function.

The complex actions of estrogen hormones in the central nervous system are solid arguments for understanding the development of neuropsychic manifestations as a result of estrogen deprivation in the postmenopausal period.

The most frequent psychic symptoms in this stage of life are: irritability, headaches, insomnia, memory disorders, lack of mental concentration, crying episodes, depression, anxiety, reduced sexual impulse, dyspareunia, feelings of alienation (Bauld & Brown, 2009; Costin, 2001). The presence of these phenomena depends on several predisposing factors: marked emotional lability due to life project failure, loss of previous femininity and attractiveness, loss of youthful appearance, a feeling of getting old, lack of warmth and affection from the partner. Women affected by depression in the postmenopausal period have several characteristic predispositions: hyper-conscientiousness, rigid behavior, perfectionism, disadaptation and nervousness in human relationships, which will lead to alienation from the self and others (Lencu, 2009).

Sleep disorders are estimated in 40-60% of postmenopausal women. Deterioration of sleep consists of the prolongation of the falling asleep phase, frequent disruptions of the sleep-wake cycle, and reduced sleep depth. The consequences of insomnia include: fatigue, irritability and a diminution of intellectual performance.

In a study on 60 early postmenopausal women aged between 41 and 55 years, we monitored cognitive-affective disorders and depressive manifestations using a self-assessment depression questionnaire - Beck Depression Inventory (BDI). This is a currently used questionnaire; the classical variant comprises 21 items that are grouped around three factors: self-deprecation with an altered self-image, pessimism and loss of vitality. The intensity of depression is evaluated by assessing four components: behavioral, cognitive, affective and physiological. According to the score, 80% of women showed depression symptoms, the majority having mild-moderate depression. Concomitantly, oxidative stress parameters (serum lipoperoxides, free malondialdehyde and protein carbonyls) were evaluated. A positive correlation was found between the degree of depression and the level of oxidative stress parameters (Lencu, 2009; Lencu et al., 2009). Similar results were obtained for anxiety. The self-assessment Spielberger-STAI (State-Trait-Anxiety Inventory) questionnaire was used, which correlated positively with the level of E₂, cortisolemia and oxidative stress parameters (Lencu, 2009). In an experimental study using ovariectomized female rats placed in an open field environment, we demonstrated motor function decline and emotional disorders compared to control animals (Lencu et al., 2009), arguments for neuropsychic disorders as a result of the reduction of estrogen hormones.

Currently, modern society can no longer afford to dispense with the experience, intelligence and charm of women at this stage of life; on the other hand, women must overcome their overwhelming psycho-hormonal problems. With or without HT indication, physical exercise and the avoidance of a sedentary lifestyle become useful therapeutic means with complex benefits.

Metabolic and adipose tissue changes in postmenopause

The progressive reduction of estrogen hormones in the menopausal transition and postmenopausal period induces significant changes in lipid parameters with an atherogenic role: hypercholesterolemia, reduction of high density lipoprotein (HDL), increase of triglycerides and low density lipoprotein (LDL). This lipid profile develops rapidly, as early as after three months of amenorrhea (Jensen et al., 1990). However, the most important postmenopausal change is the accumulation of adipose tissue in the central abdominal region – visceral adiposity. The clinical indicator is a waist circumference larger than 88 cm. This is most frequently accompanied by an
increase of the body mass index (BMI) to more than 25 kg/m² on account of subcutaneous fat. The increase of the visceral adiposity mass occurs through an increase in the size of adipose cells. These cellular morphometric changes have metabolic consequences, of which the most important is increased insulin resistance (Spangenberg et al., 2012).

Studies have shown that visceral fat accumulation starts as early as the menopausal transition period, in parallel to a decrease of E₂, being independent of age, total adiposity and BMI (Freeman et al., 2010).

Visceral adiposity is a real endocrine/paracrine organ that secretes many products, adipokines, with metabolic/organic, morphofunctional consequences. In conclusion, visceral adiposity activity is multifunctional and integrative; it has complex consequences on energy homeostasis, lipid metabolism, oxidative processes, inflammation, coagulation, vascular homeostasis (Tchernof et al., 2004). The clinical metabolic consequences are: obesity, increased insulin resistance, dyslipidemia, type 2 diabetes mellitus, cardiovascular disease (CVD), non-alcoholic fatty liver disease (NAFLD), hyperuricemia, bone manifestations (Li et al., 2002), metabolic syndrome (Lau et al., 2005). Metabolic syndrome is a concept that includes: increase of waist circumference ≥ 102 cm in men and ≥ 88 cm in women, reduction of HDL-cholesterol < 40 mg/dl in men and < 50 mg/dl in women, arterial hypertension > 135/85 mmHg, type 2 diabetes mellitus, glycaemia ≥ 110 mg/dl or alteration of glucose tolerance, NAFLD and hyperuricemia. NAFLD is defined as an accumulation of fat, mainly triglycerides, in hepatic cells > 5% of the liver’s weight; it is the most frequent chronic liver disease in Western European countries and USA (Niederau, 2014; Malinowski et al., 2013). Women in the menopausal transition and postmenopausal period have, through hormonal disorders and diminished metabolism, an additional risk to develop overweight/obesity compared to the general population. The risk for cardiometabolic diseases is very high (Zargarian et al., 2014; Sayón-Orea et al., 2014).

The incidence of mortality from cardiovascular diseases in women after the age of 50 is increased, becoming identical to incidence in men (Lloyd-Jones et al., 2010). The association of an inadequate lifestyle (a hypercaloric diet, sedentary behavior) will aggravate the disease evolution towards serious complications that will reduce life expectancy.

**Osteoporosis – a postmenopausal metabolic bone disease**

Osteoporosis consists of a bone mass diminution with an increase of bone vulnerability and fracture risk. The causes of the disease are numerous. The highest incidence of osteoporosis is found starting with the menopausal transition period, increasing at older age, when the risk of hip, vertebral body, humerus and distal radius fractures rises to 50% (Li et al., 2002).

The main mechanisms that play a role in the development of postmenopausal osteoporosis are a decrease of serum estrogen levels, which causes an imbalance between bone resorption and formation, consequently an increase of bone turnover, a decrease of vitamin D concentration, a decrease of calcium absorption, a reduction of bone formation through a decrease of somatomedins. Additional risk factors can be associated – age over 40, excessive alcohol and coffee consumption, smoking, a sedentary lifestyle, immobilization, an imbalanced diet, associated diseases – hyperparathyroidism and thyrotoxicosis, glucocorticoid treatment, genetic factors.

**Treatment**

Therapeutic principles refer to a change of lifestyle, if needed, associated with pharmacological treatment.

**Lifestyle change.** A unanimously accepted measure, it represents the first-line treatment in the complex clinical metabolic and psychosocial disorders that may occur in postmenopause. Weight loss, diet, avoidance of a sedentary lifestyle and physical exercise are involved.

Some women establish their own strategies to change their lifestyle: a diet mainly based on vegetals and/or participation in a program of group relaxation exercises and techniques (Nayak et al., 2014). Studies have demonstrated favorable results of yoga exercises in neuroendocrine system disorders under stress conditions. After 6-12 months of yoga exercises, a reduction of depression and stress response, an increase of the quality of life, weight loss, an improvement of cardiovascular function and diabetes mellitus were found (Corey et al., 2014).

**Weight loss.** The major objective of lifestyle change is weight loss. This is achieved by diet, physical exercises adapted to weight and associated diseases, pharmacological therapy and bariatric surgery. Weight loss is indicated when BMI is > 25 kg/m² or in case of a waist circumference exceeding the admissible values. Weight loss should be progressive, without exceeding 1.6 kg/week (Neuschwander-Tetri & Caldwell, 2003); otherwise, hepatic lesions may occur. A 5-10% weight loss in 6-12 months, as recommended by guidelines (European Association for the Study of the Liver – EASL, American Gastroenterological Association – AGA, Chinese Liver Disease
Discobolus – Physical Education, Sport and Kinetotherapy Journal Vol. XII, no. 4 (46), 2016

Association – CLDA (Malinowski et al., 2013; Nascimbeni et al., 2013; Chalasani et al., 2012), determines an improvement of cardiometabolic risk factors (IR, dyslipidemia, arterial hypertension, type 2 diabetes mellitus), hepatic lesions in non-alcoholic steatohepatitis (NASH), depression and anxiety, and increases self-confidence due to a more pleasant physical appearance. Medical monitoring of weight loss is mandatory.

Pharmacological treatment with orlistat (a lipase inhibitor) for weight loss has limited indications because of subsequent side effects (Neuschwander-Tetri & Caldwell, 2003; Chalasani et al., 2012).

Bariatric surgery as a weight loss means is recommended in severe/morbid obesity (Neuschwander-Tetri & Caldwell, 2003).

Liposuction or the surgical removal of excessive adipose tissue does not influence metabolic parameters (IR, lipids) and cardiovascular risk (Klein et al., 2004).

Diet. There is no special diet. This is adapted to cardiometabolic syndrome and obesity. The qualitative directions of diet recommended by guidelines (EASL, AGA, CLDA, IASL – Italian Association Study of the Liver) are: reduction of carbohydrates and saturated fats, elimination of fructose-rich juices (fructose increases insulin secretion), increased consumption of fiber-rich, antioxidant-rich foods (fruit, vegetables) and polyunsaturated fat-rich foods (fish) (Neuschwander-Tetri & Caldwell, 2003). Diet in case of overweight/obesity should be hypocaloric. Initially, 1200 kcal/day are indicated, and if inefficient, this value is changed to 600-800 kcal/day. Chinese guidelines (CLDA) recommend 500-1000 kcal/day from the beginning (Nascimbeni et al., 2013).

A diet variant would be the Mediterranean diet, which demonstrated benefits for cardiac health and improved insulin resistance and metabolic syndrome (Runawas et al., 2009).

Physical activity. Many multicenter studies on randomized trials have demonstrated multiple benefits of physical activity for postmenopausal women: prevention and reduction of the risk for metabolic syndrome, obesity, cardiovascular diseases, breast cancer, osteoporosis, some physical symptoms and psychosocial manifestations (depression, anxiety, cognitive-affective disorders), which leads to an increase of the quality of life (McTiernan et al., 2003; McAndrew et al., 2009; Slaven & Lee, 1997). Hypothetical biological, psychosocial and psychological mechanisms by which physical exercise would influence menopause-associated symptoms are suggested. During exercise, hypothalamic and peripheral production of beta-endorphins increases, which leads to a positive emotional state, and the stabilization of the thermoregulatory center results in a reduction of risk for vasomotor manifestations. Physical exercise may provide distraction from daily stress, improving mental health status. During menopause, due to weight gain, women may have an unfavorable opinion about their own body, but physical exercise can create a positive feedback regarding the morphofunctional improvement of the body (Daley et al., 2010, p. 4108).

Physical activity and quality of life. In the menopause transition period and later, concomitantly with hormonal changes, the development of physical and psychological symptoms, weight gain, associated disorders, a sedentary lifestyle and reduced physical activity affect health and quality of life (Mendoza et al., 2016). Many studies have demonstrated the need of a “healthy life plan”, which includes a healthy diet, regular physical exercise (physical exercise programs are most of the time abandoned in menopause), an active family and social life. A study in women aged 40–65 years, who were enrolled in training sessions including warming-up exercises, walking, stretching, strengthening exercises with an elastic band and cooling down exercises, 60 minutes 3 times a week for 12 weeks, reported an obvious improvement of vitality and mental health (Dabrowska et al., 2016). In another study including more than 2000 women aged over 49 years, 3 variables of quality of life were analyzed: anxiety/depression, somatic symptoms, memory/concentration based on a questionnaire; an increase of quality of life was found through an improvement of symptoms in subjects with moderate physical activity – 2 hours and 30 minutes per week or intense physical activity – 1 hour and 15 minutes per week, distributed over several days (Mansikkamäki et al., 2015).

Physical activity and mood stress / control and sleep quality. Moderate physical activity is sufficient to reduce psychosocial symptoms and phenomena in the postmenopausal period (Kim et al., 2014). Physical activity improves mental health, gives meaning to life; women are more optimistic and sometimes perceive exercise as an entertainment, an opportunity to socialize.

Regular exercise diminishes depression and reduces stress impact. Secretion of beta-endorphins during vigorous exercise can induce a state of relaxation.

Insomnia can be significantly improved under mental relaxation conditions and after physical fatigue as a result of physical exercise (Huston & Lanka, 2001).
Physical activity and changes in body size and composition / weight control. A number of controlled randomized studies in patients with NAFLD and obesity found that hypocaloric diet alone (11 weeks) had a small effect on weight loss, but diet associated with physical exercise for 24-48 weeks induced an 8-10% weight loss and significantly improved liver function (Lomonaco et al., 2013). EASL guidelines recommend moderate physical activity 150 min/week associated with vigorous exercise 75 min/week for weight loss and improved liver function; CLDA guidelines recommend aerobic exercises 5 times a week amounting to 150 min for metabolic and liver function improvement (Nascimbeni et al., 2013).

Recent studies have demonstrated the effect of intense intermittent physical exercise on β2-adrenergic receptors, which mediate lipolysis in subcutaneous and abdominal adipose tissue under the control of catecholamines, inducing weight loss, as well as β-endorphin release, with beneficial effects in anxiety (Zouhal et al., 2013).

Women who are active during the premenopausal period and have a normal BMI and reduced central adiposity are at an advantage in the postmenopausal period. For maintaining a good health status, moderate-intense physical activity for 150 minutes per week is recommended (Sternfeld & Dugan, 2011).

Physical activity, bone density, sarcopenia and pain. Regular physical exercise is one of the most effective methods to strengthen and maintain musculoskeletal system health; it is a way to reduce bone mass loss and prevent postmenopausal fractures. Studies demonstrate that regular physical activity by walking, running or resistance exercises, with the avoidance of sedentary behavior, prevents osteoporosis (Morseth et al., 2010).

The prevalence of sarcopenia in postmenopausal women is 10-40%. A progressive resistance exercise program increases muscle mass, improves balance, flexibility and physical function. The most successful strategy is a combination of balance training and aerobic exercise (Anek & Bunyaratavej, 2015).

Recently, another type of physical exercise has become popular - Pilates, whose benefit is seen in the balance/fall relationship (Cruz-Diaz et al., 2015). Step training and whole-body vibration training are other methods used to improve muscle function. Physical exercise improves fibromyalgic and osteoarticular pain by decreasing pain perception.

Physical activity and cardiovascular diseases. In cardiovascular disease, physical exercise reduces risk factors: it decreases blood pressure, improves the lipid profile (reduction of total cholesterol, LDL and triglycerides – independent risk factors for women, and elevation of HDL levels), decreases thrombotic risk by reducing platelet adhesion and increasing fibrinolytic factors, improves carbohydrate metabolism, lowers insulin levels, ameliorates myocardial function (Reichman, 1996).

Aerobic and strength physical activity may partially or completely normalize lipid profile, oxidative and inflammatory processes and reduce adipose tissue.

Physical activity and intestinal function. Functional intestinal disorders, specifically constipation is significantly improved by a daily program of exercises. There are studies demonstrating that daily physical activity improves digestion and nutrient absorption (Huston & Lanka, 2001).

Physical activity and brain. Complex physical activity that protects the central nervous system can include aerobic dancing, racquet sports and swimming (Huston and Lanka, 2001).

Examples of different intensities of exercise and physical activity: moderate intensity: badminton, brisk walking (3-4.5 miles/h), cycling, dancing (ballroom, line and disco), gardening, golf, horse riding, house work, stair climbing, tennis (doubles), yoga; vigorous intensity: brisk stair climbing, competitive sports and games (basketball, football and squash), fast cycling, fast swimming, karate, running/jogging, step aerobics, tennis (singles) (Daley et al., 2010, p. 4107).

Types of physical exercise recommended for postmenopausal women

The recommendations of the American Heart Association (AHA) and American College of Sports Medicine (ACSM) comprise 4 types of physical exercises (PE).

1. Aerobic PE (walking, swimming, tennis, dancing and cycling); they involve the cardiac and respiratory systems, as well as multiple muscle groups.

   AHA and ACSM indicate moderate aerobic exercise for at least 30 minutes, 5 days per week, or vigorous activity for at least 20 minutes, 3 times per week.

2. Muscle strengthening exercises; many muscle groups are involved: abdominal, upper and lower limbs, shoulders; increase of bone density, weight control, protection of tendons and joints; they are recommended for at least 2 non-consecutive days per week, each exercise being repeated 0 to 15 times.
3. Stretching exercises; they increase flexibility and improve posture; they are indicated for at least 20 seconds.

4. Flexibility workouts - daily; balance workouts improve stability and decrease the risk of fall.

Recently, Pilates, Taichi and Yoga exercises have been indicated. Their benefits are important: they do not overstrain the cardiovascular system and improve flexibility, balance, psychological manifestations and pain.

Regular physical activity initiated in the premenopausal period can reduce mortality by 44%, myocardial infarction by 50% (Necula & Costin, 2015), breast cancer by 50% and genital cancer by 60% (Frischet al., 1987).

Physical activity should be oriented towards cardiovascular fitness, weight control, muscular strength, flexibility improvement, for good coordination and balance, prevention of osteoporosis and improvement of brain functions (Necula & Costin, 2015).

In general, fitness experts recommend aerobic conditioning, muscle strengthening and flexibility exercises for 30-60 min, 3-4 times a week (Pollack & Froelicher, 1990). Physical exercises can also be performed daily for 30 min, divided into segments of 8-10 min.

Physical exercise recommendations are individualized depending on age, cardiometabolic pathology, the previous active or sedentary lifestyle. In general, regularly scheduled physical activity should be complex, pleasant, including walking, running, aerobic dancing, racquet sports, swimming, cycling. Physical exercise and diet are indicated after a medical cardiorespiratory, renal, neurological and biochemical evaluation, and monitoring by qualified persons is mandatory.

Replacement pharmacological treatment. It has precise indications and is limited by side effects.

Conclusions

1. Postmenopause, a vulnerable period in the life of women, requires, due to psychosomatic changes that may occur, periodic follow-up, with the recommendation of healthy life principles, for the prolongation of life expectancy in physical and mental comfort.

2. A balanced diet, adapted to weight and associated diseases, along with strictly monitored physical activity in various forms, with the avoidance of a sedentary lifestyle and other harmful factors – smoking and excessive alcohol consumption, are essential to a healthy life.

3. The types of recommended exercises are: aerobic, muscle strengthening, stretching exercises and flexibility workouts; they are recommended for 30-60 minutes, 3-4 times per week.

4. Physical activity in postmenopausal women is differentiated depending on age, weight, comorbidities.

5. The benefits of physical exercise in postmenopausal women are related to an increase of quality of life, a reduction of cardiovascular risk, an improvement of metabolic syndrome, osteoarticular pathology, vitality and cognitive emotional manifestations.

References


ALGORITHMIC PROGRAM – SUPPORT IN LEARNING OF “DANILOVA FORWARD” ON BEAM

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Abstract. Objectives: The objective of this paper is to increase the learning efficiency of “Free (aerial) walkover forward, landing on one foot” on beam by exploiting gymnasts internal factors of performance and shortening the assimilation time of technical elements using algorithmic programs. Methods of research: Experimental research involves the selection and adjustment of the most efficient means for specific physical and technical training required in learning “Free (aerial) walkover forward, landing on one foot” on beam. I also bring evidence to evaluate in an objective and gradual manner the technical preparation of gymnasts through all three series of algorithmic program. Results: I find significant and consistent differences between gymnasts execution in initial testing relative to final testing. This implies that learning of any elements should be based on algorithmic program to ensure the perfect execution. Conclusions: The difference between the performance of the two groups of gymnasts in executing “Free (aerial) walkover forward, landing on one foot” on beam indicates that the proposed objective has been achieved. The results obtained by the two tested groups of gymnasts have shown that algorithmic program that I have created makes a huge difference in performance score, difference which can mean an Olympic medal.

Keywords: algorithmic program, Danilova forward, beam.

Introduction

In artistic gymnastics, performance is assessed using athletes’ results in competitions (Côté et al., 1995). Consequently, particular attention should be given to the elements that determine better placement in final standings. Specifically, I refer to the components of training as part of the development process – adaptation, learning, improvement in the physical, psychological, artistic, technical, functional levels reached at some point (Bompa, 1994).

The performance behavior depends on showing the structure in its forms and the nature and characteristics of the stimulus that causes it. Moreover, it also encompasses the peculiarities of the gymnasts. Further, performance ability, as a result of complex processes of preparation based on internal factors (skills, attitudes, characteristics of functional activity and body structure) and external factors (ambiance, the reference to the natural environment, technical-material and social) are assessed in competition based on rigorous criteria established and known in advance (Ping, 1992).

Research hypothesis. In any branch of sports the quality of the learning process influences performance and using an algorithmic program based on the organization of the three series of exercises in the period of learning may lead to a faster and more accurate learning of “Danilova forward” on balance beam.

Materials and methods

In my research, I used 12 gymnasts as subjects with aged between 11 and 13 years. They were divided into two groups, 6 of them were the first group who learned “Danilova forward” without algorithmic program and the other 6 were the second group learned “Danilova forward” based on algorithmic program. Both groups of gymnasts were part of junior national team in Onesti and the research was held during one month.

Apparatus and materials. For the balance beam apparatus, the gymnast will focus primarily on a schematic exercise to the balance beam. I also bring evidence to evaluate in an objective and gradual manner the technical preparation of gymnasts through all three series of algorithmic program. Results: I find significant and consistent differences between gymnasts execution in initial testing relative to final testing. This implies that learning of any elements should be based on algorithmic program to ensure the perfect execution. Conclusions: The difference between the performance of the two groups of gymnasts in executing “Free (aerial) walkover forward, landing on one foot” on beam indicates that the proposed objective has been achieved. The results obtained by the two tested groups of gymnasts have shown that algorithmic program that I have created makes a huge difference in performance score, difference which can mean an Olympic medal.

Keywords: algorithmic program, Danilova forward, beam.
choose the basic variant (the one shown by us) with landing on one foot, or landing on both feet. According to the FIG Code of Points (2008), the element has the D value, which means a score of 0.40 points.

Rational training at this apparatus requires learning the technique as right from the beginning and to educate the sense of balance. The exercises of the competition must contain combinations of elements of static and dynamic force that achieves a reasonable balance of forces in time and space, but also elements of suppleness, flexibility and balance, resulting from the effect of conjugate plasticity, expressiveness and harmony of movement (Vieru, 1997).

Evaluation of the content elements that are specific sports training, are presented as a system of structured assessment types with internal logic (Dragnea, 1996). For progress in gymnastics, good conditioning is prerequisite, but to prepare a good conditioning program is important to know how a muscle works, what motor abilities are important for learning of the elements and with what means we can measure and develop important motor abilities.

Procedure

In sports activities, learning is generally called “motor learning”, resulting in the development of skills based on sensory, kinesthetic and proprioceptive components; the end of a movement is the signal that triggers the next movement (Niculescu, 2003). The learning process in general and the motor learning in particular, may not be effective if the gymnast does not have the physical necessary support, is not self-reliant during motor action and did not win sufficient coordination in his movements. There is a strong interdependence between them and any of the motor skills cannot be developed independently of others (Predescu, 2011).

To choose the most efficient means for providing physical support in learning of “Danilova forward” on balance beam, I focus on the principles of choice of phasic structure of elements. We specify that helpful methods are connected to the formation of motor skills, while preparatory means are connected especially to the development of motor skills.

As the basis of means and methods stands the algorithmic program, which is divided into three series of exercises (Popescu, 2007): 1. to provide physical support; 2. for learning; 3. for the improvement of “Danilova forward”

First:
1. Helpful means should have a similar structure with the basic structure of the exercise.
2. The choice of exercises must take into account not only the structure of muscles request but also to the efforts that occur in the overall system. We should have in view the changes of these phases (preparation phase, the phase of maximum effort, strain decline phase) at different times of movement.
3. The exercises should be arranged in the work plan in order of increasing intensity, coordination and muscular effort.

Algorithmic program for learning of “Danilova forward”

In the next lines, I will present the algorithmic program on three series (Stroescu, 2014).

SERIES I – exercises aimed at developing quantitative and qualitative muscle groups involved in Danilova execution.

• Exercise number 1

Initial position: Standing with the face oriented at fixed scale, trunk bent forward, arms up, grabbed strip:
1. rocking back left (right) foot, in high speed, with return to starting position

Purpose: development of back muscles;
    development of femoral biceps muscle;
    coxofemoral increasing mobility;
    building on the movement of trigger rotation.

• Exercise number 2

Initial position: Standing with trunk bent forward, palms on ground:
1. rocking back left (right) foot (panche) with return to starting position

Purpose: development of femoral biceps muscle;
    coxofemoral increasing mobility;
    building on the movement of trigger rotation.
Exercise number 3
Initial position: Standing with the face oriented at fixed scale, arms forward, the strip from the shoulders grabbed, left leg raised back to 90°:
1. high jumps on the right foot
*Purpose:* development of back muscles; development of lower limb muscles; pushing knowledge linked to the outbreak rotation.

Exercise number 4
Initial position: Hanging with face at fixed scale
1. trunk extension with lifting legs back and return
*Purpose:* development of back muscles

Exercise number 5
Initial position: Lying facial on the coffer gym, feet outside casing:
1. return to starting position.
*Purpose:* back muscle development

Exercise number 6
Initial position: Lying face down with arms up:
1. extension of the trunk with the simultaneous lifting of the arms and legs, with return
*Purpose:* back muscle development; increasing spine mobility.

Exercise number 7
Initial position: Standing with arms up:
1. lifting the right foot forward at 90° and maintain 10 seconds;
2. return to starting position.
*Purpose:* development of lower limb muscles; abdominal muscle development; developing balance; acquiring the final position of the Danilova forward.

Exercise number 8
Initial position: Standing with arms up and with the right foot maintain forward at 90°:
1. trunk extension with crossing in bridge and the right leg raised to vertical;
2. return to starting position.
*Purpose:* development of lower limb muscles; developing balance; increasing spine mobility.

Exercise number 9
Initial position: Stand on left foot with right foot forward with the support on fingertips and arms up:
1. 5 front walkover, one after the other, executed on a line on the ground;
2. 5 front walkover, finishing with right foot maintain forward, one after the other, executed on a line on the ground.
*Purpose:* developing balance; space-temporal orientation recognition; knowledge movement of forward rotation.
• Exercise number 11
Initial position: Standing with arms maintain forward:
1. squat with high jumps
*Purpose:* development of lower limb muscles;
increasing the strength and the speed.
• Exercise number 12
Initial position: Standing with the face oriented at fixed scale on the third strip, the strip from the shoulders grabbed:
1. lifting tiptoes;
2. return with more pressing heels down.
*Purpose:* lower leg muscle development

**SERIES II** — aims at the full learning of “Free (aerial) forward walkover, landing on one foot” (Forward Danilova) on beam.

• Exercise number 1
Handspring forward with flight to land on one leg, executed on a line on the ground
• Exercise number 2
Danilova forward with help from coach, executed on a line on the ground
• Exercise number 3
Danilova forward, executed on a line on the ground
• Exercise number 4
Danilova forward with help from coach on gymnastics bench
• Exercise number 5
Danilova forward on gymnastics bench
• Exercise number 6
Danilova forward with help from coach on low beam (30 cm)
• Exercise number 7
Danilova forward on low beam (30 cm)
• Exercise number 8
Danilova forward with help from coach on high beam with mattresses to beam level
• Exercise number 9
Danilova forward on high beam with mattresses to beam level
• Exercise number 10
Danilova forward with one mattress on beam and another one under beam
• Exercise number 11
Danilova forward with help from coach with one mattress under beam
• Exercise number 12
Danilova forward with one mattress under beam
• Exercise number 13
Danilova forward with help from coach and without mattress under beam (competition conditions)
• Exercise number 14
Danilova forward on high beam (competition conditions)

**SERIES III** — aims at improving “Free (aerial) forward walkover, landing on one foot” (Forward Danilova) on beam.

• Exercise number 1
Danilova forward in combination with forward walkover
• Exercise number 2
Free cartwheel in combination with Danilova forward
• Exercise number 3
Danilova forward in combination with free cartwheel
• Exercise number 4
Danilova forward in combination with forward salto tucked landing on one side
• Exercise number 5
Danilova forward in combination with flic-flac backward
- Exercise number 6
Danilova forward in combination with two flic-flac backward
- Exercise number 7
Danilova forward in combination with flic-flac backward and salto backward landing on one foot
- Exercise number 8
Cloche in combination with Danilova forward
- Exercise number 9
Including in full exercise the Danilova forward in combination with one or more acrobatic or artistic elements

Results

The first group it is represented by 6 gymnasts who learned “Danilova forward” without algorithmic program, and the second group by the other 6 gymnasts, who learned “Danilova forward” based on algorithmic program. The differences between the two groups are shown in Table 1.

Table 1. The differences between the two groups

<table>
<thead>
<tr>
<th>First group Penalty execution</th>
<th>Second group Penalty execution</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.40</td>
<td>0.05</td>
</tr>
<tr>
<td>0.40</td>
<td>0.15</td>
</tr>
<tr>
<td>0.50</td>
<td>0.20</td>
</tr>
<tr>
<td>0.55</td>
<td>0.25</td>
</tr>
<tr>
<td>0.60</td>
<td>0.30</td>
</tr>
<tr>
<td>0.65</td>
<td>0.35</td>
</tr>
</tbody>
</table>

Table 2. Mathematical indices

<table>
<thead>
<tr>
<th>No.</th>
<th>The calculated Indicator</th>
<th>First group</th>
<th>Second group</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Arithmetic mean</td>
<td>0.52</td>
<td>0.22</td>
</tr>
<tr>
<td>2</td>
<td>Standard deviation</td>
<td>0.10</td>
<td>0.11</td>
</tr>
<tr>
<td>3</td>
<td>Coefficient of variation</td>
<td>0.19</td>
<td>0.05</td>
</tr>
<tr>
<td>4</td>
<td>Correlation coefficient</td>
<td>-0.96</td>
<td>-0.94</td>
</tr>
</tbody>
</table>

Discussions and conclusions

Research and practice show that the effectiveness of learning complex gymnastic elements increases if the phasic structure of elements is checked during the process of technical training. Consistent with these elements, periods of movement, with or without support, in the technical structure of gymnastics exercises can be identified. An important step in the initial technical training is the learning of the universal components of basic movements. All acrobatic elements taught under the form of algorithmic programs. By applying this method we put into practice the didactical principles whose observance leads, as we know, to a faster, more accurate learning of motor skills.

By analyzing the differences between performances recorded by the two groups of gymnasts in learning of “Free (aerial) forward walkover, landing on one foot” (Forward Danilova) on beam, we can say that the proposed objective has been achieved. In this case we reject the null hypothesis and accept the research hypothesis that there are significant differences between the two groups of gymnasts.

References


INDIRECT COMMUNICATION IN PHYSICAL EDUCATION

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Abstract. Indirect communication in physical education paper aims to clarify a number of issues relating to how the specific communication process manifests in physical education curriculum. The main benchmark which was the basis of this study is the systematization proposed by the general theory of communication, having as criterion the way the message is transmitted in the communication process. Given the complexity of communication in physical education, we identified the indirect forms of communication and conducted a systematization of them. By this, we tried to highlight how these forms of communication manifest in physical education as a whole. We also consider extremely important to highlight the functional link that is established in the communication specific to physical education between different types and forms of communication and how they are influenced by forms of the indirect communication. Knowledge of specific forms of indirect communication specific for physical education is essential for understanding the phenomenon as a whole and the role of work in training students.

Keywords: indirect communication, physical education, secondary means of communication.

Introduction

Communication is a permanent phenomenon present in human life driven by the need for users to interact both with other individuals and with the environment. This is a complex process of transmission of information through symbols (Dancu, 1999).

In the context of human activities, physical education is an extremely complex social activity that takes place in an organized formal framework. It aims at educating the body, forming motor skills specific to various sports and training the transfer skills to leisure activities (Şerbănoiu, 2004).

Materials and methods

A precise definition of communication is extremely difficult because all attempts bear the imprint of science from which those who have formulated the definition are coming (Bortun, 2002).

In this context, physical education is relatively poor in information on specific communication, probably because of the complexity of the phenomenon and the myriad possibilities of interpretation. But the clarification and understanding of specific aspects of the communication process is the key to understanding the physical education and identifying specific forms of communication established as an extremely important objective (Dina, 2014).

In our action to identify the specific forms of indirect communication, we started from the specific activity in physical education, from the purpose and objectives, all these aspects establishing a number of issues regarding priorities and the communication process.

Thus, physical education is a compulsory subject in the curriculum at primary, secondary and university education. It mainly aims to integrate the school population in various motor activities organized by strict rules, in a formal setting, during the physical education class, with the aim of achieving the general objectives of physical education (Şerbănoiu, 2004).

Overall activity is regulated by the school program (curriculum) and lessons are directed specifically in relation to the themes and objectives of the lesson learned from the annual calendar plan, the main planning document.

Communication elements are represented, in physical education, by the teacher, the classroom and each student as a part of the group who participates in the lesson. Based on the interaction between teacher and students, one can easily deduce that communication is present during the lesson.

Communication mechanism implies a transmitter that sends, on different channels of communication, a message picked up by a receiver (Prutianu, 2005). The messages represent a transformation of information to be transmitted via a large number of symbols, of verbal, nonverbal and paraverbal codes (Dancu, 1999). The physical education teacher is the transmitter that sends a message translated into all domain specific information, and the receiver is the classroom or each student, depending on the lesson context or communication context. Here we refer to lesson topics involving participation in groups that have to solve tasks and themes specific to individual sports which are based on individual actuation. Regarding the context of communication, the execution corrections for students in various exercises are individualized, even if the operation is associated with the group operation.
The types of communication are the result of a process of systematization by different criteria. In relation to the way of transmitting the message, communication can be direct or indirect (Rascanu, 2002). Direct communication uses primary means, and indirect communication uses secondary means (Fiske, 2003).

Starting from the proposed systematization of communication theory, we try a specific gradual approach for physical education, with the materialization of indirect communication means in the particular forms encompassed by the “physical education” phenomenon.

**Results**

Starting from the main forms of indirect communication recommended by the communication theory, we try further identification of ways in which this type of communication is reflected in physical education:

- **Imprinted communication** is materialized at the level of physical education by:
  - The curriculum underlying the organization of work for the entire education system and including all the essential information for each class. Based on the curriculum, all the physical education activities are logically ordered so that there is a functional link between the themes and objectives;
  - Planning documents containing information on activities and important dates:
    - the annual plan - contains information on the operation of all components of the lessons covered during the school year, means in a coded form that constitutes the content of each lesson and the data regarding the partial and final evaluations;
    - annexes of the annual plan - a description containing all the component means filled with presentations and relevant charts so that the level of understanding through the material increases;
    - the lesson plan - contains important information related to the themes and objectives of the lesson, its content in relation to the lesson structure and, where appropriate, it will be supplemented by specific designs;
    - the teacher’s notebook - is an important tool for storing specific information regarding the involvement of pupils in lessons, developments of those in the partial or final evaluations, important observations about student progress in the motor plane, the personality traits and character, attitude towards work and colleagues, how they interact, collaborate, respond to different tasks and how they integrate in various activities.
  - The literature stores a wealth of important information and features such as:
    - books of theory and methodology of physical education and sport and branches from the specific subject area;
    - practical guidelines and methodological guidance for the sports disciplines integrated into the curriculum;
    - magazines that address specific topics from school physical education and school.
  - Information presented in the form of intuitive materials:
    - photos - showing actions or movements that are dealt with in teaching the lesson plan;
    - kinograms - the sequence is an ongoing for the movement that is taught.
  - Printed materials that promote physical education activity:
    - posters - especially those for presentation, promotion and advertising of school sports competitions;
    - newspapers - which, by some articles, promote: specialized activity within schools, school competitions of different levels, activity of some teachers or students with outstanding results in school competitions.

- **Recorded communication** - associated with physical education, it appears as records on magnetic media (voice, video tape) or electronic (CD, card or memory stick, mobile phone):
  - interviews of personalities from school physical education, teachers or students who have distinguished themselves in school sports competitions;
  - speeches on specialized topics of personalities in the field in training courses;
  - filming the actions or movements covered by the topics of the lesson, the school competitions or the actions of students in school sports competitions.

- **Wire communication**, used for information purposes or the transmission of information on organizes school physical education or sports competitions. It is achieved by:
  - phone;
  - PC - Internet telephone cable;
  - fax.

- **Communication through wave** - is reflected in the transmission of verbal, video or written information by:
• Mobile phone (SMS, MMS, video):
  - posting special information or from the sphere of organization of the work;
  - photos with specific topics;
  - filming of some executions from the lesson or during school competitions.
• Wireless Internet:
  - information specialized in the form of virtual books;
  - access to information published in the special online press;
  - information submitted through the web sites of schools, where it is posted information about the work of departments of physical education, domestic competitions and extracurricular results achieved by students and school teams on the sports plane, the promotion of school teachers or athletes’ activities;
  - online transmission and recording of school sports competitions.
• Radio - transmission:
  - interviews of people involved in school physical education and sport;
  - promoting the work of specialized schools or people as part of radio broadcasts;
  - transmission of school sports competitions.
• Television:
  - interviews of personalities in the field on various topics from school physical education and sport;
  - promoting within some programs, especially at the local stations, the online activity of school physical education teachers or students;
  - televised transmissions of the school sports competitions, with consequences on the local or even national level.

Discussions and conclusions

Knowledge of specific forms of indirect communication specific for physical education is essential to understand the phenomenon as a whole and the role of work in training students. It also contributes to the better ordering of all domain-specific information in relation to the importance of the moment or their perspective.

Identification of the indirect forms of communication involved in physical education helps us understand better the role that each of them has in running the activity, how it manifests and the importance owned by type of information that it holds.

Knowing the types of information contained by the types of indirect communication and messages derived therefrom highlights how forms of indirect communication influence obviously other forms of communication that underpin activity in different stages of its deployment. Thus, the quality of information coming from the literature determines the quality of the lesson plan, both of which are forms of indirect communication. Further, the lesson plan arranges the precise temporal sequence forms that put movement as the main means of direct communication in physical education class. In this context, the effectiveness of the lesson is largely conditioned by the quality of the information contained by the forms of indirect communication.

References

OBJECTIVE AND SUBJECrIVE IN THE ASSESSMENT OF FITNESS LEVEL OF THE YOUNG POPULATION IN THE ACADEMIC TECHNICAL ENVIRONMENT USING THE EUROFIT AND ALPHA-FIT TEST BATTERIES

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Abstract. The link between the practice of physical activities, the fitness level and health is well known. The measurement, assessment and monitoring of physical condition are a permanent and main concern for the Council of Europe, being considered a public health priority. Thus, the Council of Europe currently recommends two test batteries for the adult population, namely Eurofit and Alpha-Fit. This research aims to objectify some components of the aerobic, musculoskeletal and motor fitness levels (age group 20-29 years) through four tests from Eurofit for Adults (Sit and reach, Dynamic sit-up and Single leg balance) and two tests from Alpha-Fit Battery (2-km walking test and Jump and reach), as well as to emphasize how the investigated subjects perceive these tests, in terms of their challenging aspect, degree of adequacy and attractive character. The investigated sample was made up of 104 subjects, of whom 63 male and 43 female aged 20 to 29 years, of Romanian nationality, students at the Polytechnic University of Bucharest. This research is a pilot study which will establish the most appropriate tests for this population sample for a future assessment, in accordance with the recommendations of the Council of Europe, of the fitness level of students at the Polytechnic University of Bucharest.

Keywords: Eurofit, Alpha-Fit, age group 20-29 years, fitness.

Introduction

The connection between the practice of physical activities, the fitness level and the health status is well known. The systematic, appropriate and conscious practice of physical exercises both in an organized environment and independently generates the improvement and preservation of optimal physical and mental health. Several studies highlight the importance of physical condition as an excellent indicator of public health, as well as a predictor of future quality of life. By health fitness we mean the ability to perform daily activities with energy characteristics and capacities that are associated with a lower risk for developing chronic disease and premature death. It directly depends on the level of physical activity of the individual (Ruiz et al., 2009). Consequently, physical condition or fitness “represents an important vector of the influence of physical education” (Dragneae et al., 2006, p. 8).

The measurement, assessment and monitoring of physical condition are a permanent and main concern for the Council of Europe, being considered a public health priority, regardless of the age of the population. The Council of Europe has developed two official documents regarding the promotion of sports activities and recreational sports: European Sports Charter and Code of Sports Ethics. The European Sports Charter reinforces the role of sports in the education and formation of man, stating that “sport contributes to improving the human capital” and the values promoted through sport essentially contribute to the formation of future citizens (White Paper on Sport, 2008). Thus, the Council of Europe currently recommends two test batteries for the adult population, namely Eurofit and Alpha-Fit.

“The Eurofit system was accepted by numerous European countries as a uniform procedure for the assessment of the health-related, functional and motor status of adults” (Heimer et al., 2004, p. 224). Eurofit is a simple and practical test battery based on reliable and valid tests, having an excellent cost-effectiveness ratio and complying with the requirements expressed by the Council of Europe, Committee for the Development of Sport (Pekka & Tuxworth, 1995, p. 5).

Alpha-Fit Test Battery for Adults reflects long-term cooperation between scientists in the European countries promoting physical activity and fitness for health in population level. Alpha-Fit emphasizes the growing scientific evidence of the importance of assessing and monitoring physical fitness as a key indicator of person’s health (Suni, Husu, & Rinne, 2009).

There are research studies on the negative attitude of young people and adults towards physical activity and aerobic fitness (Bunc, 2008; Sigmund et al., 2009). According to other studies, avoiding sedentariness (Erikoğlu et al., 2015) and building an active and healthy lifestyle (Cepero et al., 2011; Plowman, 2005) have beneficial and significant effects on the body composition and aerobic fitness. In our country, there has been little concern for determining the level of neuromuscular fitness and aerobic fitness of the young people in the academic technical environment. Therefore, this paper attempts to complement the existing data by determining the degree of relevance of the tests included in the Eurofit and Alpha-Fit Test Batteries for the age group 20-29 years.
This research aims to objectify some components of the aerobic, musculoskeletal and motor fitness levels (age group 20-29 years) through 4 tests from the Eurofit for Adults and Alpha-Fit Batteries, by relating them to the European standards recommended by the Council of Europe, Committee for the Development of Sport, as well as by emphasizing how the investigated subjects perceive these tests, in terms of their challenging aspect, degree of adequacy and attractive character.

Materials and methods

Subjects

The investigated sample was made up of subjects aged 20 to 29 years, of both genders, of Romanian nationality, students at the Polytechnic University of Bucharest.

The selection technique used was random-type.

The sample included 104 subjects, of whom 61 male gender and 43 female gender. They did not differ from the target population.

The research was conducted between 01.11.2015 and 15.03.2016 within the Sports Complex of the Polytechnic University of Bucharest.

The environment in which the study was carried out provided optimal conditions for conducting the research.

The research was structured in six stages for each subject.

The research techniques used

To assess the cardiorespiratory fitness, we used the 2-km walking included in the Alpha-Fit Test Battery, in compliance with the conditions of participation and conducting the test described in the Tester’s Manual (Suni, Husu, & Rinne, 2009, p. 20).

The strength and endurance component of musculoskeletal fitness was assessed for the trunk muscle endurance through the Dynamic sit-up and Jump and reach tests for the leg extensor power.

The Dynamic sit-up test, consisting of 5 sit-up repetitions for 3 levels of difficulty, was applied according to the recommendations of Eurofit for Adults (Pekka & Tuxworth, 1995, pp. 56-58).

To assess the leg extensor power, the Alpha-Fit Test Battery for Adults provides the Jump and reach test. Its correspondent in the Eurofit for Adults is the Vertical jump test.

Our option for using in this research the Jump and reach test derives from the fact that we have found, in a previous study, that the assessment accuracy is higher in this test than in the Vertical jump test.

The Jump and reach test was performed according to the indications in the Tester’s Manual (Suni, Husu, & Rinne, 2009, p. 17).

The flexibility component of musculoskeletal fitness was assessed by the trunk flexion using the Sit and reach test within the Eurofit for Adults Test Battery. There were observed both the previous recommendations and the way of conducting and assessing the test, as provided in the Eurofit for Adults Battery (Pekka & Tuxworth, 1995, pp. 61-63).

According to the provisions, we used as a tool the Sit and reach box with the indicated standard sizes.

Motor fitness, through its balance-related component, was assessed using the Single leg balance test from the Eurofit for Adults Test Battery. There were observed there commended conditions for admission and conducting the test (Pekka & Tuxworth, 1995, pp. 63-65).

To know how the investigated subjects perceived these tests, we used the questionnaire survey. The questionnaire included 15 items with closed responses. It was used a 3-level scale (little, much, very much).

The questionnaire items were structured on the five tests. Each test was assessed by subjects from the standpoint of the degree to which its structure was appropriate to the fitness component assessed, as well as in terms of attractiveness and challenging factor.

The research design

This study used an empirical ascertaining-type research, its design being a cross-sectional one. The research used primary data, the method for collecting them being the database. Through this research, we aimed to provide the ethical and medical conditions for subject participation in the proposed investigations and also to conduct the research according to the project—the program plan and time schedule. All measurements performed were recorded in protocols and sheets, then they were summarized, processed both statistically and mathematically, and presented under the form of tables and graphs.
Results

The Sit and reach, Dynamic sit-up and Single leg balance tests for revealing the musculoskeletal and motor fitness levels were applied according to the recommendations of the Council of Europe, Committee for the Development of Sport, in the work *Eurofit for Adults*. Reference standard values for the tests included in the Eurofit for Adults Battery are those for the population of Sweden.

For analyzing the data, we used the percentiles, the quintiles respectively. Data distribution was divided into five classes, each one comprising one-fifth of the total population investigated.

Table 1 shows the results, structured per quintile, obtained in the Sit and reach, Dynamic sit-up and Single leg balance tests by the 104 subjects, 56 male and 48 female aged 20 to 29 years, and the reference standards in the Eurofit Test Battery (Pekka & Tuxworth, 1995, p. 96; pp. 98-99).

<table>
<thead>
<tr>
<th>Percentile</th>
<th>Sit and reach (cm)</th>
<th>Dynamic sit-up</th>
<th>Single leg balance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male Swedish</td>
<td>Female Swedish</td>
<td>Male Swedish Rom</td>
</tr>
<tr>
<td>80%</td>
<td>40</td>
<td>38</td>
<td>15</td>
</tr>
<tr>
<td>60%</td>
<td>34</td>
<td>34</td>
<td>15</td>
</tr>
<tr>
<td>40%</td>
<td>29</td>
<td>32</td>
<td>15</td>
</tr>
<tr>
<td>20%</td>
<td>20</td>
<td>25</td>
<td>15</td>
</tr>
</tbody>
</table>

Table 1. Quintile percentage value in the Sit and reach, Dynamic sit-up and Single leg balance tests

The 2-km walking test for revealing the cardiorespiratory fitness level and the Jump and reach test for highlighting the musculoskeletal fitness, by appearance or the power of lower limb muscles, were applied according to the provisions from the *Tester’s manual* of Alpha-Fit Test Battery.

For analyzing the data, we used the quintiles. The ordered data were divided into four classes, each one comprising one-quarter of the subjects.

Values corresponding to the quartile percentages obtained by the investigated subjects in the 2-km walking and Jump and reach tests and values corresponding to the reference values presented in the *Tester’s manual* of Alpha-Fit Test Battery are shown in Table 2.

<table>
<thead>
<tr>
<th>Percentile</th>
<th>2-km Walking test</th>
<th>Jump and reach</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male Fin</td>
<td>Male Fin</td>
</tr>
<tr>
<td>poorest quartile</td>
<td>≥ 16:08</td>
<td>≥ 18.34</td>
</tr>
<tr>
<td>best quartile</td>
<td>≤ 14:29</td>
<td>≤ 16:08</td>
</tr>
</tbody>
</table>

Table 2. Quartile percentage value in the 2-km Walking and Jump and reach tests

The opinions of the 56 male subjects on the five tests, in terms of their degree of adequacy for investigating the specific fitness-related aspects, attractiveness and challenging character are shown in Fig. 1.
Fig. 1. The opinions of male subjects on the five tests, in terms of their degree of adequacy, attractiveness and challenging character

In Fig. 2, there are graphically represented the opinions of female subjects on how they have perceived the five tests, in terms of their challenging character, specificity for the investigated fitness component and attractiveness. The trunk flexibility values for the 40th and 60th quintiles are identical to those in the Eurofit. Their upper values are lower by 5% in the investigated subjects.

Fig. 2. The opinions of female subjects on the five tests, in terms of their degree of adequacy, attractiveness and challenging character
Discussions and conclusions

Analyzing the data obtained in the Sit and reach test, it is noted that the Romanian male subjects have performances, for the lower quintile (20th), better by 20% than the reference ones presented in the Eurofit for Adults, for the age group 20-29 years. In female subjects, the trunk flexibility (for the 20th, 40th and 60th quintiles) is greater by 2.7-8% than for the reference population, but lower by 4.81% at the level of upper values.

Abdominal muscle endurance, investigated through the Dynamic sit-up test for all the research subjects, has values which are identical to the reference ones, namely 15 executions, according to the specific provisions existing in the Eurofit for Adults.

Motor fitness, through its balance-related component, was investigated using the Single leg balance test. We note higher values than the reference standards in both male and female subjects, particularly for the upper quintiles (60th and 80th).

Results obtained by the investigated subjects in the 2-km walking test highlight a lower level of cardiorespiratory fitness than that proposed in the Tester’s manual of Alpha-Fit Test Battery (between 6.25% and 10.47% for male subjects, and between 1.67% and 4.42% for female subjects).

Better results than the Alpha-Fit standards were achieved by the investigated subjects in the Jump and reach test. Thus, the performances were higher for female subjects, namely 22.51(20th) and 16.6% (80th). For male subjects, they exceeded the values proposed by the Alpha-Fit, between 17.77% (20th) and 2.53% (80th).

The applied questionnaires were processed and the percentages were related to each class of the 15 items.

Among the investigated male subjects in the age group 20-29 years, 44.83% believe that the 2-km walking test is less appropriate for assessing the cardiorespiratory fitness, most of them stating that it is neither attractive (55.17%) nor challenging (51.72%). The opinion of most female subjects (53.06%) on this test is that it is not attractive, but 67.35% of them believe that it is appropriate.

As to the Jump and reach test, over 86% of the total investigated subjects consider that it is appropriate for assessing power of the lower limb muscles, and that it is also attractive and challenging.

The majority of male and female subjects (over 80%) think that the Single leg balance test is appropriate and attractive, but for 24.14% of male subjects, it is little challenging.

The subjects’ opinions regarding the Dynamic sit-up test are different. Male subjects consider it less appropriate (36.21%) for assessing the trunk strength. They believe it is little attractive (36.21%) and little challenging (41.98%). Female subjects (51.02%) consider that it is appropriate for assessing this aspect of musculoskeletal fitness, but 30.61% think that it is little attractive.

The Sit and reach test is considered by the investigated subjects (over 85%) as appropriate and challenging for assessing the trunk mobility. 22.41% of male subjects believe that it is little attractive.

The assessment of cardiorespiratory fitness, in terms of duration and demand, requires the complex and total involvement of subjects, both physically and mentally. For this reason, it is very important to determine it by methods consistent with the particularities of the investigated subjects.

Under the motor aspect, after the walking rate has reached a certain limit, the healthy human being automatically passes to running. This limit is dependent on age: the younger the age, the faster the involuntary passage from walking to running.

During the application of 2-km walking test, it was difficult for us to determine the subjects to walk faster, they having permanently the tendency to pass to running. Two of the frequently asked questions were: “Why do we have to walk fast instead of running?” and after the test completion: “But when shall we run?”

We consider that the results obtained by the investigated subjects in the 2-km walking test do not reflect their cardiorespiratory fitness level, because of their partial involvement, both physically but especially mentally, in achieving maximal performances.

The subjective and objective aspects during this testing, corroborated with the subjects’ opinions regarding its specificity and attractiveness, and also with the particularities of young age, provide us the necessary support to consider that, for the age group 20-29 years, the assessment of cardiorespiratory fitness would be better achieved through a run test.

By assessing the power of lower limb muscles using the Jump and reach test, we have found that there can be significant differences determined by the position of subject’s shoulder axis in the transverse plane at the initial moment of reaching the plate. In the final point of the jump, when the subject reaches the plate, the transverse axis of shoulders has a maximum gradient, the arm and hand joints being perfectly stretched. For a conclusive test result, it is very important to explain, exemplify and check if, at the initial moment of reaching the plate, prior to the test, the shoulder axis is inclined transversally in a maximal angle towards the plate, and the joints of the arm...
and hand used to reach the plate are perfectly stretched. If, in the initial position, the shoulder axis is horizontal, and the joints of the arm and fingers are slightly flexed, differences can be of up to 10 cm compared to an assessment where the initial position of shoulders, arm and fingers is identical to the position in the end of the jump, when the plate is reached again.

The similar test in the Eurofit Battery for assessing the lower limb power is the Vertical jump. Previous research conducted by us has proven that, to obtain real results, the strap linking the subject to the ground is very important to be connected to a one-way running device, which, for mental comfort and safety reasons, should be placed at least 1.5 meters away from the subject.

Both our research and the opinions of investigated subjects confirm that the Sit and reach test, through its structure and the assessment method, is adequate for assessing the trunk mobility, one of the factors of musculoskeletal fitness.

Following the achieved study, we consider that, for a real assessment of balance, as a motor fitness factor, through the Single leg balance test, the acoustic disturbances in the environment where it is conducted should be minimal, in both the pre-test and the final test. Another important aspect for a result as accurate as possible is the necessity to advise the subjects to focus their attention, during the test performing, on the stability and relaxation components.

The subjects of this study, young people between 19 and 29 years, believe that the Dynamic sit-up test is less adequate for assessing the abdominal muscle endurance. They also think that its degree of attractiveness is low, just as its challenging character, for achieving maximal performances. Because the obtained performances do not allow the subjects to range on a value scale, we consider it appropriate, for this age category, either to increase the number of executions per group of movements or to introduce the time factor.

References


EVALUATING CONDITIONAL ABILITIES: SPEED AND STRENGTH IN THE PHYSICAL EDUCATION CLASS FOR PRE-TEENS

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Abstract. Movement, in general, and physical education class, in our case, represents a beneficial and enjoyable activity made with the aim of contributing to the development of pupils’ cognitive and somatic aspects from all points of view. In this regard, physical education classes are one of the main ways of educating motor behavior and socialization among pupils. Thus, physical education improves conditional abilities and coordination; it teaches, strengthens and improves motor and cognitive skills and trains personality traits. According to studies in the field, conditional abilities are directly dependent on physical condition and are based on muscle metabolism and the efficiency of the respiratory, cardiovascular and nervous systems. At this stage of development, pre-teens can develop their conditional abilities very well. This pilot study has as a main objective the monitoring of speed and strength as the main components of motor ability. We therefore consider that the use of the value groups supports our thesis and gives each student the opportunity to highlight his/her skill level.

Keywords: conditional ability, value groups, physical education class.

Introduction

Movement, in general, and physical education class, in our case, represents a beneficial and enjoyable activity made with the aim of contributing to the development of pupils’ cognitive and somatic aspects from all points of view. In this regard, physical education classes are one of the main ways of educating motor behavior and socialization among pupils. Thus, physical education improves conditional abilities and coordination; it teaches, strengthens and improves motor and cognitive skills and trains personality traits.

Conditional skills or capabilities are directly dependent on the physical condition and are based on the muscle and metabolic efficiency of respiratory, cardiovascular, nervous systems. Conditional abilities can be the driven to exhaustion except for speed, which develops on the background of physical comfort. This work is linked to the most important conditional abilities: speed and strength. Regarding speed, the literature has several definitions, but all refer to swiftness, how quickly gestures can be made. Speed is the expression of muscle shortening as a manifestation of chemical processes and nervous reactions.

Middle school period (11-14 years) is considered the best time to progress, an ideal one for the improvement of reaction rate and acceleration indices, in parallel with the coordination system of speed.

Strength is regarded as one of the most important capabilities that influence the manifestation of all motor components. Specialists present it as the ability to overcome internal and external resistance by muscle contraction.

Weineck(1983) argues that one cannot formulate a precise definition of strength because it is a very complex skill, which has many forms and many influencing factors.

Gagea (2002, p. 102) believes that even today we cannot say precisely what strength is. Up to 11-12 years, maximum strength typically develops and runs in parallel for both sexes. Evolution is driven by the development of neuromuscular coordination capacity. It is recommended to perform strength exercises using one's own weight load or small loads of 1-2 kg.

Preadolescent period is a stage where conditional abilities can develop very well.

This pilot study has as a main objective to monitor speed and strength as the main components of motor ability. We also believe that the use of theme groups will support our values and give each student the opportunity to highlight the skill level.

The research hypothesis: Applying the tests from Eurofit Battery and the National Evaluation System to children aged 12 will help monitor speed and strength and divide students into value groups.

Materials and methods

The study was conducted on 2 groups of 12 girls (24 in total), the average age being 12.004 years (standard deviation 0.005), belonging to “St Constantin and Elena” Middle School, sector 6, Bucharest. The students were randomly chosen from grades sixth A and B, at the beginning of the school year 2015-2016, to participate in physical education lessons twice a week, on Tuesdays and Thursdays, for 50 minutes.
In this age group, the main objectives of training are: development of psychomotor training skills with an emphasis on speed and coordination skills, learning and strengthening basic motor skills, and specific applications for sports games, plus the development of spatial orientation, creativity and personality development through focus of attention. With regard to the attainment of the psycho-social knowledge and skill level conditional parameters: speed and strength, we applied the following tests as research methods: for speed: race of 50 m distance and for strength: long jump from remote place (provided for in the national system of assessment at secondary and in the Eurofit battery of tests) at the beginning of each learning unit themes of psychomotor training skills. The tests have been applied at the level of each class, class VI respectively of the grade of B synthetic ground and the Sports Hall of St. Const. and Elena school during physical education classes.

Samples were applied twice each and it was considered the best repetition. As a result of their application, we have compiled value groups depending on the results obtained at the level of each class.

Following the results of the initial collection, we divided each class value group and applied systems of action set out in the learning unit. At the end of the unit, I applied again tests.

The working materials used were: milestones, tennis balls, soccer t-shirts-outs of different colors for each group, whistle, stopwatch, Roulette, 2 assistants in each class - students exempted from the class for medical reasons. To confirm or rule out the proposed hypothesis, we used Wilcoxon nonparametric correlation Test because the two groups, 1 and 2, were small (2 groups of 12 girls) and different continuous distributions.

The treadmill speed 1/50 m with startup (a test included in the national system of assessment grades V-VIII)

- Quality tested Execution speed and responsiveness
- The necessary means of performing the test:
  - outdoors or sports hall
  - straight track on flat terrain
  - an observer
  - stopwatch
- Description of the test:
  On track you draw two lines at a distance of 50 meters, one of them being the start and the other the finish line. The Observer, who is equipped with a stopwatch, sits close to the finish line. The subject is in the start position from the top, starting behind the line. At this signal he goes into running full speed towards the finish line.

The timer starts at the rear foot movement. The Observer located in the extension line’s arrival stops the timer, when the subject has passed completely beyond the finish line. The purpose is to cover the distance as quickly as possible.

Evaluation (grading): The time it takes to undergo the distance is measured in tenths of seconds. For better measurement of the time you can use two timers and calculate arithmetic average of the two.

Example of a grading scale (in seconds):

<table>
<thead>
<tr>
<th>Mark</th>
<th>5</th>
<th>Mark</th>
<th>6</th>
<th>Mark</th>
<th>7</th>
<th>Mark</th>
<th>8</th>
<th>Mark</th>
<th>9</th>
<th>Mark</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>B</td>
<td>F</td>
<td>B</td>
<td>F</td>
<td>B</td>
<td>F</td>
<td>B</td>
<td>F</td>
<td>B</td>
<td>F</td>
<td>B</td>
</tr>
<tr>
<td>9.2</td>
<td>8.2</td>
<td>9.1</td>
<td>8.1</td>
<td>9.0</td>
<td>8.0</td>
<td>8.9</td>
<td>7.9</td>
<td>8.8</td>
<td>7.8</td>
<td>8.7</td>
<td>7.7</td>
</tr>
</tbody>
</table>
Standing long jump (a test contained in the national system of assessment at secondary and Eurofit Test Battery)

- Equipment needed:
  - roulette
  - a trail for jumping
  - an Assistant
  - non slippery surface

Description of the test:

The subject sits next to a line marked on the ground with legs slightly apart, arms may help to swing the torso. For a better jump, the knees should be bent. Consider the best long jump of the two tests. If the topic falls back on, repeat the jump.

Results

Item 1 Running speed 50

![Histogram 1](image1)

Fig. 1. Histogram 1 Ox axis, we recorded the values on the axis Oy their frequency of occurrence

Group 1 of the research has the following values:
Between 8.02 sec and 8.8 sec are 4 of the 12 students, they are the first group (A1).
Between 9.00 sec and 9.8 sec are the following 8 schoolgirls, they represent lower-scoring group (A2).

![Histogram 2](image2)

Fig. 2. Histogram 2 axis Ox values we have on Oy the frequency of their occurrence

Group 2 of the research had the following values, as shown above:
4 schoolgirls between 10 sec and 10.6 sec, place in the high-scoring, group 1 of the value of this class (A3). Between 10.8 sec and 11.4 sec, 8 schoolgirls who are the lower-scoring group (A4).
Table 2. The internal values obtained from one original on 15/02/2016

<table>
<thead>
<tr>
<th>Sports</th>
<th>Number</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Standard Error</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12</td>
<td>9.184</td>
<td>0.488</td>
<td>0.139</td>
<td>8.87</td>
<td>9.49</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>10.79</td>
<td>0.379</td>
<td>0.109</td>
<td>10.59</td>
<td>11.03</td>
</tr>
<tr>
<td>Total</td>
<td>24</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the table above we have a statistical interpretation of item values of the following parameters:
For the first the average is 9.184 versus 10.79 for 2nd group. The standard deviation for Group 1 is 0.488 versus 0.379 for 2nd group.

Item 2 Long Jump on remote place

Fig. 3. Histogram 3, axis Ox values we have on Oy the frequency of their occurrence

Group 1 of the research the following values:
Distance between 110 cm and 140 cm, 8 schoolgirls placed in Group 2 of value from jumping (S1).
Distance between 141 cm and 152 cm, 4 schoolgirls in the first group at jumping (S2).

Fig. 4. Histogram 4 axis Ox values we have on Oy the frequency of their occurrence

Group 2 of the research the following values:
Distance between 60 cm and 85 cm, 6 schoolgirls in the two value group at jumping (S3).
Distance between 100 cm and 115 cm, 6 schoolgirls in the first group of value of this class (S4).
Table 3. The internal values obtained from one original on 17/02/2016

<table>
<thead>
<tr>
<th>Sports</th>
<th>Number</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Standard Error</th>
<th>95% Confidence Interval for Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower Bound</td>
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<tr>
<td>1</td>
<td>12</td>
<td>129.2</td>
<td>13.26</td>
<td>3.82</td>
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<tr>
<td>2</td>
<td>12</td>
<td>87.2</td>
<td>21.05</td>
<td>6.07</td>
<td>73.86</td>
</tr>
<tr>
<td>Total</td>
<td>24</td>
<td>106.7</td>
<td>15.16</td>
<td>4.04</td>
<td>97.62</td>
</tr>
</tbody>
</table>

In the table above we have a statistical interpretation of the 2nd item values which are presented for the following parameters:

For the first group the average is 129.25 compared to 87.25 for 2nd group.

The standard deviation for Group 1 is 13.267 versus 21.058 for 2nd group.

The 24 students in measure of the individual possibilities managed to overpass these tests.

The tests have been done on the level of the thematic rings which were four and five during the physical education of the learning units.

Group 1 level, 4 pupils from A1 group who achieved the best time fitness conditional speed, with an average of 8.63s, everything falls into the first group S1 and fitness conditional force, with an average of 139cm. Also shown from them is very good value relative to the national evaluation system.

The following 8 students in the group A2 with an average of 9.46s are in Group 2 of both speed and the ability to force conditional S2, averaging 118 cm. Their results represent good value relative to the national evaluation system.

At the Group 2 first 4 girls are in their first group class A3, with an average of 10.37s fitness conditional speed and strength S3 with an average of 106 cm. Their results fall in average values of the national evaluation system.

The following 8 girls, Group A4 and S4, have values below average relative to the national evaluation system, which highlights the need to move this age. Average conditional fitness for Group A4 is 11.00s speed and strength A4 68cm.

Discussions and conclusions

This paper linked to the strength and speed diagnosis conditional abilities at the age of 12, based on value groups represent a new approach for children. Avoid “classification” so that everyone is interested in working for him.

Tests suggested as the 2 items listed above and construed in statistical terms refer to elements of novelty and complexity of the physical education lesson.

Therefore, the results of the 24 girls show how effective IS the differentiated treatment which contributed not only to the diagnosis and optimization of two conditional abilities- strength and speed but also the socialization of students in each group, to the creation of new friendships, better integration in the group.

Furthermore, the tests proposed interpreted statistically prove the confirmation of the hypothesis and the division of the two groups in a future research project: the first group and the experimental group representing the 2nd to the control group.

References

THE IMPORTANCE OF ELECTRONIC DEVICES IN TENNIS PERFORMANCE

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Abstract. Tennis has become a very complex sport and also an interesting sport for electronic devices developers because there is a lot of money involved in this field. Specialists analyze every aspect of the game for improving all factors that can help the player to win. Physical preparation, mental coaching and biomechanical analyze are based on electronic devices or software. Now, sport industry has discovered also very many electronic devices to analyze technical performance. In tennis we can use devices for tennis racquets, for arm and forearm movements and software that can underline the tennis players problems through video analyze. It is very important that these devices can give us information in real time so we can manage to improve the game to an upper level. The information is significant for coaches and they can build as fast as they can a tennis program that can help the tennis players to eliminate their technical faults. These devices incorporate gyroscopes, accelerometers, radars, sensors and very many electronic items. The software can be installed on mobile phones, Ipad, laptops or PC.

Keywords: electronic devices, tennis, software, sensors; tennis performance.

Introduction

Very many tennis researches highlight the importance of electronic devices to high-performance training of athletes. A couple of them have been conducted on the system to capture and analyze a trajectory of a tennis ball or other objects associated with a game of tennis, and also to provide feed-back for players (Marty & Edwards, 2008). Some authors were interested especially in the tennis ball impact on accelerations and torques in an interactive virtual tennis system. These simulators help players to have a large variety of shots and to easily confront unknown players (Fong, 2012).

- The model and simulation work were used also for players during the training process, in an opposite situation: one player receives a serve and returns it with given probability to a region on the opposite court (or misses). This region then maps on to the other player’s matrix as an incoming ball, and then he hits back to the opposite court (or misses). (Yunal & Nabil, 2012)
- It was used also for the benefits of the players, as the analysis of the tennis racket using a computer has been developed since 1990 (Jenkins & Calder, 990).
- In 2010, some authors described how to use of the computer assisted learning to solve the tactical efficiency factors and timing patterns in game situations where the players must anticipate the opponent’s strategy. This is achieved by providing information of biomechanical nature, while the tennis player learns to interpret them to predict the opponent’s game (Lanlinger et al., 2010). The anticipatory performance in tennis with video display in game simulates the real-world environment, and it was also assessed (Ericsson et al., 2006). The computer simulated tennis serve motion can evoke the difference of experience in anticipatory performance (Hirofumi, 2007).
- In order to test objectively the biodynamical characteristics of tennis racquets under standardized and biomechanically realistic conditions, the use of simulator is suggested. Thus, from the 1990s the importance of the simulator for the tennis players’ practice stood out, as a result of its use to increase the adaptability of the players at the impact of the ball with various strings patterns and rackets (vibration characteristics, direction control, and the coefficient of restitution), by reducing the period of player’s adjustment to the materials of the racquets. (Glitsch & Detlefs, 1998; Hatze, 1992, 1993)

Materials and methods

Hypothesis. If tennis players use electronic devices that can provide feed-back on different issues of the tennis activity, they will improve their technical performances.

Subjects. We trained a junior tennis player who was a member of the As Politehnica tennis club team and played with a Babolat racquet and a Babolat Play electronic device (Fig. 1) during four months, between January 2016 and April 2016. After 2 weeks, we added a POP device (Fig. 2), which is an electronic wrist item also designed by Babolat. The research was conducted under a program structured as follows: 4 months with 3 training sessions per week. Each session was split in 4 parts: in the first part, the player was playing for 1 hour with the
devices, in the second part, with a feedback from Babolat Play software and POP device interface, where the player and the coach underlined the aspects that should be improved or the technique-related problems, and in the third part, with exercises designed to help the player solve these problems and increase the efficiency of the game; in the fourth part, the player used the devices to record again and see the improvement.

Methods

The research was conducted on two devices that recorded lot of information from the tennis player during the training session. It takes information and gives feedback about the impact location, namely it records how many times the player has hit the ball in the sweet spot (center of the string), the speed of the ball, the effect of the ball and how many strokes has hit the player during the lesson. After this information, we can set the best exercises for the players to avoid the mistakes they are doing during the sessions and to obtain higher performance.

POP Babolat device has the following components; 9 axis sensors, gyroscope, accelerometer, magnetometer.

**First part of the training session.** The research is aimed to record with two electronic devices the training session of the tennis player. One of the important parts is that one of these devices (Babolat Play) is included in a racquet and does not change the weight of the model. This racquet is officially accepted so the players can record their performance also during the official matches. Also the POP Device weights less than 9 grams, and therefore it will not disturb so much the arm movements. Both devices can record an entire session, every set or every piece of the session, so the coach can chose which part wants to analyze.

The racquet device with Babolat Play software can record forehands, backhands, services, volleys and smash hits. The content of the training included both a technical component and a physical one. The technical training comprised in the practice of forehand, backhand and service. During the physical training, emphasis was placed on developing the specific strength of the tennis game, the speed of execution and repetition.

Real-time POP device data includes shot type, swing speed, spin and style, all combined into a PIQ score, activity feature tracks court time, number of shots and records your session. The unique PIQ scoring system combines your swing speed, spin and style (the “fluidity” of your stroke) into one number that you can use to track your own game or competition. The autonomy of high performance Lithium battery allows for 6 hours of playing time with a memory capacity of on average of 150 hours of tennis.

**Second part. Feedback session.** After the lesson, we can download very easy on PC or mobile phone the results of the tennis session through these devices. The player and his coach can get a real picture of the training session. They can see the hit density of the part they want, numbers of every technical element, what was the main effect hit by the player, the speed of the service and some training session density aspects.

**Third part of the session.** After the results of the session, we try to correct the technical mistakes, the lack of power and the coordination aspects. The effects aspects were improved by changing some grips or working hard with lower body. The coordination mistakes were solved with running and sliding exercises with thrown balls instead of hitting balls. Also the PIQ aspects were improved with biomechanical simulators.

The technical mistakes for service, forehand and backhand were solved with a couple of exercises with tennis accessories, based on understanding the contact points and hitting zones.

**Fourth part.** Restarting the session for the same elements - implementing the changes. After this phase, another feedback will be applied. The selected exercises were chosen following a biomechanical analysis regarding the participation of each of the main muscle groups in the overall movement to perform various shots in the game of tennis.
Data processing and interpretation

- Forehands

We can observe that in the first session the player was hitting forehand only with flat effects (from 360 hits, 358 were flat and only 2 with topspin that means 99% flat hits) that is not a good way to play on the clay court competition period (Fig. 3). That is why we started to change the exercises during training sessions and to put more spin on the ball. After 4 months, the player was hitting for example 317 balls and 143 were with topspin and 172 flat, that means 45% topspin (Fig. 4), which is a good improvement for the May-June following clay court competitions. Also, the speed of the ball was rising from 109 km/h in January to 115 km/h in April, because the player was more confident with the topspin effect that allows the ball to be hit more powerfully without going out of the court.

The most important aspect is the PIQ score that involves all important efficiency factors and the biomechanical movement. The player was improving from 3125 to 3921 at the PIQ results. (Fig.3 and Fig. 4)

Analyzing forehand after these 4 months, we notice that the forehand from the first lesson was placed with 31% on sweet spot and 34% on the lower part of the racket, 16% on the highest side and 19% on the side of the racket. (Photo 5)

The forehand, after timing exercises, was better on efficiency on the sweet spot impact, 38% of the hits were on the center of the string, 27% on the lower side of the racket, and 28% on the sides. (Photo 6)
Backhands

Analyzing the POP Device in backhand session we observe that in the first meeting the player was hitting the ball 100% flat (Fig. 7-January 2016), and after a couple of months, he was improving the topspin effect at 50% (Fig. 8- April 2016).

The results for the efficiency of backhand were recorded by the Babolat Play and showed us that the backhand has the best growth. Starting with the efficiency of the impact hit on the center of the string with 28%, it finished with 42%. (Photos 9 and 10) All backhand and forehand results are higher than the initial tests and this confirms that the entire research practice brings a lot of benefits for the tennis player’s basic strokes. (Photos 11 and 12)
In Photo 11, we have seen the results of our forehands effects and the range of the power of this hit. The device recorded the numbers of forehands per session also. The same results we can obtain for backhands and serves.

![FOREHANDS DETAILS]

![BACKHANDS DETAILS]

Photo 12. Technical aspects recorded by the electronic device (final tests)

We can record the number of the hits per set or between some time intervals and to create interval training session. This training helps the player to simulate a longer match with strong player who are very consistent.

![Density of the shots during the training session]

Photo 13. Density of the shots during the training session

![One month curve efficiency of technique (January 16th to February 16th)]

Photo 14. One month curve efficiency of technique (January 16th to February 16th)
Conclusions

Computer-assisted evaluation and training using this device helps:

- to record every efficiency factor, starting from the effect of the ball and finishing with the speed of the racquet;
- to individualize training with immediate effects on the priority orientation toward the correction of technical or physical movements or on the coordination capacity;
- to analyze every technical element (forehands, backhands, serve, smash, …);
- to perform movements starting from speeds close to those specific to movement, which would allow the development of correct techniques and increase the final global motion, with direct positive consequences on performance;
- to analyze the contact point and the contact hitting zones;
- to observe the biomechanical aspects;
- to transfer a part of the responsibility from the coach to the tennis players, because the coach can analyze the session also when he is not on the court;
- to solve the timing problems for the tennis players;
- to create tennis interval training sessions based on the level of the players;
- to simulate different intensity games;
- to feel and adapt the ball placement in the racket to give the most efficient hit according to the moment of the game.

References


USING COMPUTER SOFTWARE TO DETERMINE AN ATTACK HIT MODEL FOR WOMEN'S JUNIOR TEAMS

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Abstract. Problem: Achieving top performance nowadays is no longer possible without a large volume of multi- and interdisciplinary data and the technology that enables high training efficiency. Based on realistic strategies, the aforementioned data and technology would permit the identification of those reference points which offer the safest ways to achieve team objectives within any given context. At the same time, having the right technological equipment and means to develop it further has also become necessary in order to keep up the pace at a global level. Purpose: We hypothesize that, by studying the data collected and analyzed by the Data Volley software, and by applying that to training and competitive play, the efficiency of the volleyball techniques of Romanian players will increase and lead to the establishing of a national attack hit model. Premise: The following study is noteworthy and innovative in that it analyses a tool little used by junior volleyball teams in Romania, the Data Volley software. Research methods: The following methods were used: scientific research, statistical analysis, observation, case study and comparative analysis. Discussions and conclusions: At the FIVB Volleyball Women’s U20 World Championship, Romania’s National Team was able to perform on the same level as other participating teams by using the Data Volley software. Through this tool, it was possible to track the evolution of each player in the court, especially the spikers. The information collected by Data Volley, regardless of the fact that both the attack hit efficiency and number of points scored increased, confirms the hypothesis according to which a national women’s junior team attack hit model can in fact be established.

Keywords: efficiency, model, volleyball, juniors, computer software.

Introduction

Achieving top performance nowadays is no longer possible without a large volume of multi- and interdisciplinary data and the technology that enables high training efficiency. Based on realistic strategies, the aforementioned data and technology would permit the identification of those reference points which offer the safest ways to achieve team objectives within any given context. (Castro, Souza, & Mesquita, 2011)

To return to the elite world of volleyball, we need to consult and follow the specialist opinions, to change selection strategy, to review player’s prototype and at the same time to use the best training methodologies (Balaiș & Păcuraru, 1997, p. 82).

The volleyball world performances have risen to a very high level lately. To reach the same level, we need to change and adapt strategies in the specific methodology of player’s training (Bril & Kleshev, 1988, p. 135). For these reasons, we need technological development and endowment.

Determining a model is a complex process. For this, we seek to capture situations and phenomena. The model never identifies with the original phenomenon – it is the essence of it, raising it to a higher value (Pascu, 2008, pp. 81-82).

This study is a volleyball field research and its purpose is to determine which volleyball actions are more efficient for sport performance. The following study is noteworthy and innovative in that it analyses a tool little used by junior volleyball teams in Romania, the Data Volley software for juniors, which objectifies the attack actions.

Data Volley transforms all the actions performed during a match into highly specific codes that describe in detail each player’s hit, in order to carry out detailed analysis for every technical and tactical aspect of the game.

The research hypothesis

We hypothesize that by studying the data collected and analyzed by the Data Volley software and by applying that to training and competitive play, the efficiency of the volleyball techniques of Romanian players will increase and lead to the establishing of a national attack hit model.

Materials and methods

The purpose of this research is to statistically present the efficiency in attack of Romanian women volleyball player’s actions during the World Championship U20 qualification tournament and to establish a national attack hit model.
The main goals are:

- Watching/observing statistical registration of the World Championship U20 qualification tournament;
- Collecting Data Volley information about all players;
- Processing Data Volley information in order to determine the progress or regress in player’s activities and find a model for their actions;
- Printing the final result of the research and development.

The following methods were used to achieve our goals:

- scientific research,
- statistical analysis,
- observation,
- comparative analysis.

Evaluation was done using the scale developed by the FIVB and presented in the Manual for FIVB Statistical Match Record (SMR), 1992. Their scaling on 5 levels for attack was as follows:

- 0 = wrong (-);
- 1 = keeping the ball in play to limit error (-0);
- 2 = continuation phase with limited tactical actions (0);
- 3 = continuation optimal conditions for of phase (+0);
- 4 = won (+).

Results

World Championship U20 qualification tournament took place in Bucharest, Rapid Hall. Romanian players were:

Table 1. Romanian national team composition

<table>
<thead>
<tr>
<th>Player’s name</th>
<th>Number</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.S.</td>
<td>1</td>
<td>Outside spiker</td>
</tr>
<tr>
<td>B.A.</td>
<td>2</td>
<td>Setter</td>
</tr>
<tr>
<td>F.L.</td>
<td>3</td>
<td>Middle blocker</td>
</tr>
<tr>
<td>R.A.</td>
<td>6</td>
<td>Opposite</td>
</tr>
<tr>
<td>D.I.</td>
<td>7</td>
<td>Setter</td>
</tr>
<tr>
<td>M.L.</td>
<td>8</td>
<td>Libero</td>
</tr>
<tr>
<td>U.A.</td>
<td>9</td>
<td>Middle blocker</td>
</tr>
<tr>
<td>T.S.</td>
<td>10</td>
<td>Opposite</td>
</tr>
<tr>
<td>D.L.</td>
<td>11</td>
<td>Outside spiker</td>
</tr>
<tr>
<td>R.R.</td>
<td>13</td>
<td>Outside spiker</td>
</tr>
<tr>
<td>M.V.</td>
<td>14</td>
<td>Middle blocker</td>
</tr>
<tr>
<td>P.M.</td>
<td>15</td>
<td>Outside spiker</td>
</tr>
</tbody>
</table>

Between January 9th and 11th Romanian team opponents were Russia, Israel and Germany.

Table 2. Romanian best spikers with Russia

<table>
<thead>
<tr>
<th>Player’s name</th>
<th>Position</th>
<th>Total player’s actions</th>
<th>Errors (out or net)</th>
<th>Blocked spikes</th>
<th>Scored points in attack</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.S.</td>
<td>Outside spiker</td>
<td>20</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>25%</td>
</tr>
<tr>
<td>R.A.</td>
<td>Opposite</td>
<td>13</td>
<td>3</td>
<td>0</td>
<td>4</td>
<td>31%</td>
</tr>
<tr>
<td>U.A.</td>
<td>Middle blocker</td>
<td>11</td>
<td>1</td>
<td>0</td>
<td>5</td>
<td>45%</td>
</tr>
<tr>
<td>T.S.</td>
<td>Opposite</td>
<td>15</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>33%</td>
</tr>
<tr>
<td>D.L.</td>
<td>Outside spiker</td>
<td>16</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>19%</td>
</tr>
<tr>
<td>R.R.</td>
<td>Outside spiker</td>
<td>6</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>17%</td>
</tr>
</tbody>
</table>
M. S. was the most efficient Romanian player (45% of 11 attack hit’s attempts) comparing with R. R.’s 17% efficiency (6 attack hit attempts). Among all players M. S. performed the highest attack hit number of attempts (20) but with only 25% efficiency. M. S., U. A. and T. S. won 5 points each. They were middle blocker and outside spikers. On the other hand R. R. won only 1 point.

Table 3. Romanian best spikers with Israel

<table>
<thead>
<tr>
<th>Player’s name</th>
<th>Position</th>
<th>Total player’s actions</th>
<th>Errors (out or net)</th>
<th>Blocked spikes</th>
<th>Scored points in attack</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.S.</td>
<td>Outside spiker</td>
<td>20</td>
<td>3</td>
<td>2</td>
<td>8</td>
<td>40%</td>
</tr>
<tr>
<td>R.A.</td>
<td>Opposite</td>
<td>12</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>25%</td>
</tr>
<tr>
<td>U.A.</td>
<td>Middle blocker</td>
<td>7</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>57%</td>
</tr>
<tr>
<td>T.S.</td>
<td>Opposite</td>
<td>14</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>29%</td>
</tr>
<tr>
<td>D.L.</td>
<td>Outside spiker</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>33%</td>
</tr>
<tr>
<td>R.R.</td>
<td>Outside spiker</td>
<td>14</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>29%</td>
</tr>
<tr>
<td>M.V.</td>
<td>Middle blocker</td>
<td>14</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>57%</td>
</tr>
</tbody>
</table>

Fig.1. The efficiency of spikers from Russia – Romania

![效率图](image-url)
U. A. and M. V. were the most efficient players (57%). U. A. scored 4 points of a total 7 attempts and M. V. 8 of 14 attempts. R. A. was the less efficient spiker (25% of a total 12 attempts) scoring only 3 points. Yet it may reveal that the spikers were pulling higher efficiency in this game than the game with Russia.

M.S. and M. V. scored the highest number of points (8 points each). They realized this attacking from middle and outside position. D.L. scored the lower number of points (2). Because of very tall Israeli block players the setter didn’t usually pass to D.L. That is why D.S. was less efficient.

Table 4. Romanian best spikers with Germany

<table>
<thead>
<tr>
<th>Player’s name</th>
<th>Position</th>
<th>Total player’s actions</th>
<th>Errors (out or net)</th>
<th>Blocked spikes</th>
<th>Scored points in attack</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.S.</td>
<td>Outside spiker</td>
<td>8</td>
<td>0</td>
<td>4</td>
<td>1</td>
<td>13%</td>
</tr>
<tr>
<td>F.L.</td>
<td>Middle blocker</td>
<td>8</td>
<td>1</td>
<td>0</td>
<td>5</td>
<td>63%</td>
</tr>
<tr>
<td>R.A.</td>
<td>Opposite</td>
<td>15</td>
<td>0</td>
<td>2</td>
<td>5</td>
<td>33%</td>
</tr>
<tr>
<td>U.A.</td>
<td>Middle blocker</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>100%</td>
</tr>
<tr>
<td>T.S.</td>
<td>Opposite</td>
<td>8</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>25%</td>
</tr>
<tr>
<td>D.L.</td>
<td>Outside spiker</td>
<td>15</td>
<td>3</td>
<td>1</td>
<td>5</td>
<td>33%</td>
</tr>
<tr>
<td>R.R.</td>
<td>Outside spiker</td>
<td>14</td>
<td>1</td>
<td>1</td>
<td>7</td>
<td>50%</td>
</tr>
<tr>
<td>M.V.</td>
<td>Middle blocker</td>
<td>11</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>36%</td>
</tr>
</tbody>
</table>

U.A. efficiency was 100% (3 attack hit attempts and 3 won points) compared with that achieved by M.S., 13% (8 attempts and only one point scored). We can highlight the fact that Romanian player’s efficiency in this match was higher than the game versus Russia.

The highest attempt numbers were realized by R.A. and D.L. (15 each) but only 5 won points each. Efficiency was 33%. Even if her efficiency was 100%, U.A. realized the lower number of attack hits, 3.

Table 5. Comparison between total points won by the spikers and total spiker’s attack hit attempts

<table>
<thead>
<tr>
<th>Game</th>
<th>Result</th>
<th>Points</th>
<th>Total attack hit attempts</th>
<th>Attack hit won points</th>
<th>Winning points</th>
<th>Spiker’s efficiency</th>
<th>Percentage between won attack hit number and team’s total number of points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Romania – Russia</td>
<td>1 – 3</td>
<td>68 – 99</td>
<td>94</td>
<td>68</td>
<td>28</td>
<td>30%</td>
<td>0.44%</td>
</tr>
<tr>
<td>Israel – Romania</td>
<td>3 – 0</td>
<td>75 – 65</td>
<td>87</td>
<td>65</td>
<td>33</td>
<td>38%</td>
<td>0.58%</td>
</tr>
<tr>
<td>Germany – Romania</td>
<td>3 – 0</td>
<td>78 – 56</td>
<td>84</td>
<td>56</td>
<td>34</td>
<td>40%</td>
<td>0.72%</td>
</tr>
</tbody>
</table>
Discussions and conclusions

Data Volley offers information about each player’s attack hit effectiveness. You can control the player’s performance for every attack hit method they use (Landau & Everitt, 2004, p.89). This Data Volley facility offer to the coach the opportunity to control the efficiency and distribution of different types of attack hits, setts, blocks and you can correlate them with rotation order, player’s position and reception.

Zetou et al. (2007) explain how the statistical evaluation of a team’s skill performance helped considerably with the development of the game of volley-ball.

The statistic data scouting through the Data Volley 2007 Media Software allows you to quickly transform what you see (the general skills performed by the players) into a standard code that is then analyzed by the computer.

Basically, the statistic scouting represents a structured model for describing the game in order to become a valid and significant support when making team and game decisions.

The possibility to analyze the match in real time is what we define the finishing touch to Data Volley! You can call a time-out and replay the serve directions of the other team to your team or you can focus on the attack directions in a specific rotation (USA Volleyball Organization, 2009, p. 72).

This kind of analysis, that can only be performed if the starting zones of the attacks or attack combinations have been scouted, allows you to view in detail, the game distribution of the setter, point by point. If you choose to analyses an attack after reception, an effect value will be displayed for the reception that preceded the attack (Florence et al., 2008)

The main advantages of using a model for the description are: abstraction, summary, low price and rapidity.

These features lead to the primal objective of the statistic data scouting: objectiveness.

Romanian players attack 94 times (92 spiker’s attack hits) during the match versus Russia. 28 (27 by the spikers) were total won attack hits.

The total points achieved in the attack in this match was number 28, of which 27 points were obtained spikers.

In the second game Romania played against Israel. In this game Romania performed less attack hit attempts than in the game with Russia. They realize 87 attack hit attempts, all of them by the spikers. Despite of that Romania won more points (33) than the previous match with Russia (28).

However, the total points achieved in the attack in this match were 33 in number, compared to the total points achieved in the game against Russia, which got only 28, all points are earned spikers.

In the last game, against Germany, Romania performed 84 attack hit attempts, 82 by spikers (the lowest number between these three matches).

In the last match against team Germany, Romania had 84 actions in the attack, 82 of which were made by the spikers, the game with the lowest number of total actions in attack.
Despite this facts, in this game Romania scored 34 points (32 by spikers) more than in the games with Russia (28) and Israel (33).

During the Women’s World Championship qualification tournament, Romanian team performed 265 attack hit attempts, won 198 points (95 scored by the spikers). Taking in consideration these three games we observe the total number attack hit attempts downward trend (94 attempt first game, 87 second and 84 the third) and attack hit winning points upward trend (28 points first match, 33 second and 34 the third). We noticed also that Romanian player’s efficiency increased every new game (first match 30%, second 38% and the third 40%) but the total scored point’s number decreased (68, 65 and 56).

We can estimate the nowadays high level volleyball performances using statistics during competitions and drills (Eloi, Laborie,& Schmit, 1998).

We need to use evaluation applications to obtain information about our or opponent team. Data Volley software is useful to evaluate different situations during the game. The coach can reevaluate in real time the match strategy.

Using Data Volley software Romania reached the same information level like the other teams. The coach could evaluate the performance of the players, especially spikers. Finally, we conclude that using Data Volley software was useful because the Romanian spikers’ efficiency increased during the competition (30%- first game, 38%- second and 40%-the third). All the information received concludes that we can obtain an attack hit model for all the junior spikers involved in high level volleyball.

We recommend Data Volley software to be used by all the junior clubs to determine and value the volleyball player’s actions.

References


THE USE OF THE MIRROR FOR STIMULATING THE HAND GRIP STRENGTH THROUGH VISUAL FEEDBACK

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Abstract. Through visual control the maximum strength increases in young adults, female and male as well, well-trained and untrained. The study aimed to examine whether the use of the mirror stimulates the hand grip (HG) strength through visual feedback. A number of 125 male and 68 female subjects of medium age 20.74 and 20.22 respectively participated in our study. They were divided in 6 groups, according to the physical activity performed. Data was recorded in three different situations: without visual control (T1), with visual control (T2) and with visual control through the mirror (T3). Elements of descriptive statistics were calculated, while the data was presented as indicators of centrality, location and distribution. In the case of female subjects, as well as in the case of male subjects differences in the values recorded between the tests T1 as compared to T3 are recorded, while the data for the right hand in male subjects are statistically relevant. Also differences between the values of the left hand (LH) and the right hand (RH) are determined. The use of the mirror may positively influence the stimulation of the hand grip strength through visual feedback.

Keywords: mirror, hand grip, strength.

Introduction

During physical activity besides the proprioceptive and vestibular feedback, the visual feedback offers information on the trajectory of the movement, playing an important part in the precise and controlled execution (Darbutas et al., 2012). 90% of information obtained from the environment is acquired through the visual analyzer. HG strength refers to the ability of the fingers and the hand to generate power and muscle strength. Grip strength can be trained in sporting exercises, which imply handling a ball and carrying out hand grips (Chang et al., 2010). The values of the maximal isometric grip strength were used as valid indicators of the total strength of the upper limb (Adams et al., 2004), of the total body strength (Niebuhr and Marion, 1990), of the extensor muscles of the spine (Sinaki, 1989) or of the strength of muscles realizing the respiratory movement (Sahin et al., 2004). Desrosiers et al. (1995, cited by Darvishi et al., 2013) showed that the grip strength is influenced by the age. In addition, they showed that the grip strength can be estimated based on gender, environment and body height.

It was shown that the maximum isometric strength increases through visual control and verbal encouragement at the level of: the quadriceps femoris muscle and the hamstring muscles in young male and female adults (Campenella, Mattacola, & Kimura, 2000); the quadriceps femoris muscle in trained and untrained female students (Amagliani, Peterella, & Jung, 2010).

Some studies suggested that visual feedback increases motivation and this way more motor units are activated, resulting in increased maximal force (Kuntz, 2006; Amagliani, Peterella, & Jung, 2010). Darbutas et al. (2012) showed that testing muscle strength in the absence of visual feedback on the isometric contraction of the flexor carpi ulnaris and palmaris longus in female and male subjects post cerebrovascular accident (CVA), with a 20% loading of the maximum strength was realized with more errors as compared to healthy subjects, while visual information plays a significant role in neuromuscular activity.

Voluntary muscle activity, irrespective of the intensity, is realized by impulses sent to the brain cortex, through motor neurons originating in the frontal lobe (Al Marsi, 2011). The motor neurons, located in the precentral gyrus (M1) and premotor gyrus (PMA) of the parietal lobe (Heyes, 2009; Catmur et al., 2011), are specific due to their capacity of sending nervous impulses to effectors also if the subject only observes an activity carried out by another person. These neurons are called mirror neurons due to the fact that they can transform sensory information into motor impulse in order to display the executed model (Sinigaglia & Rizzolatti, 2011; Lago-Rodriguez, Lopez-Alonso, & Fernández-del-Olmo, 2013). It has been proven that the functioning mechanism of mirror neurons is the understanding of the purpose of the observed activity (Rizzolattii & Fabbri-Destro, 2008; Sinigaglia, 2011). The mirror represents a visual feedback, but regarding its use opinions diverge. Some studies show that following the movements in the mirror while motor learning has positive effects; in the case of the training of dancers it facilitates the correction of the posture and long-term learning of complex movements (Dearborn & Ross, 2006). Taking into account this somewhat similar study the recruitment of more motor units
during performing a movement concomitant with the visualization of the same movement performed by somebody else was observed (Capa et al., 2010). Other studies show that the use of the mirror is inopportune due to negative effects such as distraction (Thieme et al., 2012) or creating an inferior image of the body aesthetics, because of self-evaluation as a result of comparison with others (Radell, Adame, & Cole, 2004).

The aim of this study is to determine the influence of visual feedback on muscular contraction, i.e. HG under three different circumstances: without visual control, with visual control and with visual control in the mirror.

Materials and methods

The study was conducted on a number of 193 subjects, students of the Babeș-Bolyai University from Cluj-Napoca and rugby players of the female and the male rugby teams of the Sporting Club Universitatea Cluj from Cluj-Napoca. Out of these 125 were male subjects with an average age of 20 years and 68 female subjects with an average age of 19 years, divided into 6 groups: group I – male, first year Psychology students (n = 45), untrained (physical exercise less than 3 times a week) and with an average age of 20 years; group II – male, first year Physical Education students (n = 55), with regular physical activity (at least 6 times a week) and an average age of 20 years; group III – male, rugby players of the rugby team Universitatea Cluj from Cluj-Napoca (n = 25), with regular high performance physical activity and an average age of 23 years; group IV – female, first year Psychology students (n = 10), untrained (physical exercise less than 3 times a week) and with an average age of 19.5 years; group V – female, first year Physical Education students (n = 44), with regular physical activity (at least 6 times a week) and an average age of 19 years; group VI – female, rugby players of the rugby team of Universitatea Cluj from Cluj-Napoca (n = 14) with regular high performance physical activity and an average age of 21 years. The groups were divided according to gender and the level of physical fitness.

Recorded tests: T1 – with the eyes closed, T2 – with the eyes opened, looking at the hand, T3 – with the eyes opened looking into the mirror. The study was conducted within the “Iuliu Hațieganu” sporting centre in Cluj-Napoca during April-May 2015.

Before joining in the study the participants signed an informed consent, showing the purpose of the study and the procedure to be followed. The criteria for including subjects in the study were: aged between 18 and 25 years, no skin disorders, the absence of any type of motor impairment in the upper extremity and the cognitive ability to understand the instructions given. Exclusion criteria were represented by pain or restriction of the arm or hand at the time of examination, conditions interfering with normal growth, neuromuscular and generalized bone diseases, and the inability to use the dynamometer as instructed.

HG strength measurements of both the dominant and non-dominant side were performed with each subject standing, the shoulder at $0^\circ$ of flexion, and the elbow in full extension using a standard HG dynamometer (Lafayette Instruments, Lafayette IN, US). The arm was halfway between internal and external rotation of the shoulder and the palm was facing towards the body.

Each subject was instructed to perform one sub-maximum and one near maximum effort attempt for warm up following by three attempts of maximum efforts, squeezing the handle of the instrument as hard as possible. Fifteen to twenty seconds rest was allowed between each attempt. One-minute break was the interval between testing of the dominant and non-dominant hand. The best of the three maximum efforts was used in the statistical analysis.

Elements of descriptive statistics were calculated, while the data was presented as indicators of centrality, location and distribution.

For the testing of the normal distribution the Shapiro-Wilk test was used. In the case of data with normal distribution the t (Student) test was used, whereas in the case of data with uneven distribution or ranks the non-parametric Mann-Whitney (U) test was used for two unmatched pairs or Wilcoxon in the case of two matched pairs. In order to analyze three or more pairs the test ANOVA was used in the case of data with normal distribution or the non-parametric Kruskal-Wallis test in the case of values with uneven distribution or ranks. The significance limit for the tests used was $\alpha = 0.05$ (5%), 0.01 (1%) or 0.001.

The statistical processing was conducted using the StatsDirect v.2.7.2 program with the online application OpenEpi 3.03 and the Excel application (from the Microsoft Office 2010 package).

Your methods section provides a detailed overview of how you conducted your research. The methods section includes the following sub-sections: participants, apparatus and materials, procedure.
Results

Within the statistical analysis of the values referring to the strength of the palmar flexors the different tests show the following: for the right hand – very significant differences from a statistical point of view between the tests T1-T3 in the case of group I (p < 0.01) and statistically significant differences between the tests T2-T3 in the case of group II (p < 0.05) and between the tests T1-T3 in the case of group III (p < 0.05), in the case of groups IV, V, VI differences of no statistical significance were recorded; for the left hand – no statistically significant differences were observed between the different tests for the studied groups (p > 0.05) (Table 1).

Table 1. Comparative analysis of the values referring to the strength of the palmar flexors between the two hands (kgf) for the studies groups and the statistical significance

<table>
<thead>
<tr>
<th>Group</th>
<th>Hand</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SE</td>
<td>Mean</td>
<td>SE</td>
</tr>
<tr>
<td>I</td>
<td>Right</td>
<td>33.18</td>
<td>1.96</td>
<td>35.04</td>
</tr>
<tr>
<td></td>
<td>Left</td>
<td>33.69</td>
<td>1.59</td>
<td>33.78</td>
</tr>
<tr>
<td>II</td>
<td>Right</td>
<td>47.85</td>
<td>0.99</td>
<td>48.35</td>
</tr>
<tr>
<td></td>
<td>Left</td>
<td>47.27</td>
<td>1.01</td>
<td>46.80</td>
</tr>
<tr>
<td>III</td>
<td>Right</td>
<td>47.48</td>
<td>2.03</td>
<td>49.56</td>
</tr>
<tr>
<td></td>
<td>Left</td>
<td>44.64</td>
<td>1.77</td>
<td>45.96</td>
</tr>
<tr>
<td>IV</td>
<td>Right</td>
<td>26.40</td>
<td>1.42</td>
<td>28.20</td>
</tr>
<tr>
<td></td>
<td>Left</td>
<td>23.60</td>
<td>2.53</td>
<td>23.80</td>
</tr>
<tr>
<td>V</td>
<td>Right</td>
<td>17.09</td>
<td>0.66</td>
<td>17.05</td>
</tr>
<tr>
<td></td>
<td>Left</td>
<td>15.41</td>
<td>0.81</td>
<td>14.80</td>
</tr>
<tr>
<td>VI</td>
<td>Right</td>
<td>15.93</td>
<td>1.76</td>
<td>17.14</td>
</tr>
<tr>
<td></td>
<td>Left</td>
<td>17.57</td>
<td>1.98</td>
<td>16.36</td>
</tr>
</tbody>
</table>

Statistical significance (p)

<table>
<thead>
<tr>
<th>Group</th>
<th>Moment</th>
<th>Right Hand</th>
<th>Left Hand</th>
<th>Group</th>
<th>Moment</th>
<th>Right Hand</th>
<th>Left Hand</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>T1-T2</td>
<td>0.1755</td>
<td>0.8092</td>
<td>T1-T2</td>
<td>0.2247</td>
<td>0.8534</td>
<td></td>
</tr>
<tr>
<td></td>
<td>T1-T3</td>
<td>0.0014</td>
<td>0.5275</td>
<td>IV</td>
<td>T1-T3</td>
<td>0.3823</td>
<td>0.4174</td>
</tr>
<tr>
<td></td>
<td>T2-T3</td>
<td>0.1877</td>
<td>0.2264</td>
<td>T2-T3</td>
<td>0.0957</td>
<td>0.2367</td>
<td></td>
</tr>
<tr>
<td></td>
<td>T1-T2</td>
<td>0.4104</td>
<td>0.2645</td>
<td>T1-T2</td>
<td>0.9814</td>
<td>0.1788</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>T1-T3</td>
<td>0.2758</td>
<td>0.0828</td>
<td>V</td>
<td>T1-T3</td>
<td>0.7457</td>
<td>0.525</td>
</tr>
<tr>
<td></td>
<td>T2-T3</td>
<td>0.0349</td>
<td>0.2485</td>
<td>T2-T3</td>
<td>0.2346</td>
<td>0.4798</td>
<td></td>
</tr>
<tr>
<td></td>
<td>T1-T2</td>
<td>0.076</td>
<td>0.605</td>
<td>T1-T2</td>
<td>0.4648</td>
<td>0.2754</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>T1-T3</td>
<td>0.0231</td>
<td>0.1289</td>
<td>VI</td>
<td>T1-T3</td>
<td>0.0641</td>
<td>0.3804</td>
</tr>
<tr>
<td></td>
<td>T2-T3</td>
<td>0.978</td>
<td>0.9187</td>
<td>T2-T3</td>
<td>0.25</td>
<td>&gt; 0.9999</td>
<td></td>
</tr>
</tbody>
</table>

Within the statistical analysis of the values referring to the grip strength, taking into account all male groups I, II, III, in the three tests conducted there were observed highly significant differences from a statistical point of view between at least two groups for the right hand, as well as for the left hand (p < 0.001).

In the case of the female groups IV, V, VI, there were observed highly significant differences from a statistical point of view between at least two groups for the right hand (p < 0.001) and very significant differences from a statistical point of view between at least two groups for the left hand (p < 0.01).

The statistical significance (p) for the comparative analysis of the values referring to the grip strength for both hands (kgf), for male and female groups, and the three different tests recorded are displayed in Table 2.
ing the opposing limb in all male groups, the Physical Education students and the rugby players displayed significantly superior palmar muscle strength. For the female groups the biggest discrepancy is to be observed in all tests between untrained subjects and Physical Education students. Big differences between the subjects of group IV and group VI were only found in the first two tests.

The analysis of the muscle strength between genders showed highly significant differences in the analysis of groups II-V and III-VI and very significant differences between the groups I-IV, for the upper right limb, and the upper left limb as well (Table 1).

Discussions and conclusions

The aim of this study was to determine whether direct visualization or visualization through the mirror of the maximal HG can be influenced as compared to realizing the maximum grip without visual control, for the right and for the left hand.

The results obtained show that the presence of visual control through the mirror influences the grip strength only in the case of the male groups and only for the right hand, whereas the differences recorded in the case of the female groups are not significant from a statistical point of view.

The differences found in the female groups between untrained and trained subjects or female rugby players are somewhat similar to the results obtained by MacDonald et al. (2014) within the analysis of the bilateral limb deficiency, comparing untrained female subjects with swimmer subjects. They analyzed the isometric muscular strength in lower and upper limbs, unilateral and bilateral, but they did not determine significant differences between the two groups. The significance of the results we found in the case of groups IV, V and VI might be influenced by the type of dynamometer used and the position, in which the evaluation was realized. Some studies suggested that the evaluation be done sitting with the upper limb horizontally lying in sagittal plane and the elbow in a 90° angle (Demura, Aoki, & Sugiura, 2011) or sitting with the arm in adduction and the elbow in a 90° angle (Martin-Martin & Cuesta-Vargas, 2014; Hepping et al., 2015), while others standing with the arm in a 90° angle and the elbow in a 90° angle, with lateral orientation with regard to the body (Darvishi et al., 2013) or with the upper limb in adduction beside the body and the elbow in pronosupination (Kubota & Demura, 2011; Mandalidis & O’Brien, 2008). Also, some studies doubled the evaluation through electromyography (Martin-Martin & Cuesta-Vargas, 2014; MacDonald et al., 2014).

In the case of our study however significant differences of the grip strength between the right hand and the left hand were recorded in group V, in the case of each test. These results can be explained by the frequent playing of ball sports such as basketball, handball and volleyball as part of the university curriculum and which imply the unilateral development of muscle strength. The absence of significant differences between upper limbs in untrained female subjects and female rugby players was surprising, but a possible explanation is delivered by the fact that group V and group VI were more varied as regarding the dominant limb. According to the conclusions drawn by Hepping et al. (2015), females with dominant left hand are stronger with it. Higher diversity of the dominant limb within the same group increases the probability that similar results appear when comparing the two upper limbs. Within the study Hepping et al. (2015) also found identical muscular strength or even increased muscle strength in the non-dominant limb with male left handed dominant subjects, a theory set out and proved in adults by Incel et al. (2002) and Petersen (1989).

In contrast to the results obtained by Chang et al. (2010), the comparison of the three different tests conducted showed significant differences only in the upper right limb of the male subjects. Chang et al. (2010) studied the influence of Kinesio Taping on the development of maximum palmar strength and its proprioception, through the presence or absence of visual feedback in the mirror, in young male athletes. Using the Kinesio Taping confirmed the improvement of proprioception, but not of muscle strength as well. In this study the visual control seems to play an important part in producing the maximum palmar muscle strength for the dominant hand, as there is a

<table>
<thead>
<tr>
<th>Group</th>
<th>Hand</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-II-III</td>
<td>Right</td>
<td>&lt; 0.0001</td>
<td>&lt; 0.0001</td>
<td>7.43 x 10^-9</td>
</tr>
<tr>
<td></td>
<td>Left</td>
<td>&lt; 0.0001</td>
<td>1.16 x 10^-11</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>IV-V-VI</td>
<td>Right</td>
<td>&lt; 0.0001</td>
<td>&lt; 0.0001</td>
<td>0.0027</td>
</tr>
<tr>
<td></td>
<td>Left</td>
<td>0.0043</td>
<td>0.0019</td>
<td>0.0321</td>
</tr>
</tbody>
</table>

Table 2. Statistical significance (p) for the comparative value analysis
significant difference between the first and the last test in untrained subjects and an insignificant difference in rugby players.

Starting from the results found by Hepping et al. (2015), referring to the fact that people with dominant right upper limb present a strength difference of 10% as compared to the non-dominant left limb, but not if the dominant limb is the left one, it is possible that this strength is more or less developed according to the presence or absence of the visual feedback.

In the case of the group of the male rugby players all three tests of the upper right limb showed significantly superior results as compared to the untrained subjects or Physical Education students, as compared to the group of the female rugby players, which presented more significant differences in the presence of the visual stimulus (test 2 and test 3). Martin-Martín and Cuesta-Vargas (2014) conducted a kinematic and electromyographic analysis for six types of grip on male and female subjects, all with dominant right hand. They observed the most intense muscle activity in the case of ball grip. Also the involvement to the highest degree of the flexor carpi ulnaris was determined in the case of the strength grip. These conclusions support our results and explain the superior muscle strength of rugby players of both genders.

The results of our study are in accordance with the results described by Kubota and Demura, (2011). They studied divergences between the two genders referring to the maximum palmar muscular strength and the exercising of controlled muscle strength, i.e. grabbing objects with the appropriate strength. Values of the superior muscle strength in both upper limbs with the males were found, but the exercising of controlled muscle strength was similar in the two groups. Playing rugby implies handling the ball under visual control, so it is possible that the differences are present only in developing the strength as shown by the present study.

Visual control through the mirror determines the improvement of grip strength in the right hand in male subjects, as compared to female subjects.

Visual control through the mirror determines the improvement of grip strength in the right hand in subjects with occasional physical activity.

Visual control through the mirror determines the improvement of grip strength in the right hand in subjects with regular physical activity, as compared to visual control without the mirror.

Visual control through the mirror determines the improvement of grip strength in the right hand in subjects with high performance physical activity, as compared to grip with closed eyes.

Visual control through the mirror determines growth of grip strength in the right hand in male subjects, as compared to female subjects.

Visual control in the mirror determines significant increase of the grip strength in the right hand in female subjects with regular physical activity.

References


THE UTILIZATION OF CRITICAL SWIMMING SPEED IN TRAINING THE AEROBIC CAPACITY OF YOUNG SWIMMERS

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Abstract. When training the aerobic capacity of young swimmers (9-11 years old), the coach plays a crucial role in helping them find the adequate speed with which they swim in order to obtain the adaptation one would expect. Training groups with large numbers of swimmers represents an even bigger challenge for coaches, and therefore simple but effective methods of structuring training sets are required. Through this paper, we aimed to show the effects of using critical swimming speed in training the aerobic capacity of young swimmers (9-11 years old). We tested the aerobic capacity of the young swimmers from both the control and experimental groups with the T-2000 test. The data were subsequently processed using statistical and mathematical methods. Comparing the results of T-2000 test, before and after using the critical swimming speed, we observed that the group of young swimmers who used this speed in training presented a more significant improvement of the aerobic capacity than the control group.

Keywords: critical swimming speed, aerobic capacity, young swimmers.

Introduction

It is widely accepted that the aerobic capacity is a key factor in order to achieve success in the sport of swimming. The swimmers level of aerobic training will influence the outcome, whether you are racing a 50 meters sprint or a long distance event such as the 1500 meters.

Aerobic training is largely considered to be the most important aspect of physical fitness and “all athletes can benefit from maximizing their endurance” (Wilmore, Costill, & Kenney, 2008, p. 245). “This aerobic and endurance training should begin before maturation and general application and will stay with the swimmer through post-maturation involvement in swimming” (Sweetenham & Atkinson, 2003, p. 13). “Aerobic training, or cardio respiratory endurance training, improves central and peripheral blood flow and enhances the capacity of the muscle fibers to generate greater amounts of adenosine triphosphate” (Wilmore, Costill, & Kenney, 2008, p. 222).

Olbrecht (2000) claims that “the better the aerobic system is developed, the more oxygen can be used and the faster one can swim during prolonged exercises. The aerobic capacity is therefore the major factor determining performance in long distance events” (p. 53).

Aerobic training is defined by Sweetenham and Atkinson (2003) as “doing the greatest amount of work in the shortest possible time, with the least amount of rest, without the heart rate exceeding 40 beats below maximum” (p. 13).

In order to avoid expensive and invasive blood lactate testing and starting from the concept of “critical power”, as proposed by Monod and Scherrer (1965), Wakayoshi et al. (1992) validated the use of critical swim speed as a way of measuring the aerobic capacity. Studies from Hill (1993) and Toussaint et al. (1998) further confirmed the validity of the method.

Ginn (1993) defines critical speed as “the highest sustainable work rate which enables lactate to remain in a steady-state; it is similar in definition (though not in exercise intensity) to the anaerobic threshold or OBLA (onset of blood lactate accumulation)”.

“Studies undertaken by Faina et al. (1988) and Wakayoshi et al. (1992) have shown that critical swim speeds elicit mean steady-state blood lactate values of 5.5 and 8.9 mmol.L⁻¹” (Ginn, 1993).

For this present research, we selected two groups of young swimmers (boys and girls) with ages between 9 and 11, irrespective of their level of performance.

The two groups of subjects were tested at the beginning and at the end of the observation period with the aim to calculate the degree of improvement in their aerobic capacity. Their aerobic capacity was tested with the T-2000 test.

The main objective of this research paper is to obtain conclusive data on how training sets designed on the results of the Critical Swim Speed Test (CSS Test) can facilitate the improvement of the aerobic capacity of young swimmers.

Hypothesis. The aerobic capacity of young swimmers aged 9-11 can be improved by using training sets designed on their critical swim speed.
Materials and methods

In developing this paper, we used the experimental method, controlled observation, testing method (T-2000 Test, Critical Swim Speed Test), the graphic method and the statistical-mathematical method with the following indices: the mean, the standard deviation and the variance.

Duration, location and the subjects

The research was conducted at Aqua Team Sports Club Bucharest.

The study lasted 66 days, starting on 22 February 2016 and ending on 28 April 2016. The twenty subjects with ages between 9 and 11 were randomly divided into two groups.

All the subjects had the same amount of training hours and swam similar volumes during the observation period.

The Test Group was submitted to both the T-2000 Test and the Critical Swim Speed Test. Using the results from the Critical Swim Speed Test, the Test Group was submitted to a training program similar to the Control Group's, but with an emphasis on controlling the swim speed to the values indicated by the Critical Swim Speed Test. The Tempo Trainer Pro was used to help control swimming speed.

The Control Group only completed the T-2000 Test.

The Critical Swim Speed Test (CSS Test)

The Critical Swim Speed Test or CSS Test is used to determine the swimming velocity at the athletes maximal lactate steady state.

The test consists of completing two time trials of 400 meters and 200 meters, after a proper warm up of about 1000 meters. The swimmers should try to swim the two distances as fast, yet evenly paced as possible and will start with a push off from the wall, not a dive start.

The 400 m time trial is swam first because it’s less likely to influence the 200 m time trial.

Complete recovery is mandatory between time trials.

The two recorded values are then placed in the following formula:

\[ \text{CSS (m/sec)} = \frac{D2-D1}{T2-T1} \]

where D2 = 400 meters, D2 = 200 meters, T2= time for 400 meters, T1= time for 200 meters (Ginn, 1993).

The swimming speed is then used to design training sets.

The T-2000 test

The T-2000 test (Maglischo, 2003) was used to test changes in aerobic capacity of the swimmer. This involves that the swimmer should swim as fast as possible a distance of 2000 meters, and the lap times in every 100 meters to be equal between them.

The times for every 100 meters should correspond to the anaerobic threshold, the swimmer being compelled to maintain this speed throughout the test. In the eventuality that there is a difference bigger than 4 seconds between the fastest and the slowest 100 meters, the result of the test is disregarded. The final time after 2000 meters is recorded.

The apparatus/equipment used

The Finis Tempo Trainer Pro is a small device that creates an audible beep on a designated pattern (underwater metronome).

The Tempo Trainer Pro has three modes:

a) Mode 1 - it is used to monitor and set the stroke rate in which you swim;
b) Mode 2 - it gives you the ability to set the pace for consecutive laps;
c) Mode 3 - this is used to monitor and set the stroke rate per minute.

This device is cheap and very easy to use even for young swimmers as the ones that took part in our research.

Results

In Table 1, we show the results of Critical Swim Speed Test for the Test Group.
Table 1. Results of the Critical Swim Speed Test

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Age</th>
<th>Sex</th>
<th>200 m</th>
<th>400 m</th>
<th>CSS</th>
<th>Tempo Trainer Pro Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>S.D.</td>
<td>9</td>
<td>M</td>
<td>02:54:00</td>
<td>05:54:00</td>
<td>01:30:00/100 m</td>
<td>29.97</td>
</tr>
<tr>
<td>2</td>
<td>M. I.</td>
<td>11</td>
<td>F</td>
<td>02:33:00</td>
<td>05:19:00</td>
<td>01:23:00/100m</td>
<td>27.64</td>
</tr>
<tr>
<td>3</td>
<td>A. A.</td>
<td>10</td>
<td>F</td>
<td>02:47:00</td>
<td>05:47:00</td>
<td>01:30:00/100 m</td>
<td>29.97</td>
</tr>
<tr>
<td>4</td>
<td>S. T.</td>
<td>10</td>
<td>M</td>
<td>02:35:00</td>
<td>05:26:00</td>
<td>01:26:00/100m</td>
<td>28.47</td>
</tr>
<tr>
<td>5</td>
<td>N. A.</td>
<td>11</td>
<td>M</td>
<td>02:43:00</td>
<td>05:49:00</td>
<td>01:33:00/100m</td>
<td>30.97</td>
</tr>
<tr>
<td>6</td>
<td>B. A.</td>
<td>10</td>
<td>F</td>
<td>03:04:00</td>
<td>06:23:00</td>
<td>01:40:00/100m</td>
<td>33.13</td>
</tr>
<tr>
<td>7</td>
<td>D. B.</td>
<td>10</td>
<td>F</td>
<td>02:46:00</td>
<td>06:10:00</td>
<td>01:42:00/100m</td>
<td>33.97</td>
</tr>
<tr>
<td>8</td>
<td>R. C.</td>
<td>10</td>
<td>F</td>
<td>03:01:00</td>
<td>06:29:00</td>
<td>01:46:00/100m</td>
<td>35.3</td>
</tr>
<tr>
<td>9</td>
<td>G. V.</td>
<td>9</td>
<td>M</td>
<td>03:12:00</td>
<td>06:29:00</td>
<td>01:39:00/100m</td>
<td>32.8</td>
</tr>
<tr>
<td>10</td>
<td>G. C.</td>
<td>11</td>
<td>M</td>
<td>02:45:00</td>
<td>05:46:00</td>
<td>01:31:00/100m</td>
<td>30.14</td>
</tr>
</tbody>
</table>

Table 2. Results of the T-2000 tests before and after the observation period

<table>
<thead>
<tr>
<th>Control Group</th>
<th>Test Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td>Name</td>
</tr>
<tr>
<td>-----</td>
<td>--------</td>
</tr>
<tr>
<td>1</td>
<td>I. L.</td>
</tr>
<tr>
<td>2</td>
<td>A. A.</td>
</tr>
<tr>
<td>3</td>
<td>C. S.</td>
</tr>
<tr>
<td>5</td>
<td>G. A.</td>
</tr>
<tr>
<td>6</td>
<td>C. A.</td>
</tr>
<tr>
<td>7</td>
<td>B. R.</td>
</tr>
<tr>
<td>8</td>
<td>T. B.</td>
</tr>
<tr>
<td>9</td>
<td>B. L.</td>
</tr>
</tbody>
</table>

Table 2, Fig. 1 and Fig. 2 contain the results of the two T-2000 tests that were carried out before and after the observation period.

![Figure 1](image-url)
From the results of the T-2000 test, both groups improved their average times from 32:37.9 (min/sec) to 32:33.1 for the Control Group and from 32:32.1 to 32:24.3 for the Test Group as seen in Fig. 3 and Fig. 4.

Analyzing at the difference between the average improvements, we can observe that the Test Group managed to surpass the Control Group with 3.1 seconds. This means that they improved with 35% more in the same length of time.
Discussions and conclusions

The aerobic capacity is an important factor in creating fast and competitive swimmers. Comparing the results of the Test Group and the Control Group, the young swimmers from the Test Group who have used the Critical Swimming Speed as a waypoint in training, improved their aerobic capacity by a greater margin.

The aerobic capacity of young swimmers, aged 9-11, can be improved by using training sets designed on their critical swim speed – the research hypothesis is confirmed.

This implies that the use of critical swim speeds can help coaches design training sets for improving the aerobic capacity of young swimmers with greater accuracy. It is an easy method to implement regardless the number of swimmers involved. More so, the purchase of an equipment such as the Finis Tempo Trainer does not require large sums of money. Underwater metronomes are cheap and easy to acquire on the ever-growing market specialized in training equipment.

References


MacLaren, D., & Coulson, M. (2002). Critical swim speed can be used to determine changes in training status. Liverpool: John Moores University.


HYPERACTIVITY\IMPULSIVITY AMELIORATION EFFECTS OF A FENCING TRAINING PROGRAM ON CHILDREN DIAGNOSED WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER

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Abstract. Background: Attention Deficit Hyperactivity Disorder (ADHD) according to Diagnostic and Statistical Manual of Mental Disorders – 5 (DSM-5) is characterized by a pattern of behavior, present in multiple settings (e.g., school and home), that can result in performance issues in social, educational, or work settings. During the last decades a tremendous effort was done in establishing adequate methods to delimitate the symptoms and ameliorate the performance issues. As Physical Activity (PA) was previously found to be such a method and fencing being a combat type PA, the aim of this study is to examine the influence of a fencing training program activated on ADHD diagnosed children. The present article focuses mainly on the Hyperactivity\Impulsivity aspect. Methods: The study samples part of the study population are (N=40) all children (mean age 10) diagnosed with ADHD divided into two groups; one of them (N=20, 10 boys and 10 girls) experimental fencing training group compared to a control group (N=20, 10 boys and 10 girls) about the same age and characteristics undergoing only a Physical Education (PE) training program. Results: All groups’ data were processed statistically to evaluate reliability using Cronbach’s Alpha and obtained values above 0.75, indicating of high reliability. Conclusions: Fencing training program was found to yield higher impact on moderating Hyperactivity\Impulsivity symptoms over PA study population group undergoing PE training program.

Keywords: ADHD, fencing, PA, PE.

Introduction

According to DSM 5 released by the American Psychiatric Association and used in USA “ADHD is a neurodevelopmental disorder defined by impairing levels of inattention, disorganization, and/or hyperactivity-impulsivity. Inattention and disorganization entail inability to stay on task, seeming not to listen, and losing materials, at levels that are inconsistent with age or developmental level. Hyperactivity-impulsivity entails overactivity, fidgeting, inability to stay seated, intruding into other people’s activities and inability to wait – symptoms that are excessive for age or developmental level”. The term used by the International Classification of Mental and Behavioral Disorders 10th revision ICD10 widely used in Europe is hyperkinetic disorder (HKD).

Hyperactivity refers to excessive motor activity as running about when it is not appropriate, or excessive fidgeting, tapping, or talkativeness. Impulsivity may reflect a desire for immediate rewards without consideration and refers to hasty actions that occur without forethought like leaping into the street without looking or interrupting others excessively.

Population surveys propose that ADHD occurs in most cultures in about 5% of children and about 2.5% of adults being about 3 times more common in boys than in girls and, according to Faraone (1998), the inattentive type is about 3 times more persistent than the hyperactivity-impulsivity type. Primary deficits of ADHD may cause impairments in social communication and functional restriction of effective communication, social participation, or academic achievement. ADHD is most often identified during elementary school years, and inattention becomes more prominent and impairing.

According to Searight (2012) stimulant pharmacotherapy is the evidence-based treatment of choice for ADHD, complementary and alternative medicine (CAM) therapies are becoming increasingly common treatments for this clinical condition. PA and the relationship to ADHD were deeply investigated during the past years from several aspects Rommel (2015). A 10 week moderate to high-intensity PA program on fitness, cognitive functions, and ADHD-related behavior in children by Verret (2012) concluded that structured PA program may have clinical relevance in the functional adaptation of children with ADHD and promoting habitual PA through organized sports, aim to help manage symptoms of ADHD Wigal (2012) and Smith (2013). Effects of before school PA and sedentary classroom based (SC) interventions on the symptoms, behavior, moodiness, and peer functioning of young children (Mean=6.83) at risk for attention-deficit/hyperactivity disorder by Hoza (2015) concluded that PA intervention may reduce impairment associated with ADHD-risk in both home and school domains. The hypothesis that aerobic exercise might be an effective adjunctive therapy for enhancing the effects of methylphenidate on the clinical symptoms, cognitive function, and brain activity was investigated by Choi (2014) during a six week methylphenidate treatment + exercise or methylphenidate treatment + education and concluded
that aerobic exercise increased the effectiveness of methylphenidate on clinical symptoms, perseverative errors, and brain activity.

Broad research including 11,676 German children and adolescents (6–17 years) overweight/obese children conducted by Egmond-Frohlich (2012) relating a wide range of parameters among them PA, correlated PA as reducing the risk for ADHD symptoms. Equivalent conclusion was repeated by Berger (2014) with 1,615 German adolescent undergoing excessive exercising, resulting in partial suppression of ADHD symptoms.

Meta-analysis by Cerrillo-Urbina (2015) on short-term aerobic exercise, based on several aerobic intervention formats, elucidate it seems to be effective for mitigating symptoms such as attention, hyperactivity, impulsivity, anxiety, executive function and social disorders in children with ADHD. A foreplay explanation for ADHD perception tested on rats is revealed by Robinson (2012) and Wigal (2003) suggest that catecholamine excretion after a minimally invasive, non-pharmacologic exercise challenge in children with ADHD is deficient compared with healthy control children. Also Taylor (2009), indicate that the environment at which the PA take place can affect the results.

Although the design and the exercise interventions featured in the studies Gapping (2011) varied considerably, all showed that exercise reduced the symptoms of ADHD and led to improvements in emotional functioning, expression of anxiety or depression symptoms Kiluk (2009), executive functions Gapin J. (2010), social behavior, motor skills, strength, neural functioning Berwid (2012) and neuropsychological parameters - Kamp (2014). Even studies with ambiguous results like eye blink rate agreed with latest conclusion – Tantillo (2002).

Fencing is one of the most ancient forms of sport activity that developed since man held a stick in his hand. Later on that stick became sharp and made from bronze and iron – the sword. As Sir Richard F Burton in his book The Book of the Sword (1884) stated: “The history of the sword is the history of humanity”. Historically, the Greeks included fencing in the first Olympic Games in 776 BC, then it evolved throughout the years from a fundamental defensive method to combat used by armies in war affairs and later was refined to a noble way of solving personal affairs – Live by the sword, die by the sword. In the late 19th century, after many countries had outlawed the duel, fencing became an organized sport being one of five sports which have been featured at every one of the Modern Olympic Games since Athens 1896. Recently as the self-consciousness of the society grows, fencing starts spreading its roots into the field of healing methods by making use of the skills important to a warrior, such as speed, strength, accuracy and courage as a means for developing self-perceptions, of competence in various areas of ability and function, self-confidence, physical conditioning, and emotional balance.

Study held by Vetropoulos (2010) investigating visual memory task and spatial anticipation task of 15 to 22 years old athletes found significant difference between fencers & swimmers in the Brixton Spatial Anticipation Test (BSAT) getting to the conclusion that fencers are superior in rule detection, comparing to swimmers. Other studies attempt to characterize the fencer profile using a multiple anthropometric variables, Alberto Ochoa (2013) and brain activity.

The purpose of the present study was to evaluate the possible effect of a fencing training program on ADHD symptoms among elementary school age children.

Materials and methods

Participants

Analogues to, Kang (2011) who demonstrated a positive correlation with sports and improvement in attention symptoms, cognitive symptoms and social skills outcome an experiment conducted a 6-week, 90-min twice a week with 13 ADHD children having sport activity, evaluated against a control group of 15 ADHD children undergoing education on behavior control sessions; the actual research is based on a whole academic year (9 months), 90-min twice a week experiment with two groups established by randomization: 20 (10 boys and 10 girls) ADHD diagnosed children undergoing fencing activity evaluated against a similar control group of 20 (10 boys and 10 girls) ADHD diagnosed children undergoing general sport activity also for 90-min, twice a week.

Evaluation Questionnaire

ADHD diagnosis should be considered when attention difficulties or hyperactivity exceeds that typically seen in individuals of comparable mental age. First step in the study was to identify the research population, all of them being school children ADHD diagnosed using the well-known social performance evaluation test ADHD RS (Rating Scale) IV: Home Version questionnaire – Appendix A as explored by Goodman D. (2010).

The ADHD RS IV: Home Version questionnaire is identical in context to the ADHD RS IV: School Version questionnaire which was actually used in the research and completed by the teachers. Data has been completed by
the staff for each participant before starting the intervention, and once again at the end of the study after completing the fencing training program for the experiment group, or the PE activity program for the control group. The questionnaire evaluates three disorder parameters: inattention, hyperactivity-impulsivity and combined manifestation. The actual study will concentrate with the Hyperactivity\Impulsivity factor score.

Data was processed statistically to evaluate reliability using Cronbach’s Alpha. To analyze Hyperactivity\Impulsivity we used statistically test during the elapsed Overtime using ANOVA 2x2x2 for mixed design, having two between independent variables Gender (with two level, boys and girls) and Intervention type (fencing and physical education activity) and one repeated measure independent variable, Time (with two levels, pre- and post-intervention) and run for all questions followed by a Holm-Sidak Post Hoc test for interactions.

Results

Univariate descriptive statistics for Hyperactivity-Impulsivity scale scores are presented in Table 1. Cronbach’s Alpha coefficient ranges between 0.923 to 0.823 having the highest score for experimental girls group and also for the boys control group and the lowest score for control girls group.

Table 1. Univariate descriptive statistics, mean and (standard deviation) for Hyperactivity-Impulsivity scale scores before and after intervention (N=40)

<table>
<thead>
<tr>
<th>Time</th>
<th>Intervention type</th>
<th>Gender</th>
<th>Pre-intervention</th>
<th>Post-intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fencing</td>
<td>Boys</td>
<td>17.40 (3.30)</td>
<td>7.80 (1.68)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Girls</td>
<td>16.40 (6.31)</td>
<td>8.00 (2.90)</td>
</tr>
<tr>
<td></td>
<td>Physical activity</td>
<td>Boys</td>
<td>17.60 (2.31)</td>
<td>8.60 (2.79)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Girls</td>
<td>13.70 (4.39)</td>
<td>6.50 (1.58)</td>
</tr>
</tbody>
</table>

![Fig. 1. Mean for Hyperactivity-Impulsivity scale scores before and after intervention (N=40)](image)

a) Fencing group  
b) Physical activity group

Collected data were analyzed using ANOVA 2x2x2 for mixed design, having two between independent variables Gender (with two levels, boys and girls) and Intervention type (fencing and physical activity) and one repeated measure independent variable, Time (with two levels, pre-intervention and post-intervention).

Table 2. ANOVA main and interaction effect for the within factor (Time) of the design

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
<th>Observed Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>1462.05</td>
<td>1</td>
<td>1462.05</td>
<td>339.135</td>
<td>0</td>
<td>0.904</td>
<td>1</td>
</tr>
<tr>
<td>Time * Gender</td>
<td>11.25</td>
<td>1</td>
<td>11.25</td>
<td>2.61</td>
<td>0.115</td>
<td>0.068</td>
<td>0.349</td>
</tr>
<tr>
<td>Time * Interv</td>
<td>4.05</td>
<td>1</td>
<td>4.05</td>
<td>0.939</td>
<td>0.339</td>
<td>0.025</td>
<td>0.157</td>
</tr>
<tr>
<td>Time * Gender *</td>
<td>0.45</td>
<td>1</td>
<td>0.45</td>
<td>0.104</td>
<td>0.749</td>
<td>0.003</td>
<td>0.061</td>
</tr>
</tbody>
</table>
We found a significant main effect for Time, $F(1, 36) = 339.15, p<0.001$, $(MSE=4.31, \eta^2=.904)$ indicating that after intervention, Hyperactivity\Impulsivity scale score suffered a significant reduction. Partial eta squared indicates that the difference is not just statistically significant, but also has a high practical significance. Neither mixed interaction (first or second order) was found to be significant (Table 2). The power of the test is small due to the small sample size, thus the differences are insignificant although exist.

Table 3. ANOVA main and interaction effect for the between factors (Intervention and Gender) of the design

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
<th>Observed Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>57.8</td>
<td>1</td>
<td>57.8</td>
<td>2.89</td>
<td>0.09</td>
<td>0.074</td>
<td>0.381</td>
</tr>
<tr>
<td>Intervention</td>
<td>12.8</td>
<td>1</td>
<td>12.8</td>
<td>0.64</td>
<td>0.429</td>
<td>0.018</td>
<td>0.122</td>
</tr>
<tr>
<td>Gender * Intervention</td>
<td>33.8</td>
<td>1</td>
<td>33.8</td>
<td>1.69</td>
<td>0.201</td>
<td>0.045</td>
<td>0.245</td>
</tr>
<tr>
<td>Error</td>
<td>718.6</td>
<td>36</td>
<td>19.961</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Regarding the between factors of the design, there was a marginally significant Gender effect, $F(1, 36) = 2.89, p=.09$, $(MSE=19.96, \eta^2=.07)$, while the effect of Intervention type and the effect of Intervention type x Gender were all non-significant. As a result we can conclude that Hyperactivity\Impulsivity scores was reduced by intervention, but comparing scores through Intervention type and Gender did not resulted statistically significant differences (Table 3).

![Fig. 2. HI ADHD RS IV questionnaire intermediate data without gender discrimination:](image)

1. Fencing group, absolute data at the beginning of the research
2. Control group, absolute data at the beginning of the research
3. Fencing group, absolute data at the end of the research
4. Control group, absolute data at the end of the research
Discussion and conclusions

All groups’ data were processed statistically to evaluate reliability using Cronbach’s Alpha and obtained values above 0.75, indicating high reliability.

In Fig. 1, 2 & 3 high values on the vertical axis represent objectionable HI behavior than the normal average expected. Fig. 1 shows a total difference of 1.8 between the mean values of the experimental group (18) to the mean values of the control group (16.2) implicating at first glance the experimental group was more effective in attenuation of the HI symptoms. Fig. 2 is an explicit reflection of the previous Fig. 1 showing detailed values for each question representing HI behavior according to ADHD RS IV:

- Question #2: Fidgets with hands or feet or squirms in seat.
- Question #4: Leaves seat in classroom or in other situations in which remaining seated is expected.
- Question #6: Runs about or climbs excessively in situation in which it is inappropriate.
- Question #8: Has difficulty playing or engaging in leisure activities quietly.
- Question #10: Is “on the go” or acts as if “driven by a motor”.
- Question #12: Talks excessively.
- Question #14: Blurts out answers before questions have been completed.
- Question #16: Has difficulty awaiting turn.
- Question #18: Interrupts or intrudes on others.

Fig. 3 shows over time period effect of the study without gender discrimination, for each question. Both the experimental and the control groups show positive values, implying that PA and fencing contribute in ameliorating the HI behavior of ADHD children while from the last column of the total accumulated values it can be concluded that fencing has greater contribution to ameliorating HI symptoms than PA by 11%.

The reliability of the evaluated data was performed using Cronbach’s Alpha and obtained values above 0.75, indicating of high reliability. The 3 way Anova affirm the power of the test is small due to the small sample size, thus the differences between the study group to the control group are insignificant although exist.

Overtime Hyperactivity/Impulsivity Analysis

It was performed using a 3 Way Anova using the factors time, gender and training and run for all questions followed by a Holm-Sidak Post Hoc test for interactions.
- Q2: a significant difference was found between the Initial time and the Final time (p<0.001), but no other differences were present.
- Q4: a time effect was shown (p<0.001) affecting both groups in the same manner. This difference is justified by the difference over time between the girls and the boys in the control group (p=0.007).
- Q6: A difference between the initial and final time point is preset (p<0.001). Again a difference between the girls and the boys was detected (p<0.001) within the control group (p<0.001) and the boys from the fencing group were found different from the Control Boys (p=0.003). For that question, the statistically significant interaction lies in the relationship between training group and the gender (P=0.005).
- Q8: A time difference is found again (p<0.001) but only between the boys and the girls (p<0.001) independently of which group they belong.
- Q10: A time difference is found again (p<0.001) but only between the boys and the girls (p=0.003) independently of which group they belong.
- Q12: The time difference here (p<0.001) is related to the Training regimen (p=0.018), independently of the gender.
- Q14: there is a statistical difference here (p<0.001) but it is not attributed to either the training (p=0.055) or the gender (p=0.379). Note that a trend does exist that lean towards of training effect (p=0.055).
- Q16: This variable is problematic as there was already a difference between the control and the fencing group at the initial time point (p<0.001). Both groups are also different from their value at the final time point (p=0.003 and p<0.001, respectively). But there is no difference at the final time point between the 2 groups. Gender has no effect whatsoever.
- Q18: There is a difference between the 2 time points (p<0.001) and this difference appears to be due to the training regimen (p=0.007), independently of the gender (p=0.358).

References


## ADHD Rating Scale-IV: Home Version

<table>
<thead>
<tr>
<th>Number</th>
<th>Item</th>
<th>Never or Rare</th>
<th>Sometimes</th>
<th>Often</th>
<th>Very Often</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fails to give close attention to details or makes careless mistakes in schoolwork</td>
<td>U</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Fidgets with hands or feet or squirms in seat</td>
<td>U</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Has difficulty sustaining attention in task or play activities</td>
<td>N</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Leaves seat in classroom or in other situations in which remaining seated is expected</td>
<td>N</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Does not seem to listen when spoken to directly</td>
<td>N</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>Runs about or climbs excessively in situations in which it is inappropriate</td>
<td>N</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>Does not finish through an instruction and fails to finish work</td>
<td>O</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>Has difficulty playing or engaging in leisure activities quietly</td>
<td>O</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>Has difficulty organizing tasks and activities</td>
<td>O</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>Is &quot;on the go&quot; or acts as if &quot;driven by a motor&quot;</td>
<td>O</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>11</td>
<td>Avoids tasks (eg, schoolwork, homework) that requires sustained mental effort</td>
<td>O</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>12</td>
<td>Talks excessively</td>
<td>U</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>13</td>
<td>Loses things necessary for tasks or activities</td>
<td>O</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>14</td>
<td>Blurs out answers before question have been completed</td>
<td>O</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>15</td>
<td>Is easily distracted</td>
<td>O</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>16</td>
<td>Has difficulty awaiting turn</td>
<td>O</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>17</td>
<td>Is forgetful in daily activities</td>
<td>O</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>18</td>
<td>Interrupts or intrudes on others</td>
<td>O</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

### How to Score

A diagnosis of ADHD depends on the type and number of symptoms your child is having and how those symptoms are affecting him or her. This screening tool is a tool for healthcare providers and is not a substitute for a diagnosis. The scores on this screening tool are for use by your child’s healthcare provider. If you feel that your child may be showing signs of ADHD, please complete this questionnaire and share the results with your healthcare provider.

<table>
<thead>
<tr>
<th>Subscale Raw Score</th>
<th>Subscale Percentile Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For office use only: [for healthcare provider interpretation]
Coping in Team Sports Versus Individual Sports

Daniela CRISTEA¹, Andrei IONESCU²

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Abstract. Coping is the active process through which an individual faces a stressful life situation and manages to master it. The purpose of this paper is to assess the athletes’ ability to cope with stress and to reveal whether there are significant differences between individual and team sports. To achieve this purpose, it was used the Athletic Coping Skills Inventory, with 28 items measuring the athletes’ psychological skills, such as coping with adversity, coachability, concentration. The scores obtained for each subscale range between the lowest, 0, and the highest, 12. The study was conducted on 73 athletes with a mean age of 22.04 years and 10 years of sports experience. Of the 73 athletes, 49% reported that they had practiced or were still practicing individual sports, and 51%, team sports. Results have shown that average scores for the subscales are higher in athletes practicing individual sports compared to those involved in team sports. This finding proves that individual sports athletes can cope much better with competitive stress. We consider that these results support the fact that they are able to assess objectively and realistically their own psychological skills and to establish their own motivational system, unlike the athletes who practice team sports.

Keywords: coping, psychological skills, motivation, individual sports, team sports.
Example:

Introduction

The term “stress” antedates its systematic or scientific use. In the 14th century, it was used to mean “narrowness, oppression”, and in the 17th century, to denote “hardship, straits, adversity or affliction” (Shorter Oxford Dictionary, 2007). In the 18th and 19th centuries, its meaning broadened to indicate “strain, pressure or strong effort”, which was intended to include terms describing the laws of physics (Hinkle, 1973, p. 3). In physics, stress was used to refer to an object’s resistance to external pressure (Thomas & Hersen, 2002, pp. 9-10).

Materials and methods

Purpose; Hypothesis; Subjects; Methods (other items can be added, depending on the structure of the paper)

Examples:

Purpose: To know the level of aerobic exercise capacity in order to establish the maximal potential of players
Hypothesis: Determining the level of higher aerobic exercise capacity during training can provide information on the team’s performance during the game.

OR, considered as subchapters:

Purpose
To know the level of aerobic exercise capacity in order to establish the maximal potential of players

Hypothesis
Determining the level of higher aerobic exercise capacity during training can provide information on the team’s performance during the game.

Results

Analysis of the obtained results
Tables and figures: numbered with Arabic numerals and include an explanatory title: TNR 9pt, regular, single
Name of the table (written above the table): left, before text 0.5”, 12pt before, 6pt after
Inside the table: TNR 9pt, regular, single, left, 4pt after
Name of the figure (written below the figure): centered, 6pt before, 12pt after
Reference must be made in the text to all tables and figures used: Table 1, Fig. 2 (with capital letters)
Scanned tables and figures are not allowed! (The item “Edit Data” must be accessible)

Examples:

Table 1. Descriptive statistic for ACSI variables

<table>
<thead>
<tr>
<th>ACSI subscales</th>
<th>Sports</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coping with Adversity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual</td>
<td></td>
<td>6.86</td>
<td>2.573</td>
<td>423</td>
</tr>
<tr>
<td>Team</td>
<td></td>
<td>6.50</td>
<td>2.833</td>
<td>472</td>
</tr>
<tr>
<td>Coachability</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual</td>
<td></td>
<td>8.43</td>
<td>2.489</td>
<td>409</td>
</tr>
<tr>
<td>Team</td>
<td></td>
<td>8.11</td>
<td>2.836</td>
<td>473</td>
</tr>
</tbody>
</table>
Discussions and conclusions
A systematic presentation of findings which are consistent with the literature
Conclusions of the research, proposals

Acknowledgements
To thank someone for the support and/or advice provided in achieving the paper

References
TNR 9, regular/italics, single, justified, 4pt after, hanging 0.2"
Examples:
Author’s name, year of publication, title, city, publisher (italics for the title) – for books
Author’s name, year of publication, title, name of the journal, volume, issue, pages (italics for the name of the journal and the volume)
Name of the association/organization, year of publication, title, city, publisher (italics for the title) – for a group author
Title, year of publication, city, publisher (italics for the title) – for books/articles with no author

Examples:

If not all the data are available, the full Internet address must be indicated.
Authors must be mentioned in alphabetic order.
References must contain ONLY the authors/titles that appear in the text.
The titles of books/papers must remain in the original language (not translated into English!)

Papers must be written in APA style. Important information can be found at:
https://owl.english.purdue.edu/owl/resource/560/20/