The difference in motor skills between adolescent judokas and gymnasts

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Abstract:
The paper subject are motor skills of adolescent judokas and gymnasts from District of Niš. The aim of this study was to determine differences in the studied variables of speed and strength between two sports schools. The total sample of subjects who participated in the study is 23 gymnast and 34 judoist with sports experience of two years, and the total number of investigated variables of motoric space is eight. The statistical analysis was performed using the statistical package Statistica 10. To determine the results of the difference between the sportsmen was used T-test for independent samples. Motoric abilities consist of package of tests proposed by Kostić, 1999. Standardization of tests determined Kurelić et al. (1975). Motoric tasks were adjusted to the sample of children and had shawn optimal measuring characteristics in previous research (Bala, 2007; Kukolj, 2006).

Results shows the difference in six motoric tasks with statistically significant on the level of significance of 0.00 (Medicine ball throw; Running speed – 20-meter sprint; Long jump and Push-ups), High jump (0.015) and Feet tapping against the wall (0.050).

Based on these results it can be concluded that the training period adolescent gymnast and judokas before selecting athletes for the competitive categories is necessary to develop all the motor abilities. The repetitive strength of the arms (SKLK) and arm movement frequency speed (TAPR) had no statistical significance of differences, which is obvious because these motor skills relevant to success in these sports. Specific motor tests which monitor the motor skills of adolescent selected for the competitive categories gymnast and judo athletes will continue to monitor specific physical preparation and tests defined by general similarity in these individual sports that have early specialization.

Keywords: gymnast, judokas, motor skills, T-test, difference, adolescent

Introduction
The period of a child’s development between the ages of 4-12 is known as the early school age. Bala (1991) states that the period between the ages of 4-12 is a time when the development of motor skills can be extremely positively influenced. At the same time, the content of preschool and elementary school physical exercises are not stimulating enough to additionally develop motor skills. It is necessary to facilitate the better development of the psychophysical characteristics of children through different exercises and various types of training. The degree of the development of students’ motor skills is significantly conditioned by their proper growth and development (Gadžić & Vučković, 2012). In order to properly and efficiently perform judo techniques, a certain level of motor skills is needed (Ilić et al., 2012).
These skills have considerable influence on success in judo combat, so special attention should be paid to the development of these skills from the very first judo training sessions in high school (Drid, Janoš, & Obadov, 2008). Judo is a high-intensity activity where the judoka tries to throw the opponent on his/her back or subdue him on the floor (Bala & Drid, 2010). Judo is also considered a basic sport such as gymnastics and athletics, because it helps develop basic motor skills at the school age. Artistic gymnastics (AG) is classified as a sport of complex structures of movement (Petković et al., 2010, 14), and a conventional sport that values the aesthetic component of movement. AG, as a polystructural sport (Matveev, 1977), is very popular among boys in the southeastern part of Serbia. Gymnastics content designed specifically for children aged 3-6 is the most common form of physical activity in the early school age in the southeastern part of Serbia. Programs are specifically designed for children who want to train according to their abilities and skills and do not follow the requirements of top-level gymnastics.

Motor abilities are used in motor tasks to solve and condition successful movements, whether they are skills acquired by training or not. The basis of motor abilities consists of very integral and complex movements (Malacko, 1982). Elementary or basic motor skills are basic movement activities that allow motor function. These include: speed, strength, endurance, coordination, flexibility, balance and precision. Specific motor abilities occur as a result of specific training within the framework of basic motor abilities. Many studies explored the transformation process of motor skills in preschool children (Bala, 1999; Kostić et al., 2002; Petković et al., 2009, Tonic et al., 2010). Struza Milić (2016) found that the children at the age of 7-8 should already be guided towards sports that are predominant with coordination movements such as AG. Earlier research indicated that young judokas possess significantly better motor skills compared to students that only exercise during PE classes (Obadov, Drid, & Nurkić, 2006; Drid, Obadov, & Bratić, 2006). The aim of this study was to determine differences in the studied variables of speed and strength between gymnastics and judo exercise programs in sport schools.

The method

The total sample of participants was made up of 23 gymnasts of a gymnastic club from Prokuplje (GKPK) and 34 judokas of the Kinezis University Judo Sports Club (UJSCK) from Niš. The participants in this research had previously been training for two years. Training session in both the gymnastics and judo sport school programs in the southeastern part of Serbia are carried out 3 times a week for up to 2 school classes. All of the participants, their parents, teachers and coaches were familiar with the aim of the research, and the parents signed a consent form allowing their children to participate in the research. The study was approved by the Ethics Committee of the Faculty of Sport and Physical Education, University of Niš, in accordance with the Helsinki Declaration. For the assessment of the students’ motor abilities, a battery of tests consisting of 8 measuring instruments that cover the field of running speed, explosive strength and movement frequency of the extremities was applied. The motor abilities were evaluated based a set of tests proposed by Kostić, 1999. Standardization of the tests was determined previously by Kurelić et al. (1975). The motor tasks were adapted for the sample of participants and had shown optimal measuring characteristics in previous studies (Bala, 2007; Kukolj, 2006). Motor skills were estimated by the following tests: Explosive strength – Long jump (SKUD, in centimeters), High jump (RAMD, in centimeters), Medicine ball throw (BACM in meters); Movement frequency speed – Hand tapping (TAPR, in frequency), Feet tapping against the wall (TAPN, in frequency); Running speed – 20-meter sprint (SP20 in seconds); Repetitive strength – Sit-ups in 60 seconds (SKLK, in frequency), push-ups (PODT, in frequency). Data processing was...
performed using the SPSS 20 statistics software. Data analysis was performed via a T-test for independent samples to determine any differences, while descriptive statistics were used to determine the frequencies for obtaining important percentages significant for this research. A significance criterion was defined at the level of \( p < .05 \).

The aim of this study was to determine differences in the studied variables of speed and strength between the two types of individual sport as part of the sport school physical education curriculum.

**Results**

Table 1 shows the Descriptive statistics for judokas, including mean values for the variables of speed and strength.

**Table №1.** Descriptive statistics for judokas

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>R</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Skew</th>
<th>Kurt</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKUD</td>
<td>34</td>
<td>63.00</td>
<td>100.00</td>
<td>163.00</td>
<td>129.44</td>
<td>15.16</td>
<td>.26</td>
<td>.26</td>
</tr>
<tr>
<td>BACM</td>
<td>34</td>
<td>2.20</td>
<td>1.70</td>
<td>3.90</td>
<td>2.45</td>
<td>.48</td>
<td>.73</td>
<td>.75</td>
</tr>
<tr>
<td>TAPR</td>
<td>34</td>
<td>49.00</td>
<td>30.00</td>
<td>79.00</td>
<td>52.08</td>
<td>10.52</td>
<td>.19</td>
<td>.26</td>
</tr>
<tr>
<td>TAPN</td>
<td>34</td>
<td>12.00</td>
<td>8.00</td>
<td>20.00</td>
<td>13.14</td>
<td>3.22</td>
<td>.51</td>
<td>-.24</td>
</tr>
<tr>
<td>SP20</td>
<td>34</td>
<td>12.00</td>
<td>8.00</td>
<td>27.00</td>
<td>19.66</td>
<td>4.37</td>
<td>-.30</td>
<td>-.54</td>
</tr>
<tr>
<td>PODT</td>
<td>34</td>
<td>34.00</td>
<td>14.00</td>
<td>45.00</td>
<td>31.29</td>
<td>7.08</td>
<td>-.16</td>
<td>-.24</td>
</tr>
<tr>
<td>RAMD</td>
<td>34</td>
<td>17.00</td>
<td>10.00</td>
<td>27.00</td>
<td>19.66</td>
<td>4.37</td>
<td>-.30</td>
<td>-.54</td>
</tr>
</tbody>
</table>

Legend: N-number of participants; Mean- arithmetic mean; Min- minimum and Max- maximum value; R-range; Std. Dev - standard deviation; Skew - skewness; Kurt- kurtosis; SKUD - Standing long jump; BACM - Medicine ball throw; TAPR - Feet tapping against the wall; TAPN - Hand tapping; SKLK - Sit-ups in 60 seconds; RAMD - High jump; PODT - push-ups.

Table 2 shows the Descriptive statistics for gymnasts, including mean values for the variables of speed and strength.

**Table №2.** Descriptive statistics for gymnasts

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>R</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Skew</th>
<th>Kurt</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKUD</td>
<td>23</td>
<td>108.00</td>
<td>90.00</td>
<td>198.00</td>
<td>150.56</td>
<td>27.53</td>
<td>-.110</td>
<td>.05</td>
</tr>
<tr>
<td>BACM</td>
<td>23</td>
<td>1.90</td>
<td>2.80</td>
<td>4.70</td>
<td>3.66</td>
<td>.55</td>
<td>.101</td>
<td>-.101</td>
</tr>
<tr>
<td>TAPR</td>
<td>23</td>
<td>33.00</td>
<td>31.00</td>
<td>64.00</td>
<td>47.17</td>
<td>7.97</td>
<td>-.181</td>
<td>-.27</td>
</tr>
<tr>
<td>TAPN</td>
<td>23</td>
<td>23.00</td>
<td>4.00</td>
<td>27.00</td>
<td>16.00</td>
<td>6.17</td>
<td>-.299</td>
<td>-.68</td>
</tr>
<tr>
<td>SP20</td>
<td>23</td>
<td>23.00</td>
<td>3.00</td>
<td>5.36</td>
<td>4.05</td>
<td>.58</td>
<td>-.754</td>
<td>-.04</td>
</tr>
<tr>
<td>PODT</td>
<td>23</td>
<td>44.00</td>
<td>10.00</td>
<td>54.00</td>
<td>40.47</td>
<td>10.97</td>
<td>-.1278</td>
<td>3.19</td>
</tr>
<tr>
<td>RAMD</td>
<td>23</td>
<td>29.00</td>
<td>10.00</td>
<td>39.00</td>
<td>24.43</td>
<td>8.11</td>
<td>-.282</td>
<td>-.69</td>
</tr>
<tr>
<td>SKLK</td>
<td>23</td>
<td>16.00</td>
<td>25.00</td>
<td>41.00</td>
<td>34.34</td>
<td>4.87</td>
<td>-.358</td>
<td>-.120</td>
</tr>
</tbody>
</table>

Legend: N-number of participants; Mean- arithmetic mean; Min- minimum and Max- maximum value; R-range; Std. Dev - standard deviation; Skew - skewness; Kurt- kurtosis; SKUD - Standing long jump; BACM - Medicine ball throw; TAPR - Feet tapping against the wall; TAPN - Hand tapping; SKLK - Sit-ups in 60 seconds; RAMD - High jump; PODT - push-ups.

Difference between adolescent judokas and gymnasts has shown in Table 3 using the statistical analysis T-test for independent samples.

**Table №3.** The differences between gymnast and judokas

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sport schools</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>t</th>
<th>p</th>
<th>Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKUD</td>
<td>Judokas</td>
<td>34</td>
<td>129.44</td>
<td>15.1641</td>
<td>-3.351</td>
<td>.002</td>
<td>.201</td>
</tr>
<tr>
<td></td>
<td>Gymnasts</td>
<td>34</td>
<td>150.57</td>
<td>27.5397</td>
<td>.7401</td>
<td>.469</td>
<td>.245</td>
</tr>
<tr>
<td>BACM</td>
<td>Judokas</td>
<td>34</td>
<td>2.45</td>
<td>0.4869</td>
<td>-8.689</td>
<td>.000</td>
<td>.579</td>
</tr>
<tr>
<td></td>
<td>Gymnasts</td>
<td>23</td>
<td>3.66</td>
<td>0.5571</td>
<td>1.998</td>
<td>.063</td>
<td>.062</td>
</tr>
</tbody>
</table>

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http://journal.pesk.eu/content/vol2/iss2-art9.pdf
The T-test for independent samples shows that there is a statistically significant difference between adolescent judoist and gymnasts for the variable \textit{TAPN} (\(t=\text{-}2.037; p=0.050\)). Based on the mean value (Mean), we can see that the gymnasts (Mean = 150.57) achieved better results than the judokas (Mean = 16). Based on Eta Squared (0.086), we can see that the difference between the groups is medium. According to Cohen, .01 indicates a small impact (small difference), .06 medium impact (difference) and .14 or more a large impact (difference) (Pallant, 2011). Statistically significant differences between the judokas and gymnasts was determined for the \textit{PODT} variables (\(t=3.846; p=.000\)) where better results were achieved by the gymnasts (Mean=40.48) in comparison to the judokas (Mean=31.29). Based on the value of Eta Squared (Eta Squared=.212) we can determine that the difference between the groups is large.

A statistically significant difference between judokas and gymnasts exists for the following variables: \textit{SP20} (\(t=5.115; p=.000\)) where better results were achieved by the gymnasts (Mean=4.06) in comparison to the judokas (Mean=4.81). Based on the value of Eta Squared (Eta Squared=.322) we can determine that the difference between the groups is large. Variable \textit{RAMD} (\(t=-2.578; p=.015\)) where better results were achieved by the gymnasts (Mean=24.43) in comparison to the judokas (Mean=19.66). Based on the value of Eta Squared (Eta Squared=.131) we can determine that the difference between the groups is medium.

### Discussion

From Table 3, it can be seen that statistically significant differences were noted in 6 of the 8 variables between gymnasts and judokas. The results shows a difference in four motor tasks which were statistically significant at the .000 level of significance of (\textit{SKUD; BACM; PODT; SP20}), \textit{RAMD} (.01) and \textit{TAPN} (.05). This result is probably the consequence of judo training, where the accent is placed on developing the segmental speed of the lower extremities, which is very important in a judo fight (Stamenković et al., 2016). The other variables showed no significant differences (\textit{TAPR, SKLK}). The repetitive strength of the arms (\textit{SKLK}) and arm movement frequency speed (\textit{TAPR}) had no statistical significance of differences, which is obvious because these motor skills relevant to success in these sports.

In comparison to other motor skills, speed is the hardest to perfect in human beings. For example, in the past 100 years (from the first Olympics to the present), world records have been improved by 12–20% in endurance sports; by 20–30% in jumps; over 50% in weight lifting and athletic throws, and only 9–10% in 100- and 200-meter sprints. It is especially difficult to increase the frequency of movement, which is considered predominantly genetically conditioned and can be improved until the ages of 14 or 15. Later improvement is achieved mainly at the expense of force increase, endurance, and technical perfection (Željaskov, 2004). Repetitive strength of the participants was estimated using the...
following measurement instruments: sit-ups in 60 seconds (SKLK) and push-ups (PODT). After the results were obtained, it could be seen that there was a statistically significant difference in the variables of repetitive strength in favor of the gymnasts. The greatest difference could be noticed in the PODT variable (.000), and SKUD variable (.000), where the judoist did 31.29 push-ups on average, and the gymnasts had an average of 40.48. The judoist had long jump 129.44 cm on average, and the gymnasts had an average of 150.57 cm.

Conclusions

The motor development of children is of vital importance and has a crucial influence on their development in general, especially in the case of the youngest children. It influences their intellectual, social and emotional characteristics. If children are not able to allow proper motor development and progress in terms of their motor abilities and skills, it is more likely that they will have less self-confidence, and more difficulties when communicating with their environment, as well as in handling everyday situations. In most cases, these children will not do the minimum physical activities necessary for a healthy and productive life once they are grown-ups (Strauss et al., 2001). The effects of judo training on anthropometric characteristics and motor abilities are reflected in changes in circular dimensions with regard to statistically significant differences in speed, strength and coordination in judo-trained compared to judo-untrained participants (Drid et al., 2009; Koropanovski, 2011). Based on the results of differences in gymnast of different categories in selected tests of coordination, strength and speed, a moderate intensity of properly programmed gymnastics training contributes a proper development of motor skills of young female gymnasts (Petković et al, 2009.; Tonić et al, 2010).

Motor development should be observed through the interaction of morphological and motor systems, thereby employing target kinesiologic treatments to bring the structures of these systems into optimal interrelationships (Katić, Maleš, & Miletić, 2002). It should be born in mind that environmental factors, including carefully planned and programmed methods of training, contribute to shaping motor skills, along with genetic predispositions (Bala & Drid, 2010). Based on these results it can be concluded that the training period adolescent gymnast and judokas before selecting athletes for the competitive categories is necessary to develop all the motor abilities. Specific motor tests which monitor the motor skills of adolescent selected for the competitive categories gymnast and judo athletes will continue the continuous monitoring of specific physical preparation and tests defined by general similarity in these individual sports that have early selective basis and specialization.

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References


