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THE CORRELATIONS OF CERTAIN ENVIRONMENTAL FACTORS WITH MOTOR ABILITIES IN 6TH GRADE ELEMENTARY SCHOOL PUPILS

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Abstract: Physical culture (and its corresponding areas: physical education, sports and recreation), exists as a complex human activity in a variety of social circumstances, and there is no doubt that one of the vital circumstances is the conditions of the environment in which it transpires. More optimal socio-economic conditions should contribute to a better position of physical culture in a given environment, while the main aim of this research was to carry out an analysis of the correlations between the motor abilities and some environmental factors in 6th graders, as well as to determine the impact of these factors on the level of motor abilities. On a sample of 94 6th graders, by applying the canonical correlation analysis, no statistically significant link between the mentioned areas was established, while a series of regressional analysis determined the existing of a significant impact of only one environmental factor (the number of children in a family) on the motor ability of foot precision. The obtained results point to the fact that motor abilities are more under the impact of some other factors, not environmental.

Key words: environmental factors, motor abilities, pupils

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INTRODUCTION

The times we are living in are characterized by many accomplishments which have eased daily life and liberated him from great physical effort. However, along with these conveniences, contemporary age is also characterized by a series of negative impacts, especially from the aspect of the hypokinesis of modern man. Today, we have increasingly more commitments, and less time for ourselves, and we live under constant stress which is an additional danger for health. Along with the mentioned, for a long time we have been witnessing a deep recession, whose consequences on the psychosomatic status have yet to be scientifically researched. However, it is clear that the mentioned crisis has been reflected on all aspects of life, as well as work in schools, where physical education (hereinafter: P.E.) classes have often taken place in poor conditions and with an unmotivated staff. The motor abilities of primary school pupils can also be viewed in the context of the results of recent research carried out on primary and secondary school pupils in Serbia. The data in the pilot project ‘Determining the physical abilities of children and youth’ carried out by the Ministry of Youth and Sports and the Republic Institute for Sports in cooperation with the Ministry of Education of Serbia on the state of physical abilities of children and youth, and obtained on the basis of testing pupils from 1,553 schools in Serbia (74% elementary and 26% high schools), indicate weak results of elementary and high school pupils. Some of the variables which characterize the physical abilities applied in this research (the Eurofit test battery), showed lesser values than 6% in girls and 12% in boys in relation to earlier measurements, and by a comparative analysis with the results of children from certain EU countries, it has been concluded that the results of Serbian pupils were mostly under average. Such a state of physical abilities can be the consequence of the fact that only 15% of elementary and high schools in Serbia have a P.E. hall larger than 450 m², as well as the fact that in the tested schools the most represented team sport was volleyball, while the least represented were the basic sports of Track and Field and gymnastics (Republic Institute for Sports, 2010).

The tendency of reducing the physical activities of children has a direct impact on the level of motor abilities, which occurs not only in this country but also the neighboring countries (Šiljeg, Zečić, Morgan and Kević, 2008; Strel, Bizjak, Starc and Kovač, 2009), as well as developed countries (Janz, Dawson, & Mahoney, 2000; Tomkinson, Olds, & Gulbin, 2003; Wedderkopp, Froberg, Hansen, & Andersen, 2004).

If physical culture (and its corresponding areas: physical education, sport and recreation) is viewed as a complex human activity which exists in different
social circumstances, it is without doubt that the environmental circumstances is one of the vital features. Thus, more optimal socio-economic conditions should contribute to a better position of physical culture in an environment and the results of the newest research have shown that the socio-economic status of respondents impacts the level of their abilities (primarily coordination), which the authors link with better possibilities to carry out the sports activities of the respondents in larger environments (Mikalački, Hošek-Momirović and Bala, 2006; Matić and Jakšić, 2007). Changes in motor abilities occur in certain socio-economic conditions, which are characteristic for the environment of an individual or a group of people, and which consist of a group of cultural, material, urban and other factors. The social standard, the cultural level of the environment, the place and role of P.E. within it, the social status of the parents and the pupils, are just some of the factors of a social environment which can indirectly impact the development of motor abilities of the population and the level of engagement in sports activities (Gadžić and Vučković, 2009; Ivanović, 2010; Matić, Kuljić, and Maksimović, 2010).

The main aim of this research is to carry out an analysis of the correlation between motor abilities and some environmental factors as well as to determine the impact of these factors on the level of motor abilities of 6th grade pupils of the Elementary School Čibukovački partizani from Kraljevo.

**METHOD**

**Sample**

The sample of 94 respondents in this research can be defined as 6th grade elementary school pupils, of the male gender, average age of 12.89 (±0.31).

**Variables**

For the sample of variables which assess the motor abilities applied was a set of 12 variables which measure the following motor abilities: precision, balance, coordination, speed, flexibility and strength. The tests for assessing motor abilities were separated from a battery made up of 110 tests (Gredelj, Metikoš, Hošek and Momirović, 1975):

a) for assessing precision (tossing horizontally with the hand – THWH and kicking vertically with the foot - KVWF);

b) for assessing balance (standing on one leg longitudinally on a balance bench - S1LB and standing on one leg with eyes closed - S1EC);

c) for assessing coordination (figure eight with bending – 8WB and
drumming with hands and feet - DWHF);  
d) for assessing speed (hand tapping - HTAP and foot tapping - FTAP);  
e) for assessing flexibility (deep bend on the bench – DBB and one arm skin the cat with stick - OASCT);  
f) for assessing strength (standing long jump – SLJ and pull-ups - PU).

The set of variables which represented environmental factors has been obtained from the reduced questionaire SSMAXIP (Hošek, 2004) which served to gather data on the following residential, social and economic features:

- Residential type of family home (RTFH)  
- Father’s education (FE)  
- Mother’s education (ME)  
- Father’s work status (FWS)  
- Mother’s work status (MWS)  
- Number of children in the household (NCH)  
- Total monthly income of household (TMIH)

**Method of data processing**

The measuring results have been statistically processed and calculated based on basic central and dispersion parameters. The normality of distribution has been assessed by Skewness and Kurtosis. Along with descriptive statistics, also applied was canonical correlational analysis in order to test the link between environmental factors and the motor abilities of respondents.

In the further data processing procedure, applied was a series of multiple regresional analyses in order to test the impact of the variable system which assesses the environmental factors on motor variables, that is, establishing the individual contribution of predictor variables according to each criteria variable individually.

**RESULTS**

**Table 1. Basic body features of respondents**

<table>
<thead>
<tr>
<th></th>
<th>AS</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body height</td>
<td>157.91</td>
<td>7.24</td>
</tr>
<tr>
<td>Body weight</td>
<td>50.79</td>
<td>10.54</td>
</tr>
</tbody>
</table>

The average values of body weight and body height of the respondents (Table 1) are within the range of the expected limits and values for the tested age (Gajević, 2009).
Table 2. Central and dispersionsal parameters of variables for assessing the motor abilities of pupils

<table>
<thead>
<tr>
<th>Variable</th>
<th>M (SD)</th>
<th>Min - Max</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>GHCR</td>
<td>16.74 (5.20)</td>
<td>5 - 36</td>
<td>0.59</td>
<td>1.09</td>
</tr>
<tr>
<td>GVCN</td>
<td>11.70 (3.48)</td>
<td>3 - 20</td>
<td>0.21</td>
<td>-0.34</td>
</tr>
<tr>
<td>SJUK</td>
<td>8.72 (4.90)</td>
<td>3.1 – 34.3</td>
<td>2.46</td>
<td>8.38</td>
</tr>
<tr>
<td>SZOJ</td>
<td>17.78 (12.12)</td>
<td>3.8 – 61.2</td>
<td>1.34</td>
<td>1.24</td>
</tr>
<tr>
<td>OSAS</td>
<td>58.28 (4.47)</td>
<td>49.5 – 71.2</td>
<td>0.43</td>
<td>0.13</td>
</tr>
<tr>
<td>BURN</td>
<td>6.51 (2.88)</td>
<td>0 - 15</td>
<td>0.53</td>
<td>0.01</td>
</tr>
<tr>
<td>TAPR</td>
<td>36.07 (4.11)</td>
<td>25 - 48</td>
<td>-0.21</td>
<td>0.49</td>
</tr>
<tr>
<td>TAPN</td>
<td>29.40 (3.05)</td>
<td>22 - 35</td>
<td>-0.16</td>
<td>-0.56</td>
</tr>
<tr>
<td>ISKP</td>
<td>84.84 (15.57)</td>
<td>47 - 125</td>
<td>0.23</td>
<td>-0.22</td>
</tr>
<tr>
<td>DPKL</td>
<td>33.70 (6.99)</td>
<td>12 – 45.5</td>
<td>-0.52</td>
<td>0.21</td>
</tr>
<tr>
<td>SUDM</td>
<td>164.73 (24.93)</td>
<td>94 - 218</td>
<td>-0.30</td>
<td>0.00</td>
</tr>
<tr>
<td>VISZ</td>
<td>26.01 (18.12)</td>
<td>1.1 – 85.9</td>
<td>0.53</td>
<td>-0.01</td>
</tr>
</tbody>
</table>

M – median value, SD – standard deviation, Min – minimum result, Max – maximum result, Skewness – parameter of result distribution symmetry, Kurtosis – parameter of result elongation in regards to normal distribution.

Based on the results from Table 2, we can see that the distribution of results with the majority of assessed variables does not deviate significantly from normal distribution. The exception are the variables for assessing balance (S1LB and S1EC) where the distribution is of an exceptionally positive direction which points to the fact that the majority of respondents had weaker results. At the same time, the values of the coefficient of roundness of these two variables are somewhat larger and confirm the existing of several extreme results which deviate significantly from the average. A somewhat higher heterogeneity of results is evident in variables for assessing statical and explosive strength (VISZ and SUDM) which is to be expected in the tested age group (high school age) as the biological development of pupils is intensified, uneven and heterochronous which is also reflected on motor abilities. There are periods when some abilities are developed more quickly (the sensitive development stages), in order to be followed by periods of the slower development of these abilities (Radovanović and associates, 2009).

Table 3. The link between environmental factors and the motor abilities of pupils

<table>
<thead>
<tr>
<th>Roots</th>
<th>Canonical R</th>
<th>R²</th>
<th>Wilk’s</th>
<th>Chi-Sq</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.373</td>
<td>0.055</td>
<td>0.328</td>
<td>0.301</td>
<td>84.00</td>
<td>0.253</td>
</tr>
</tbody>
</table>

The results of the applied canonical correlation analysis (Table 3) have shown that there are no statistically significant link between environmental factors and the motor abilities of pupils in the tested sample. For this reason, it was unnecessary to carry out an interpretation of canonical factors.

In order to test the impact of the system of variables which assess the environmental factors on each motor ability of the pupils individually, we applied a series of multiple regressional analyses.

Table 4.1 *The impact of environmental factors on the motor abilities of pupils (the first six motor tests)*

<table>
<thead>
<tr>
<th>Environm. factors</th>
<th>Motor variables</th>
<th>Tossing horizontally with the hand</th>
<th>Kicking vertically with the foot</th>
<th>Standing on one leg longitudinally on a balance bench</th>
<th>Standing on one leg with eyes closed</th>
<th>Figure eight with bending</th>
<th>Drumming with hands and feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Father’s education</td>
<td>-0.041</td>
<td>0.742</td>
<td>0.067</td>
<td>0.585</td>
<td>0.304</td>
<td>0.018</td>
<td>0.052</td>
</tr>
<tr>
<td>Mother’s education</td>
<td>0.170</td>
<td>0.194</td>
<td>0.039</td>
<td>0.759</td>
<td>-0.192</td>
<td>0.147</td>
<td>0.041</td>
</tr>
<tr>
<td>Father’s work status</td>
<td>-0.221</td>
<td>0.071</td>
<td>0.113</td>
<td>0.345</td>
<td>-0.080</td>
<td>0.516</td>
<td>0.179</td>
</tr>
<tr>
<td>Mother’s work status</td>
<td>0.142</td>
<td>0.233</td>
<td>0.008</td>
<td>0.946</td>
<td>0.269</td>
<td>0.027</td>
<td>0.069</td>
</tr>
<tr>
<td>Number of children in family</td>
<td>0.101</td>
<td>0.392</td>
<td>-0.460</td>
<td>0.000</td>
<td>-0.023</td>
<td>0.844</td>
<td>0.083</td>
</tr>
<tr>
<td>Total income of household</td>
<td>-0.081</td>
<td>0.564</td>
<td>-0.070</td>
<td>0.612</td>
<td>-0.060</td>
<td>0.673</td>
<td>-0.109</td>
</tr>
<tr>
<td>Residential status of family</td>
<td>0.162</td>
<td>0.160</td>
<td>-0.221</td>
<td>0.052</td>
<td>-0.070</td>
<td>0.545</td>
<td>-0.106</td>
</tr>
<tr>
<td>R</td>
<td>0.370</td>
<td>0.411</td>
<td>0.339</td>
<td>0.236</td>
<td>0.214</td>
<td>0.278</td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>0.137</td>
<td>0.169</td>
<td>0.115</td>
<td>0.056</td>
<td>0.046</td>
<td>0.077</td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>0.072</td>
<td>0.022</td>
<td>0.148</td>
<td>0.653</td>
<td>0.761</td>
<td>0.418</td>
<td></td>
</tr>
</tbody>
</table>

β – regression coefficient, p – significance level of regression coefficient, R – multiple correlation coefficient, R² – determination coefficient, P – level of statistical significance of multiple correlation coefficient

The results of a multiple regressional analysis for the first six motor tests (Table 4.1), as criteria variables, have shown the existing of a significant impact of predictors, that is, environmental factors, on foot precision. The numerical
values of the coefficients of regression (P=0.022; β=-0.460; p=0.000) show that the significant impact of the environmental factor is defined by a variable of the number of children in the family on the motor ability of precision (of the foot). The mentioned can be interpreted as a higher probability for physical activities (usually soccer) to be carried out in families with more children (especially of the male gender) and thus indirectly realize an impact on better foot precision. Along with the mentioned environmental factor, the other indicators failed to realize a more significant impact on the motor abilities of the pupils.

Table 4.2 The impact of environmental factors on the motor abilities of pupils (of the other six motor tests)

<table>
<thead>
<tr>
<th>Motor variables</th>
<th>Hand tapping</th>
<th>Foot tapping</th>
<th>Deep bend on the bench</th>
<th>One arm skin the cat with stick</th>
<th>Standing high jump</th>
<th>Pull ups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Father's education</td>
<td>-0.092 0.487</td>
<td>-0.167 0.206</td>
<td>0.053 0.671</td>
<td>0.188 0.152</td>
<td>-0.131 0.305</td>
<td>-0.020 0.883</td>
</tr>
<tr>
<td>Mother's education</td>
<td>0.101 0.462</td>
<td>0.130 0.343</td>
<td>-0.118 0.368</td>
<td>-0.148 0.279</td>
<td>-0.032 0.811</td>
<td>-0.064 0.648</td>
</tr>
<tr>
<td>Father's work status</td>
<td>-0.105 0.416</td>
<td>-0.070 0.583</td>
<td>-0.058 0.636</td>
<td>0.099 0.438</td>
<td>-0.016 0.896</td>
<td>0.020 0.877</td>
</tr>
<tr>
<td>Mother's work status</td>
<td>-0.013 0.914</td>
<td>0.012 0.923</td>
<td>0.315 0.009</td>
<td>-0.041 0.743</td>
<td>0.139 0.251</td>
<td>-0.015 0.903</td>
</tr>
<tr>
<td>Number of children in household</td>
<td>0.110 0.379</td>
<td>0.134 0.281</td>
<td>-0.232 0.052</td>
<td>-0.039 0.753</td>
<td>-0.249 0.041</td>
<td>-0.064 0.613</td>
</tr>
<tr>
<td>Monthly household income</td>
<td>0.086 0.562</td>
<td>0.024 0.871</td>
<td>-0.091 0.517</td>
<td>-0.042 0.775</td>
<td>-0.064 0.658</td>
<td>-0.051 0.736</td>
</tr>
<tr>
<td>Residential family status</td>
<td>0.151 0.214</td>
<td>0.121 0.316</td>
<td>-0.118 0.306</td>
<td>-0.078 0.515</td>
<td>-0.076 0.516</td>
<td>-0.060 0.624</td>
</tr>
<tr>
<td>R</td>
<td>0.188</td>
<td>0.206</td>
<td>0.364</td>
<td>0.225</td>
<td>0.311</td>
<td>0.124</td>
</tr>
<tr>
<td>R²</td>
<td>0.035</td>
<td>0.043</td>
<td>0.132</td>
<td>0.051</td>
<td>0.097</td>
<td>0.015</td>
</tr>
<tr>
<td>P</td>
<td>0.869</td>
<td>0.797</td>
<td>0.084</td>
<td>0.707</td>
<td>0.253</td>
<td>0.987</td>
</tr>
</tbody>
</table>

β – regression coefficient, p – significance level of regression coefficient, R – multiple correlation coefficient, R² – determination coefficient, P – level of statistical significance of multiple correlation coefficient

In the following six of a total of 12 motor tests (Table 4.2), multiple regresional analysis did not show a statistically significant impact of the predictors on the criteria variables.
DISCUSSION

Newer research of the correlations between environmental factors and the motor abilities of children has given contradictory results. In some research, the authors have determined that motor abilities are mostly independent from socio-economic status (Bala, Katić, & Mikalački, 2010), and that in boys (ages from 7 to 11) the factors of the socio-economic environment can explain only 4% of the total variability of the general motor factor (Matić, Kuljić & Maksimović, 2010). In an earlier research by Matić and Maksimović (2007), the authors concluded that there are significant links between the physical activity of children and socio-economic status, and that the sports results of parents, the sports engagement of parents in sports organizations, residential status and the factor of informal education have the most important mediating role in the impact of the socio-economic status on physical status.

The results of this research are largely in concordance with the research carried out by Bala, Katić and Mikalački (2010), which was carried out on a younger sample of respondents, and where more significant links between socio-economic status and the motor abilities of respondents were established. Also, Okely and Booth (2004) failed to establish a significant link between socio-economic status and the basic motor abilities of elementary school pupils. There are certain similarities with the research which was carried out by Booth and associates (Booth et al., 1999) who established a link between the socio-economic status with the fundamental motor abilities of pupils from grades 4 to 10 but only on the female part of the sample.

The results of current research, in spite of the fact that canonical correlation analysis failed to determine a link between environmental factors and the motor abilities of pupils, shows the an impact of one environmental factor (the number of children in the family) on foot precision. The mentioned can probably be interpreted in the way that the research was carried out with boys of elementary school age who most often played football (Radojević, 2006; Đordić, 2010; Šekeljić, Stamatović and Marković, 2012). On the other hand, it is logical that in families with several children there is an increased probability of a more frequent physical engagement of children in sports activities, especially football, which can without doubt contribute to better foot precision. The fact that the results of other environmental factors have no significant impact on the motor abilities of pupils of this age is a little surprising, but it is probably a consequence of using a smaller sample, that is, the fact that all the respondents come from a smaller area (the suburbs). Another explanation can be sought in hereditary factors, i.e. a more significant impact of genetics on the motor abilities of pupils than environmental factors in the test sample.
CONCLUSION

In researching the correlations between some environmental factors and the motor abilities of 6th grade elementary school pupils, we have reached the conclusion that in the test sample there have not been established any statistically relevant correlations between the mentioned. Thus, based on the obtained results of the research, we can assume that motor abilities in the test sample are more under the impact of some other factors and not environmental.

Along with the fact that this research does not establish more significant correlations between motor abilities and some environmental factors, it is necessary to stress that the research had certain limitations. Primarily, this relates to the size of the sample and the set of applied measures for assessing environmental factors. Namely, the research did not encompass all the possible environmental factors which could have a significant impact on the motor abilities of the pupils (the technical equipment of schools, access to sports fields, clubs and similar).
REFERENCES


THE IMPACT OF DISC HERNIA ON THE MUSCULATURE FORCE OF THE LOWER LIMBS

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Abstract: When a sudden flexion of the lumbar disk, a hernia, occurs, usually in the posterolateral direction, the consequence may be muscular weakness of the lower extremities. The aim of the study was to determine how and in what way hernias affect the strength and endurance of leg and torso muscles among athletes without clinical symptoms of neurological and muscle weakness. The study included 20 male subjects without clinically present motor weaknesses in the lower extremities. The respondents were athletes, aged 28.70 ± 3.22, weight 76.25 ± 4.78 kg, height of 184.35 ± 5.67 cm. They were divided into two groups: the first group (K) of 10 respondents and a completely healthy group, and (E) which included patients with disc hernia. Within the Myotest-m and CMJ, the following variables were obtained: height (cm), power (W/kg), force (N/kg), acceleration (cm/s); 1RM-maximum weight in one repetition of the thrust legs (kg), repetitive leg strength (REPC), flexion (REPF), trunk extension (REPE).

In order to determine the difference in arithmetic means of the respondents, analysis of variance with one factor was used (ANOVA) and multiple analyses of variance (MANOVA). Statistically significant differences exist in the variables of explosive strength p ≤ 0.001, while the repetitive strength of trunk and legs, maximum power has no differences p> 0.005. This suggests intergroup differences in the variables of explosive strength in which a very strong statistical significance p ≤ 0.001 occurs. It can be concluded that the disc herniation which was not accompanied by neurologic deficit leads to a certain reduction in power parameters, but is not crucial for the termination of sports or achieving good sport results among patients who have no obvious neurological deficit.

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Keywords: disc herniation, power, sport, strength of the lower extremities

INTRODUCTION

When a sudden flexion of the lumbar disk hernia occurs, usually in the posterolateral direction, the consequence may be muscular weakness of the lower extremities. A prolapse of intervertebral discs or disc herniation most commonly occurs in a sudden lifting of the front bend at the knees instead of being extended in a crouch. On that occasion, the forces acting on the spinal column are incomparably greater than the load being lifted, and the maximum load point at the level is L5-S1, L4-L5, the site of the most frequent rupture of the membrane (Karaikovic, 1986).

A herniated disc usually occurs due to degenerative changes that occur owing to water loss, metabolic disorders of chondroitin sulfate, collagen disorders of quantities, and so on. Damage to this part of the spinal column occurs when using force of 5 kn, which corresponds to the heavy lifting of 500kg. Very often, if there is a complete prolapse, it is unlikely that the nucleus pulposis will return to its place. Symptoms include sharp pain in the lower back and a blocking of movement and can cause damage to the nerve roots and even paralysis. The pain can be so intense that the person it happens to remains rooted in the place and position in which the violation occurred (Zivkovic, 2009). Often herniation occurs as a result of professionally practicing sports, swimmers who swim mostly butterfly, judo athletes, due to rotation within flexion, wrestlers, and so on.

As has already been said, disc herniation can restrict movement, reduce mobility or lead to current paralysis. Disc herniation is treated conservatively or surgically, depending on the severity. Therefore, it is very important to examine the condition and the power of the lower extremities of patients who do not have obvious weaknesses of the lower extremities through explosive tests maximum power and repetitive force after the appearance of disk herniation. The vertical jump is designed as a means of assessing the explosive strength of the lower extremities within healthy and injured people. “Myotest” as an instrument (Myotest SA, Sion, Switzerland), has the technology and methodology for assessing the said explosive strength (Bubanj, Stankovic, Bubanj, Crayons, & Dimic, 2010). The absolute strength of the legs is also very important and therefore its trial is of a great importance for further sporting activities of the injured individual. Herniation may also have an impact on troop strength which we can examine with the test of repetitive strength. The aim of the study was to determine how and in what way herniation without clinical neurological and muscular weaknesses affects the strength and endurance of the muscles of the legs and the torso among athletes.
RESEARCH METHODS

Respondents

In this research, some twenty male subjects attended and all of the respondents have been professional athletes for many years, aged 28.70 ± 3.22, with an average body weight of 76.25 ± 4.78 kg and average height 184.35 ± 5.67 cm. Subjects were divided into two groups, the first group (control group) of 10 subjects that were completely healthy, the second group (E) group was composed of patients with disc herniation in the area of the spine L5-S1, asserts reviewing MRI. At the time of the test, the subjects had no symptoms of diseases, and regarding treatment, they occasionally ingested the drug Mydocalm-Midokalm.

Variables

Using the Myotest and performing the jump from half squat (CMJ):
1. Height (expressed in cm)
2. Power (expressed in W/kg)
3. Force (expressed in N/kg)
4. Acceleration (expressed in cm/s).

There was a maximum weight of thruster legs (leg press) in a repeating, formula weight / (1.0278 - (0.0278 x number of repetitions)) = One repetition Maximal or one repetition maximum (Brzycki, 1993).

1RM (expressed in kg)

Test repetitive leg strength: REPC- deep squat on one leg (the maximum number of repetitions).

Test repetitive strength of trunk: REPF-flexion (forward bend from the horizontal position back to an angle of 90°) and REPE- trunk extension (shelter troops from lying down on stomach), (maximum number of repetitions) (Stojiljkovic, 2003).

Before the measurement, the manner in CMJ performance was explained in detail to all the respondents. The respondents performed CMJ from a normal upright position, with hands upon hips, without swinging through the knee joint and flexion to 90° and after the beep, when the maximum strongly reflected in the air and the landing with a slight flexion in the knee joint. After that the respondents took the starting position, waiting for a new sound signal when repeating the mentioned jump technique. All respondents performed vertical jumps five times. The test of the leg press was carried out by the respondents by a full extension of the load on the machine lowered until the angle of the knee joint was not 90°, 130° in the hip joint, and then back to full extension. Bend troops moved from a lying position on the back with a paddle on medium until a flexion of 90°, then the respondent was again returned to the original position and performed the exercise until failure. In the test trunk exercises on
a Swedish crate, the respondent took the starting position lying on the stomach, with trunk out of the Swedish crate and an initial position with flexion of 90°, up to a maximum hyperextension, and then returning to the original position. A deep squat on one leg was derived from an upright position, where the subject stood on one leg, then moved into a squat position where the angle was 90° in the knee, and 130° of the hip joint, returning to the original position, with the test being performed to failure.

Data processing

All data was processed in the SPSS 11 program. Variable power was shown by descriptive statistics, separately for each group and the initial and final measurements. To determine the difference in the means of the respondents, used was an analysis of variance with one factor (ANOVA) and multiple analyses of variance (MANOVA).

RESULTS

Table 1. Descriptive indicators of body weight, body height and age

<table>
<thead>
<tr>
<th></th>
<th>number</th>
<th>minimum</th>
<th>maximum</th>
<th>(x)</th>
<th>(SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>20</td>
<td>175.00</td>
<td>193.00</td>
<td>184.350</td>
<td>5.67798</td>
</tr>
<tr>
<td>Weight</td>
<td>20</td>
<td>68.40</td>
<td>83.40</td>
<td>76.2550</td>
<td>4.78721</td>
</tr>
<tr>
<td>Age</td>
<td>20</td>
<td>22.00</td>
<td>35.00</td>
<td>28.7000</td>
<td>3.22980</td>
</tr>
</tbody>
</table>

Table 2. Kolmogorov-Smirnov test

<table>
<thead>
<tr>
<th></th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>height</td>
<td>.979</td>
</tr>
<tr>
<td>power</td>
<td>.386</td>
</tr>
<tr>
<td>force</td>
<td>.245</td>
</tr>
<tr>
<td>acceleration</td>
<td>.268</td>
</tr>
<tr>
<td>RM1</td>
<td>.984</td>
</tr>
<tr>
<td>REPF</td>
<td>.789</td>
</tr>
<tr>
<td>REPE</td>
<td>.907</td>
</tr>
<tr>
<td>REPC</td>
<td>.658</td>
</tr>
</tbody>
</table>

From Table 2 it can be concluded that the distribution of the results were normal p> 0.05.
Table 3. Mean values of variables within healthy and injured athletes, and difference mean values between groups

<table>
<thead>
<tr>
<th>Group</th>
<th>K</th>
<th>E</th>
<th>K-E</th>
</tr>
</thead>
<tbody>
<tr>
<td>height (cm)</td>
<td>44.18</td>
<td>35.09</td>
<td>Δ visina 9.09</td>
</tr>
<tr>
<td>power (w/kg)</td>
<td>42.89</td>
<td>29.73</td>
<td>Δ snaga 13.16</td>
</tr>
<tr>
<td>force (N/kg)</td>
<td>28.65</td>
<td>20.37</td>
<td>Δ sila 8.28</td>
</tr>
<tr>
<td>acceleration (cm/s)</td>
<td>236.20</td>
<td>198.40</td>
<td>Δ ubrzanje 37.8</td>
</tr>
<tr>
<td>RM1 (kg)</td>
<td>119.90</td>
<td>114.20</td>
<td>Δ RM1 5.7</td>
</tr>
<tr>
<td>REPF</td>
<td>82.00</td>
<td>80.70</td>
<td>Δ REPF 1.3</td>
</tr>
<tr>
<td>REPE</td>
<td>50.60</td>
<td>49.90</td>
<td>Δ REPE 0.7</td>
</tr>
<tr>
<td>REPC</td>
<td>7.40</td>
<td>6.30</td>
<td>Δ REPC 1.1</td>
</tr>
</tbody>
</table>

Table 4. The differences between K and E groups in variables in the multivariate power level

<table>
<thead>
<tr>
<th>Wilks’ Lambda</th>
<th>F</th>
<th>Hypothesis df</th>
<th>Error df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>.194</td>
<td>5.713*</td>
<td>8.000</td>
<td>11.000</td>
<td>.005</td>
</tr>
</tbody>
</table>

Wilks’ Lambda – value of the coefficient Wilks test F – value of the coefficient; F-test for significance, Wilks’ Lambda; Hypothesis df and Error: df – degree of freedom; p – relevance of difference between centroids

Table 4 shows that there are statistically significant differences in the multivariate level variables in power, the statistical significance of p = 0.005.

Table 5. Intergroup differences K and E groups in the variables on the univariate power level

<table>
<thead>
<tr>
<th>source</th>
<th>Dependent variables</th>
<th>Type III df</th>
<th>Mean square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>group</td>
<td>visina</td>
<td>413.140</td>
<td>1</td>
<td>413.140</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>snaga</td>
<td>865.928</td>
<td>1</td>
<td>865.928</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>sila</td>
<td>342.792</td>
<td>1</td>
<td>342.792</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>ubrzanje</td>
<td>7144.200</td>
<td>1</td>
<td>7144.200</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td>RM1</td>
<td>162.450</td>
<td>1</td>
<td>162.450</td>
<td>.055</td>
</tr>
<tr>
<td></td>
<td>REPF</td>
<td>8.450</td>
<td>1</td>
<td>8.450</td>
<td>.499</td>
</tr>
<tr>
<td></td>
<td>REPE</td>
<td>2.450</td>
<td>1</td>
<td>2.450</td>
<td>.860</td>
</tr>
<tr>
<td></td>
<td>REPC</td>
<td>6.050</td>
<td>1</td>
<td>6.050</td>
<td>.471</td>
</tr>
</tbody>
</table>

Wilks’ Lambda – value of the coefficient Wilks test F – value of the coefficient; F-test for significance, Wilks’ Lambda; Hypothesis df and Error: df – degree of freedom; p – relevance of difference between centroids
From Table 5 we can conclude that statistically significant differences exist only in variables of explosive strength where the significance is very high $p \leq 0.001$, while in variables of a repetitive strength of the trunk and the legs there are no statistically significant differences, as well as in the maximum strength of the legs $p >0.005$. All this is also indicated by the results from Table 3 where the intergroup difference is in the variables of an explosive strength in which occur statistically significant differences ($\Delta$ height=$9.09$cm; $\Delta$ strength =13.16 w/kg; $\Delta$ force=8.28 N/kg; $\Delta$ acceleration=37.8cm/s).

**DISCUSSION**

In the current study, all patients were still active and professionally engaged in sports, both healthy and injured. However, there are some differences, especially in explosive force, where significantly more force is produced as well as a large number of muscles used, and thus the load on the body of athletes is significantly higher. Schumacher et al. (2003) compared the power of flexion and extensions within the body among patients with and without lumbar disc hernia. Respondents with no damage to the disk showed significantly better results and to 44% more power when isometrically flexed, and 36% when isometrically extended. With dynamic trunk tests respondents with no injuries carried out a 70% higher number of repetitions of the respondents with spinal cord damage. Muscle status mostly depends on the type of hernia, so that when there are two types of hernia, there are intense changes in the development of the muscles in the lumbar region, on the side where the damage occurred as much as 9.8%, and 6.4% with hernia type 1 (Kiyoshi et al., 2001). Cheng-Wen et al. (2005) came to the conclusion that individuals with disc herniation have reduced muscle strength of the trunk muscles and the actuator muscles in the knee joint.

As much as 89.3% of the athletes who stopped playing sports due to disk herniation returned to sports after treatment. The average length of recovery was 5.8 months (Watkins et al. 2012). Herniation is closely associated with a limiting of motion, but if there is no damage to the nerve pathways, disc herniation is no barrier in sports activities. All this was shown in the results of this study, where we could see that the difference is only in explosive force, while the other tests showed no statistically significant changes. When it comes to tests of repetitive power differences, the results are $\Delta$REPF =1.3, $p = 0.499$; BEET $\Delta = 0.7$, $p = 0.860$; $\Delta$REPC =1.1, $p = 0.471$. In these tests, no large load was used as the muscles could not overcome excessive force, and therefore the load on the spinal column was reduced.

This type of power is not highly genetically determined, and thus it is easily renewable, unlike explosive power. When maximum power there was
also no statistically significant differences $\Delta R M 1 = 5.7kg$, $p = 0.055$, primarily due to the fact that as a movement it was not too dynamic and no excessive involvement of the spinal column was detected. In the test of maximum power, it was better to use a deep squat or crouch, but people with disc hernia were expressly prohibited to lift weights above their heads, that is, each load had to be at the level of the pelvis. In the last decade, there was an increase in the training and rehabilitation process of “core stability training” i.e. the training of the body’s core stability. The goal of this training was to adequately rehabilitate muscle imbalance (Meier, 1997).

**CONCLUSION**

In this case, disc herniation was not the reason for termination of sport but it did lead to some changes in the strength of athletes. Athletes with disk herniation have less explosive power than athletes without injuries, which can be explained by the engagement of larger muscle groups, a dynamic mode of operation and a production of great power, although other results did not show any statistically significant differences. It can be concluded that herniation leads to certain limitations and reductions of performance parameters, but is not a decisive factor for terminating sports activities or achieving good sports results. Disc herniation in the lumbar region, however, can affect these measures and the function of the muscles of the lower extremities, resulting in termination of sports. In our group of patients without motor deficit, this was not the case. Changes in the parameters of explosive forces were detectable (jump height, force, acceleration), while the repetitive and maximum power of these changes were not visible. It can be concluded that herniation led to certain limitations and reductions of certain performance parameters, but it was not a decisive factor in terminating sports or the failure to achieve good sports results.
REFERENCES


Abstract: This case study analyzes the results of the questionnaire which aimed to test to which extent certain integrated marketing communication instruments affect the decision-making process of potential students regarding the choice of a higher education institution, which was the subject of study. The questionnaire was carried out on a yearly basis, during the 2013/14 school year entry exam period, and the candidates were for the first time allowed to opt for several offered options. The questionnaire was not anonymous. The obtained responses underwent qualitative processing and analysis in this paper. The sample consisted of 85 respondents (candidates) of both genders, and the research showed that certain marketing communication activities which the higher education institution had applied during its promotional campaign had a significant impact on the choice of institution for continuing further education. The obtained results confirmed that word of mouth communication continues to represent the most efficient means of integrated marketing communication, and that certain instruments, such as Internet marketing (web pages, Facebook and similar), continue to gain in significance, especially among the young.

Key words: Higher education institution, integrated marketing communication instruments, word of mouth communication, advertising, Internet marketing, public relations
INTRODUCTION

Considering that there is a strong competitive market in the area of higher education, most higher education institutions, especially from the private sector, need to carry out dynamic marketing campaigns in order to reach their target groups and sign up as many students as possible. Such a campaign is also carried out by the College of Sports and Health from Belgrade (hereinafter: the College, or CSH), which is the subject of this case study, and which educates specialists to work in the area of sports and health. During the signing up of each new generation of students, the College carried out an evaluation of the marketing communication program in progress. Considering there is no universal formula, as the situation involves an environment which is inclined towards constant changes, it is necessary to constantly assess the efficiency of certain integrated marketing communication instruments, in the unremitting search for new and efficient ways to approach target groups; in the case of higher education institutions, the most significant target group are secondary school graduates, which are the source of the majority of potential students. The result of this assessment, which implies collecting and analyzing information, should aid in the process of creating, planning and carrying out a future marketing communication program. Every year, during the signing up of a new generation of students, the assessment also includes a questionnaire which determines how potential students had found out about the College. This data is of a paramount significance, as it gives some guidelines for a further choice and application of an adequate marketing communication strategy and investing resources in certain activities and integrated marketing communication instruments.

Word of mouth communication

It is well known that marketing success depends on those clients who come back to purchase another time, that is, those who reuse the same products/services. Thus, it is very significant that an organization secures a permanent benefit for users, that is, that it sustains service quality. An efficient appealing to clients and their retaining is a challenge for marketing. Thus it is of a crucial significance that the promise specified within a marketing communication mix corresponds to real service quality, if the desire of the organization is to realize long term success (loyalty, return of users), as it must be kept in mind that a client will make use of an inferior service only once (Smith, 2002).

2 In order not to be overwhelmed by an overload of text, and considering the situation involves services in the area of higher education and their users, the paper will avoid using the terms products and buyers, in spite of the fact that everything mentioned about services and service user is generally also valid for products and buyers.
Despite the fact that word of mouth communication is not formally acknowledged as an integrated marketing communication instrument, its significance is unquestionably large. Positive oral communication represents one of the best types of promoting every organization, and thus also higher education institutions, considering it has a higher degree of credibility and reliability than communication via the media. Word of mouth communication is a process by which one person verbally conveys a message to another person. Everyone who is talking about the organization or its services is included in this process: all those employed, whether they formally or informally communicate with the service users or other outside public. The employees who are in direct contact with the service users directly impact the image of the organization. However, this process is hard to control, as it has a very big potential. It represents a powerful media in spreading information on the organization and its services (Bond, 2001).

According to certain research, it has been determined that one individual may share his or her positive impressions about the organization, that is, services, with at least three persons; however, discontent will be shared in average with 11 individuals. This is a fact which is to be borne in mind by everyone who wishes to build and maintain the good image of an organization. Quick problem-solving, that is, resolving complaints, is of vital significance to avoid the spreading of negative word by mouth communication at the very start, as negative feelings in regards to some services can be maintained for a long time (Kotler, 2006).

It must be borne in mind that that circle of influence is significantly increased when people communicate over the Internet, and so word of mouth communication via the Web is joined by the spoken word, as a significant stimulus for purchasing (Kotler, 2006). With the emergence of social networks (Facebook, Twitter), every user has the possibility to communicate and exchange opinions and experiences with an enormous number of other users at practically the same moment, which should be taken into consideration as it involves a young population, which on one hand is the most numerous group of social networks users, and on the other hand, it is one of the most significant target groups of higher education institutions - potential students.

Word of mouth communication, thereby, is directly linked with the quality of services in higher education institutions. This is especially significant when referring to educational services in the private sector, considering that market growth, development and the survival of institutions such as these depend directly on the quality and successful carrying out of their activities, which is in a direct correlation with the number of students signed up. Thusly, in order to merit a recommendation by word of mouth users, these higher education institutions must invest a great deal in the quality of their services, which primarily refers to the quality and a constant innovating of curricula, careful selecting of employees, investing
in post-sales services, which in turn implies care about the users (that is, the students) after enrollment, as well as an ceaseless meeting of their needs as well as following comments, acting in coordination with them and a rapid resolving of potential problems. It is also necessary to invest in new teaching aides, classrooms and IT equipment which contributes to the quality of the teaching process.

**Advertising**

According to expectations, one of the basic instruments of integrated marketing communication – advertising, has shown to be very efficient in promoting higher education institutions. Many experts consider this instrument sufficiently powerful to stimulate users, due to large visibility and suggestibility.

“Economic propaganda is constituted of every kind of activity which thanks to audiovisual or combined means informs consumers and endeavors to create in them a positive image about certain products or services and in that way to exert a direct influence on their attitudes in choosing and purchasing products, that is, the choice and use of their services” (Vračar, 1999, 112). Economic propaganda is a form of mass communication, that is, direct communicating with target groups via media outlets (printed or electronic); one of the most popular forms of paid service presenting in the media, whose aim is to create a demand for a certain service in the minds of the public (Vračar, 1999). It has great power, considering that it is directed towards the wide audience. Using different media, it combines information and messages about certain services, by which it stresses and stimulates users to use the services and increase the profit of the organization (Filipović, Kostić, 2001). “Advertising is every type of impersonal presentation and promoting of ideas, goods, or services, which is paid by a known sponsor“ (Kotler, Keller, 2006, 568).

While creating a propaganda message, the relevant elements are the following: what to say and how to say it. “A propaganda message is the use of words, symbols, and illustrations for communicating with the target auditorium via the media” (Jobber, Fahy, 2006, 258). These messages can be more or less artistically formed, or just informative; longer or shorter, with more or less information, and can be based only on associations or images in color. These kinds of decisions depend on the aim of the message, whether it is the presenting of a new service, an attempt of (re)positioning on the market, or simply a reminder of the features of certain services, or something else entirely. The basic function of economic propaganda, i.e. convincing and motivating the consumer to buy the product, is achieved by an appropriate text. A strong text of an economic-propaganda message is one of the most powerful means of communication (Filipović, Kostić, 2001, 253). Thus, it is important to produce new ideas, to avoid repetition and use means already used by somebody else. A good advertisement usually stresses one or two essential features of a product/service.

After choosing a message, the media which is to carry it out is chosen, in
regards to the range, frequency and influence. The range is the most significant during the launching of a new service, as well as poor demand. Frequency is the most important if there are strong competitors, or resistance by the user. The media refer to different target segments of the marker, especially divided according to age, life style, interests. Mass-media increasingly refer to certain target groups and exert influence on them. The choice of a good media outlet is of a crucial and vital importance, as without the appropriate media, the carrier of a promotional message, it is not possible to carry out successful marketing communication. Thus understanding the features of different media outlets is a significant prerequisite for using their potential wisely (Bond, 2001).

The media which use economic propaganda are the following (Filipović, Kostić, 2001): the press, audio and audio-visual means of entertainment and advertising: the radio, TV, film, the Internet (www, e-mail, Facebook), as well as the means of external economic propaganda (which include all the areas which are graphically processed in the aim of advertising: billboards, posters, neon signs, advertising space, or ads on streets, bus stops, shopping malls, sports fields; and buses or taxis with advertisements on them).

Of course, the available budget is of a crucial impact on the choice of media, the frequency of advertising, as well as the quality of the ads. Economic propaganda, that is, advertising, is one of the most frequent and most preferred instruments of integrated marketing communication in promoting educational institutions, regardless of the relatively high price of advertising space.

In regards to content and time, economic propaganda must be in accordance with the other integrated marketing communication instruments and must augment them in order to achieve a maximum effect of the sales efforts of the organization. It is relevant that all the activities of integrated marketing communication have a joint aim. It is also necessary to compile a detailed plan of marketing communication, taking in view the compatibility of all their instruments. Such a plan should have an optimal effect on creating a corporate image and organization identity, as well as a successful realizing of the sales of its services (Filipović, Kostić, 2001).

**Internet marketing**

Internet marketing is defined as “meeting marketing aims via Internet use and technologies based on this” (Jobber, Fahy, 2006, 281). The phenomenon of the Internet has fundamentally impacted the developing of personal and business communications. It can be used for informing, promotional activities and sales (Morris, 2001, 105). One of the key presumptions of modern business implies the existing of Internet presentations, which is a contemporary, efficient and attractive way to presents a higher education institution to its users and other interested parties. Higher education institutions use their Internet pages for developing public relations, presenting the most vital information about an
institution (aims and mission, teaching staff, material resources), presenting services (study programs and eventually, other activities) and advertising.

The Internet enables establishing direct communication between the organization and its multiple and diverse target groups. In order for business communication on the Internet to be successful, it is necessary for it to be included in the total plan and strategy of business communication, as well as a firm link with traditional communication instruments (Filipović et al., 2001). “Internet marketing must be creative, interesting and prone to constant changes, due to a variety of information supplied to users. On the other hand, though it is relatively easy to create a positive image on the net, thus it is equally quick and easy to create a negative impression” (Vukmirović, 2001, 404).

The content of a Web presentation must in no way be neglected at the expense of form. The message content must be adapted to the demands of the users. According to Dragutin Vračar, “information is what sells products on the Web” (1999, 247). Thus, information must be presented clearly and as simply as possible and it must be significant and useful for the site visitors. The aim should be to establish an interactive relationship and communication between the visitors of the Internet presentations and the organization.

In the past years, an increasing number of higher education institutions with their target groups (most often these are current or potential students, as well as their parents; also, potential business partners) also communicate via social networks (in Serbia, the most popular are Facebook and Twitter), whose development has also enabled an easier and quicker linking of these institutions and their target groups. The interaction is practically momentary, it transpires 24 hours a day due to the nature of social networks and the possibility of exchanging various contents (photographs, video clips, music, and entertaining material), and it is more direct and has a greater flexibility. It can be said that it is devoid of the rigor typical for business communication which on the other hand is typical for e-mail or official Internet presentations, as it takes part in a somewhat more relaxed, virtual ambience, even when this involves an official Facebook page of a higher education institution.

Some public relations activities

The definitions of public relations are various and numerous, and here we will mention some of the most recent ones. Namely, in March of 2012, thanks to the Public Relations Society of America (PRSA), with the help of 12 other vocational organizations and associations and a industry-wide public, based on a public vote, hundreds of submissions, abundant commentary and nearly one year of research, the profession’s choice for the modern definition of PR profession is: Public relations is a strategic communication process that builds mutually beneficial relationships between organizations and their publics.
This sort of communication between higher education institutions and their target groups is realized via numerous PR activities which, among other things, encompass: consulting the management in regards to the policy of the institutions and communications with the public, researching attitudes and the behavior of the public in the aim of planning an adequate strategy of public relations, relations with the media, crisis management and many others, among which this paper will mention the following: organizing special events, presenting higher education institutions and/or its services and creating a visual identity.

Organizing special events is carried out for the purpose of attracting attention to the services of higher education institutions, or some of their activities. Special events include the following: organizing diverse conferences and seminars, participating at fairs, organizing exhibitions or competitions, celebrating anniversaries and one-time or regular events, whose aim is to attract as much media attention as possible (publicity), as well as exerting influence on targeted public organizations (Lawrence, 2001).

One of the more significant PR activities are also presentations of higher education establishments or their services, which occur at fairs, seminars, while visiting secondary schools and talking with pupils whenever there is an opportunity for this. Power Point presentations, as clear demonstrations and oral presentations are always received well, as they present the possibility of interaction and establishing contact with the public, which can take part and ask questions (Lawrence, 2001).

Creating a visual identity of higher education institutions, especially private establishments, is usually focused on. A visual identity represents all that an establishment is recognizable to the public by, starting from the name, logotype, slogan, banner, to a variety of promotional material (pens, organizer, T-shirts, caps), to branded vehicles and business space.

**METHOD**

The questionnaire which assesses the influence of integrated marketing communication instruments on the decision-making process on the potential students of the College of Sports and Health is conducted every year, and this paper presents the results of the questionnaire carried out during the signing up of students in the 2013/14 school year. All the integrated marketing communication instruments which are strategically planned and used to promote the College were mentioned in the questionnaire.

Applied was the methodology of transversal processes, that is, a process which is carried out in the planned periods of research (in this case, once a year, during enrollment), orientated towards elementary descriptive statistics. The questionnaire technique was used for gathering data, and the questionnaire was not anonymous, offering some 14 options (14 communication channels), while the candidates were expected to respond how they had found out about
the College. The sample consisted of 85 candidates of both genders, applicants for the a new generation of students in 2013/14, which was 77% of the total number of those who applied for all three study programs (Sports Coach, Sports Management, Vocational Physiotherapist) and signed up for the first year of study. The candidates were allowed to choose more than one answer.

The obtained responses of the respondents were processed and qualitatively analyzed. The data processing implied creating a spreadsheet of the number of candidates who opted for this higher education institution based on certain communication activities.

**RESULTS**

The offered options (communication channels) in the questionnaire, as a response to the question how the candidates had heard about the College, and sorted according to frequency of choice, were the following (Table 1):

Table 1. Communication channels according to the frequency of choice (in percentage and absolute value)

<table>
<thead>
<tr>
<th>Communication channel</th>
<th>No (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Recommendation of friends, relatives</td>
<td>40 (47,06%)</td>
</tr>
<tr>
<td>2. CSH student recommendation</td>
<td>31 (36,47%)</td>
</tr>
<tr>
<td>3. Recommendation from sports club</td>
<td>16 (21,18%)</td>
</tr>
<tr>
<td>4. Recommendation of friends from secondary school</td>
<td>15 (17,65%)</td>
</tr>
<tr>
<td>5. College site</td>
<td>13 (15,29%)</td>
</tr>
<tr>
<td>6. College Facebook page</td>
<td>11 (12,94%)</td>
</tr>
<tr>
<td>7. TV</td>
<td>11 (12,94%)</td>
</tr>
<tr>
<td>8. Press</td>
<td>9 (10,59%)</td>
</tr>
<tr>
<td>9. Something else</td>
<td>4 (4,71%)</td>
</tr>
<tr>
<td>10. Billboards</td>
<td>3 (3,53%)</td>
</tr>
<tr>
<td>11. Posters in public transportation</td>
<td>3 (3,53%)</td>
</tr>
<tr>
<td>12. Posters in the Tašmajdan Sports Center</td>
<td>2 (2,35%)</td>
</tr>
<tr>
<td>13. Presentations in secondary schools</td>
<td>2 (2,35%)</td>
</tr>
<tr>
<td>14. Education Fair</td>
<td>2 (2,35%)</td>
</tr>
</tbody>
</table>

The questionnaire enabled potential students to choose only one option (one communication channel), which was decisive for their enrollment to the College (Table 2).

---

3 This option is the least specific, considering it is unspecified whether the friends/relatives are College students (former or current), or coaches in sports clubs or whether they found out about the College from some of the marketing activities carried out by the College.
Table 2. Opting of candidates based on only one communication channel (percentage and absolute value)

<table>
<thead>
<tr>
<th>Communication channel</th>
<th>No (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Recommendation of friends, relatives</td>
<td>22 (25.88%)</td>
</tr>
<tr>
<td>2. CSH student recommendation</td>
<td>10 (11.76%)</td>
</tr>
<tr>
<td>3. Recommendation from sports club</td>
<td>3 (3.53%)</td>
</tr>
<tr>
<td>4. Recommendation of friends from secondary school</td>
<td>-</td>
</tr>
<tr>
<td>5. College site</td>
<td>2 (2.35%)</td>
</tr>
<tr>
<td>6. College Facebook page</td>
<td>1 (1.18%)</td>
</tr>
<tr>
<td>7. TV</td>
<td>2 (2.35%)</td>
</tr>
<tr>
<td>8. Press</td>
<td>1 (1.18%)</td>
</tr>
<tr>
<td>9. Something else:</td>
<td>4 (4.71%)</td>
</tr>
<tr>
<td>- CSH professor recommendation</td>
<td></td>
</tr>
<tr>
<td>- attendance of professional training in the College</td>
<td></td>
</tr>
<tr>
<td>- training in the College fitness center</td>
<td></td>
</tr>
<tr>
<td>- recommendation of secondary school teacher</td>
<td></td>
</tr>
<tr>
<td>10. Billboards</td>
<td>-</td>
</tr>
<tr>
<td>11. Posters in public transportation</td>
<td>-</td>
</tr>
<tr>
<td>12. Posters in Tašmajdan Sports Center</td>
<td>1 (1.18%)</td>
</tr>
<tr>
<td>13. Presentation in secondary school</td>
<td>1 (1.18%)</td>
</tr>
<tr>
<td>14. Education Fair</td>
<td>2 (2.35%)</td>
</tr>
</tbody>
</table>

Thus, 37 candidates (43.53% of those polled) made up their minds based only on word of mouth communication, that is, a direct recommendation, while 10 candidates (11.76%) decided based on only one marketing activity. Two of them (2.35%) made a decision on the basis of something else. This makes up 57.64% of all those polled, that is, 49 candidates (Table 3).

Table 3. Frequency of choice of only one communication channel according to category (percentage and absolute value)

<table>
<thead>
<tr>
<th>Communication channel</th>
<th>No (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Word of mouth communication</td>
<td>37 (45.53%)</td>
</tr>
<tr>
<td>2. Marketing activities</td>
<td>10 (11.76%)</td>
</tr>
<tr>
<td>3. Something else</td>
<td>2 (2.35%)</td>
</tr>
</tbody>
</table>

Here the word category implies a gathering of communicational channels which belong to a larger group. For example, the category word of mouth communication also includes the recommendation of former students, and friends/relatives, and teachers, i.e. coaches; in the same way, the category marketing activities includes every kind of advertising, as well as Internet marketing, participating at education fairs and similar.
The remaining candidates, some 36 (that is, 42.36%), opted to study at the College based on several combinations of the offered options (communication channels), among which the most frequent are the following (Table 4):

- Recommendation of friend/relatives and (former and current) College students – 11 candidates, that is, 12.94%,
- Recommendation of friends/relatives, combined with TV/press – 6 candidates, that is, 7.06%,
- Recommendation of friends/relatives, in combination with the Internet (College site or College Facebook page) – 5 candidates, that is, 5.88%.

The other candidates, 14 of them (that is, 16.47%), opted for some other combinations, that is, they were exposed to information about the College through several different communication channels at the same time (three and more), with the condition that none of these cases had a combination of different marketing activities which omitted some of the word of mouth communication forms.

Table 4. Frequency of chosen combinations of the offered communication channels (percentage and absolute value)

<table>
<thead>
<tr>
<th>Combination of communication channels</th>
<th>No (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Recommendation of friends, relatives – recommendation of (former/current) College students</td>
<td>11 (12.94%)</td>
</tr>
<tr>
<td>2. Recommendation of friends, relatives – advertising on TV/ in the press</td>
<td>6 (7.06%)</td>
</tr>
<tr>
<td>3. Recommendation of friends, relatives - Internet marketing (College site /Facebook page)</td>
<td>5 (5.88%)</td>
</tr>
<tr>
<td>4. Various communication channels</td>
<td>14 (16.47%)</td>
</tr>
</tbody>
</table>

To sum up, we have the following data (Table 5):

- Based on one of the word of mouth communication forms (friends or relatives, former or current students, talks in the sports club, friends from secondary school, College professors, teachers from secondary school) or their combinations, some 48 candidates applied, that is, 56.47% of those polled;
- Based on marketing activities (advertising on TV or in the press, the College site or FB page, billboards, posters in public transportation or in the Tašmajdan Sports Center, at the Education Fair or presentations in secondary schools) – 10 candidates, that is, 11.76% of the polled;
- Based on the combinations of one of the word of mouth communication forms and some marketing activities (or several of them together), 25 candidates applied, that is, 29.42% of the polled;
- Something else (via professional training programs or training sessions in the College fitness center) – 2 candidates, that is, 2.35%.
Table 5. Recapped replies of candidates according to communication channel categories (percentage and absolute values)

<table>
<thead>
<tr>
<th>Combination of communication channels</th>
<th>No (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Some word of mouth communication form</td>
<td>48 (56.47%)</td>
</tr>
<tr>
<td>2. Some applied marketing activities</td>
<td>10 (11.76%)</td>
</tr>
<tr>
<td>3. Some word of mouth communication and marketing activity together</td>
<td>25 (29.42%)</td>
</tr>
<tr>
<td>4. Something else</td>
<td>2 (2.35%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>85 (100%)</strong></td>
</tr>
</tbody>
</table>

**DISCUSSION**

It is important to stress that this questionnaire differs from previous ones in the way that for the first time, students could choose more than one response, as well as due to the fact that different marketing activities were offered separately, in order to obtain precise data and effective insight into which communication channels are the easiest and quickest for reaching potential students.

All the obtained results testify of the power of the recommendation of a trustworthy person conveyed by word of mouth communication. In accordance with expectations and previous experience, the largest number of new students continue to apply on the basis of a recommendation of a friend/relative, whether (former or current) College students or not. This is logical, considering it involves lasting education which, on one hand, is relatively expensive, and on the other, decisive for every young person. A possible reason for such a result is the fact of insufficient differentiation and affirmation of good quality institutions (appearance of new institutions, insufficient assessment of their quality, etc.). Thus it is clear that it the recommendation of a trustworthy person, that is, one with experience with this service, which will exert a crucial influence while choosing the future profession, as well as the establishment which will enable quality education. The latest research carried out during the first and second registration period (July and September 2013), points to the fact that 56.47% of the polled students applied based on some form of word of mouth communication (including here also the recommendation obtained in a sports club or a secondary school), and if we add to that the fact that students, along with word of mouth communication, were also exposed to some marketing activity, this number increases to as many as 85.88% of the employed.

Last year, the College used the press, audio-visual means of advertising and entertainment (TV and the Internet) and means of outdoor advertising: namely, billboards, posters in public transportation and in the rooms of the Tašmajdan Sports Center (Image 1).
After a careful selection of the College spokesmodels (Ivana Maksimović – a silver medal winner at the 2012 Summer Olympics, student of the Sports Coach study program (sport shooting); Marko Pantelić – former Serbian football national team member, graduate of the Sports Management study program; Draženko Mitrović – Paralympic vice-champion in athletics, student of the Sports Coach study program (Athletics) and Aleksandar Bulatović – a renowned vocational physiotherapist), a poster was created and two commercials were shot, which in the period from April to mid-July 2013, as well as the first half of September, were aired on the first and second channels of RTV Serbia.

These commercials were made painstakingly. The first one was focused primarily on young people in sports and in it Ivana Maksimović exclaims the following: “The College of Sports and Health – my choice, as education and top sports go together”. At the end of the video spot there is a list of study programs and relevant College information, while the speaker intones the official slogan: “Learn from the best – achieve the most”.

The second commercial focuses on all those interested in the Vocational Physiotherapist study program. It features a former student, and today a renowned and successful physiotherapist, Aleksandar Bulatović, who says: “Invest in your future – become a vocational physiotherapist; the College of Sports and Health – my choice”. At the end of this commercial, the official College slogan is heard.
These commercials last a mere 10 seconds. The focus was on achieving a synergy with the contents of the TV program, and thus the commercial with Ivana Maksimović was aired mostly before the start of a Champions League match. The commercial for vocational physiotherapists was aired mostly in the RTS morning show, addressing not only the primary target group – secondary school graduates, but also their parents, who have a great influence on the decision-making of their children in regards to their future profession.

In regards to the press, school competitions were published in Politika and Večernje novosti newspaper supplements dedicated to higher education, as well as in the dailies Sportski žurnal and Sport, which covered some of the most significant target groups for College application: namely, expect for secondary school graduates (and their parents), these are also young people interested in sports, sportspeople, coaches and, generally speaking, individuals who work in sports, or follow sports with some regularity (Image 2). There is an insistence on an optimal positioning of the advertisement (always best on the right hand side).

Image 2. Presenting the College in a supplement dedicated to higher education in the Večernje novosti newspaper
In regards to the means of outdoor advertising, College advertisements were shown for three weeks on LED billboards at three attractive and carefully chosen locations in Belgrade: across from the building of the Republic of Serbia government (on the corner of the Knez Miloš and Nemanjina streets), on Slavija Square and the Square of the Republic (Image 3).

Image 3. The billboard of the College of Sports and Health

The mentioned posters were placed on four public transportation bus lines which cover the vicinity of the College.

From May to end-September, or a full 5 months, the College poster was positioned at the entrance and within the Tašmajdan Sports Center, which is daily visited by a large number of young people who are interested in sports.

As can be seen, in the 2013 campaign, except for the regular College slogan “Learn from the best – achieve the most”, a new slogan was also used – “The College of Health and Sports – MY CHOICE”.

Internet marketing deserves special attention. Namely, except for the questionnaire results obtained during enrollment which indicates the increasing significance of this integrated marketing communication instrument, it has also come to our attention that in 2013 the largest number of those seeking information over the telephone in regards to education responded that they had found out about the College over the Internet.

The College Facebook page was started in April 2012. By the end of 2013 (when this paper was written), it had over 1,200 fans, which indicates the great impact of Facebook on the young population. Such a large number of fans, which grows day after day, imposes the obligation to keep up the Facebook page with seriousness and great attention, as it represents an influential marketing instrument, and is, for all intents and purposes, free. From the aspect
of profitability, Facebook is unrivalled. For now, information linked with sports, nutrition and school events are being posted. The page viewers have the opportunity to ask questions in regards to education, and the task of the page administrator is to give precise, concrete and useful responses, and as quickly as possible. Interaction is enabled 24 hours a day, and takes place almost instantly.

In regards to special events, the College traditionally participated in the EduFair Educational Fair, which was held at the beginning of March 2013 in Belgrade. On that occasion, the College presented its study programs to secondary school graduates, their parents and teachers. This kind of promotion can be very efficient, as it enables a direct contact between the higher education establishment and its target groups, when two-way communication and a direct dialogue are established. Every year, within the framework of practical teaching the subjects Communication, PR and the media in sports, engaged were all the students of the third year Sports Management program and a number of students of the Sports Coach program, which were in charge of distributing the promotional material (flyers, pens, pads with the College logo and similar), as well as direct communication with secondary school graduates, to which they were closer in age, features, style and way of communicating from the College staff, who on the other hand was in charge of giving detailed information regarding teaching. Also included were a number of students of the Vocational Physiotherapist program, which had the task of giving information to all those interested in their study program.

Considering that the fact that the decision on college-attending is in June and the fair takes place in March, the Power Point presentation, as well as the airing of commercials, are an inevitable part of the presentation. By using a plethora of photographs and stills which demonstrate the teaching process and College activities, studying at the College is depicted in an interesting and dynamic way and adds on to the information which interested parties get on the spot.

The Power Point presentation is also shown during presentations organized in secondary schools, where there are also promotions of study programs through direct presentations and interaction with secondary school graduates, accompanied by a distribution of promotional material (flyers). The College presentation was held in 2013 in two secondary medical schools in Belgrade, in the aim of acquainting the pupils with the Vocational Physiotherapist study program.

CONCLUSION

After an analysis of the questionnaire, the same conclusions as before can be drawn: in the case of a higher education institution which is the subject of this case study, promoting via word of mouth communication continues to
represent the most efficient means of marketing communication. This means that investing in the quality of services should be continued. This primarily relates to the quality and a constant innovating of curricula, the quality of teaching and non-teaching staff, as well as investing in post-sales services. It is also necessary to invest in new teaching equipment, classrooms and IT which contributes to the quality of the teaching process.

As it has already been stressed in a previously carried out research, quality is crucial and the most significant factor in attracting new students. The activities of marketing communication are significant, but the activities of marketing communication are not and cannot be sufficient if there is no solid quality to support them (Krstić, 2007). Such a research result also corroborates how significant it is to develop firm, correct and consistent relations with all those studying at the College.

In regards to integrated marketing communication instruments, Internet marketing is gaining in significance, in order to be seen as the most efficient in this polling, as well as the most profitable. It is taking precedence over the traditional means of advertising – the press, even TV, especially with those of the young generation (secondary school pupils), who represent one of the most significant target groups of higher education institutions.

Somewhat less efficient is outdoor advertising (billboards, posters), as well as promoting the College at the Educational Fair and presentations in secondary schools. However, when the number of those who found out about the College via these activities is summed up, there is the conclusion that these forms of marketing communication should not be neglected or left out in the future, as each one of them, both individually and collectively, not only impact the decisions of potential students, but also contribute to strengthening and creating the public image of the College.
REFERENCES


Abstract: Security at sports competitions is gaining in importance and growing into a fundamental issue due to an increased exposure of society and individuals to a variety of risks, threats and challenges, which lean towards constant growth. The ever more complex conditions of preparing and carrying out sports competitions demand from competition management new approaches in assessing security challenges and risk management. One of the key prerequisites for their well-timed recognizing and repression is a consistent application of all the known functions of contemporary management and efficient risk management. This paper indicates the types of contemporary risks which endanger sports competitions and their management.

Key words: risk; management of sports competitions; risk management

INTRODUCTION

The contemporary environment of sports organizations is very turbulent, with increasingly complex and random changes and many risks with a significant impact. In professional literature, such an environment is indicated by the phrases hyperchange, hypercompetitors and hyperturbulence, and increasingly also as a “risky society”. Such a “risky” environment is not limited only to health and environmental risks but also includes a series of interlinked changes in contemporary social life – changes in work patterns, an increasingly greater insecurity of the work place, as well as insecurity in daily life, a decrease of the impact of tradition and habits, the collapsing of

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traditional forms and family patterns, etc. All this contributes to a state of affairs in which attending sports competitions today is much more risky than earlier. Such an intensity and unpredictability of changes have led to new paradigms for organizations and new management paradigms which are also radically reflected in the area of sports and sports competitions. Thus, “a new concept, new technologies and a new life style demand a totally new management” (Mašić, 2001, p. 2).

In the conditions of global competition on a specific market of large events, only adaptable and innovative organizations can survive. The justification for such an approach can be found in one of the most significant features of sports competitions—their diversity, that is, broad possibilities of choosing various contents which are available to ‘consumers’.

Integrated in the structure of contemporary sports competitions are a large number of different interest groups, investors or shareholders, which in “event management” are uniformly called “stakeholders”.

Each sports competition is authentic, inimitable and represents a potential field of various risks, which should be identified, analyzed, processed and assigned a method of supervision.

Such a complexity of sports competitions imposes the need for implementing certain procedures for risk management, integrated into all the functions of modern management, in order to anticipate or diminish possible consequences of risk which accompany sport competitions.

THE AIM OF RESEARCH

The aim of this research is to contribute to the recognizing of the risks of contemporary social reality, the assessment of its possible impact on sports competitions and to indicate the significance and way of application of tested functions of managing risk management in sports competitions.

RESEARCH TASKS

It is possible to realize the defined aim of the research by realizing three main tasks:

1. risks characteristic for modern society,
2. possible risks at sports competitions, and
3. the process of risk management at sports competitions.
SUBJECT AND OBJECT OF RESEARCH

Contemporary sport is characterized by two basic tendencies: a constant spreading and complicating of relevant theoretical and practical-organizational issues, on one side, and the commercializing of sports activities on the other. An increasingly multidimensional and interdisciplinary character of sports activities demands a significantly larger number of funds of scientific and professional facts and information than earlier, which in turn imposes the demand of a continuous scientific following and researching of various areas and phenomena in sports.

The commercializing of sports has the consequence of sport no longer being merely a sports activities but a serious business involving large sums of money. Thus, a powerful sports industry was established, which is made up of three elements:

1. sports products – not just sports goods and equipment but also sports results, broadcasting sports games, etc.;
2. suppliers of sports products – all those offering goods, services and financial means (organizers, media, sponsors, etc.), and
3. consumers of products-spectators (group and individual) and the participants of sports activities (Bošković, 2013, p. 4).

The basic specific feature of sport which makes it different from the other forms of social awareness and activities is sports competition. According to many authors, it is sports competitions which are the greatest challenge for management, as “their preparation, organizing and realization, basically, reflect the success and ability of distinct human potential in a certain environment. Sport without sports competitions would not be such an attractive phenomenon which has in the contemporary world become a social phenomenon“ (Nešić, 2006-07, p. 5). They reflect the very essence of sports and without competitions there is no business or any other dimensions of sport.”Sport without sports events or competitions would not be such an attractive event which in the contemporary world has become a sociological phenomenon” (Nešić, 2006-07, p. 5).

It can be said that today there is a developed global market of sports competitions which brings to the organizers and hosts of these events greater or lesser financial gain and other income.

Holding sports events is changing the outlook of sport, raising its quality and initiating organizational capacities. “How important are sports events? History has shown us that they have played a crucial role in the development of society and that key individuals, in contrast to the expectations, have managed to create a complex industry of sports events from modest beginnings” (Masterman, 2008, p. 15-17).
Even though the causes and methods of organizing sports competitions, venues and their massive scale have changed through the years, it can be said that the issue of security and risk reduction to a minimum for the participants has always been the imperative. Thus historians have noted that in the Roman Coliseum the audience could be evacuated in the case of fire in 10 minutes, while the spectators, during sunny days, would be protected by a cover stretched between the pillars.

Today this aspect of sports competitions, in spite of a high development of civilization, has gained in significance and grown into a fundamental issue due to a progressively greater endangering of society and individuals by various security risks, threats and challenges, which incline towards a constant multiplying. Increasingly more complex conditions of formation, of the process and leading of sports competitions demands from competition management new approaches in assessing security challenges and risks and their management, which is the object of this research.

METHODS OF WORK

The research uses predominantly the theoretical research methods. The general scientific methods used were mostly so-called quality methods: analysis-synthesis, induction-deduction, abstraction-concretization, generalization-specialization and classification. From the group of special scientific methods, the method of analyzing the contents of documentation was used, to the purpose of determining the legal and normative aspects of the issue.

The objective of the research is, according to its nature, to direct the research process towards studying, generalizing and linking information and facts about sports competitions, as a place of potential risk, and the process of managing competitions by the competition manager.

The basic limitations of a more complex reviewing of risks at sports competitions and the responsibility of the management of sports competitions is linked with an insufficient number of empirical and professional research of this topic.

ANALYSIS OF RESEARCH RESULTS

Risks and risk management in contemporary society

The concept risk implies the possibility that something will head in the wrong direction and that something negative will happen. Unlike past times, the risks in contemporary society are less evident and often appear as unexpected effects, due to which there is a need for every organization to systematically
deal with dangers and insecurities, caused and introduced processes of modernization and globalization. This is present to such an extent that some authors call these earlier periods in the development of human society “pre-risk societies”, and contemporary societies “risk societies”. All types of risks can be divided into the following: external (dangers such as drought, earthquakes, hunger, tsunamis, stormy winds) which come from nature and are not in any kind of connections with human actions; the second type are produced risks, which are a result of the impact of knowledge and technology on the world of nature (for example, ecological risks, health risks, etc.) (Gidens, 2003, p. 72).

The risk society which we in live today produces consequences which are hard to predict and control. Many changes brought on by globalization give birth to new forms of risk, which to a large extent differ than those in the past. People have always had to face risks, but unlike the previous ones which had established causes and known consequences, it is much harder to determine the origins of the risks of the modern age and view the effects.

These differences, globally speaking, can be shown in the following way:

Table 1. A comparative review of risks in contemporary societies (Source: Bek, 2001)

<table>
<thead>
<tr>
<th>Risks in “pre-risk” societies</th>
<th>Risks in contemporary societies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal – affecting smaller groups of people</td>
<td>General – have consequences for entire mankind</td>
</tr>
<tr>
<td>Local character</td>
<td>Global character (macro risks)</td>
</tr>
<tr>
<td>Brevity, transience</td>
<td>Longevity</td>
</tr>
<tr>
<td>Visibility</td>
<td>Invisibility, latency</td>
</tr>
<tr>
<td>Comprehensiveness – the effects are realized at once</td>
<td>Dispersion – the effects are realized in a diffuse and fragmented way</td>
</tr>
<tr>
<td>Predictability</td>
<td>Unpredictability</td>
</tr>
<tr>
<td>Consequences are removed more easily</td>
<td>Consequences are removed with more difficulty</td>
</tr>
<tr>
<td>Motivated by possibilities, a certain choice</td>
<td>Systematic and structural intensified patterns of destruction</td>
</tr>
<tr>
<td>Patterns of courage and adventure</td>
<td>Patterns of destruction and self-destruction</td>
</tr>
<tr>
<td>Expected causes</td>
<td>New and unexpected causes</td>
</tr>
</tbody>
</table>

In view of the possible consequences, there are three main types of risks: risks by mission (function), property risks and security risks. Functional risks prevent an organization to realize its mission. Property risks can damage the physical property of the organization, and a security risk has the potential to harm data and people. What should also be borne in mind is that every risk includes three stages: pre-risk, risk (the risk process), after-risk.
The pre-risk stage is the one where there is a possibility of failure. It encompasses the period prior to a crisis, a problem, incident and similar, as decisions are brought which make an organization more or less vulnerable considering the crisis (for example, neglecting internal and external security checks, or an extreme focus on maximizing profit which leads to a weakening of security patterns). One of the generators of this stage in risk development is often the resistance of organization members towards changes and reinforced business procedures.

The risk stage (risk process) relates to a direct managing of a crisis-incident within the organization and includes the time of duration of the risk which becomes visible, as well as a reestablishing of normal activities. This period will change according to the nature of the crisis-problem and the ability of the organization to give feedback.

The post-risk stage ensues after the risk has occurred and many define this period as “the levitation direction”, which marks the speed of reviving activities. This last stage relates to the time within which the organization tries to consolidate, strengthen relations and change its position (Beech & Chadwick, 2010).

In order to follow risk in all the mentioned evolutionary stages, from incubation to its detection, it is necessary to manage it. And thus, it is risk management which becomes one of the key signs of the modern global order. Risk is in the focus of attention for several reasons: primarily due to the progress of science and technology which has had an impact on creating new risky situations, which in turn differ from earlier periods. However, science and technology should also be put in the service of repressing, not generating risk. Due to this, the process of risk management encompasses identifying crisis situations, their assessment and processing using tested management functions as a scientific discipline. One of the basic prerequisites is a well structured and functional organization, as a bad organization is considered as one of the significant causes of risk.

**Characteristics of sports competitions from the aspect of risk**

Seen as a whole, contemporary risks are fundamentally different in regards to those from previous societies and have new political, social, economic, security, cultural and religious potential and consequences. Globalization and an abrupt development of the IT sector have produced rapid changes in all social segments, perhaps the most rapid in sports which has become an important part of European identity. Sport has become an increasingly more important part of daily life of men and women and a motive for free time and traveling to attend sports competitions, as the most dynamic part of the sport industry, and thus also a potential source of risk.
Today there is no organizer of sports competitions who does not face risks, as there is no competition which fails to carry some sort of risk. The causes for this is a significantly larger massive scale of those attending competitions which are organized in today’s age, whereupon venues and facilities of sports competitions become an arena for leisure and somewhere where passion can be let loose, as well as an especially developed system of information and telecommunication due to which every crisis, regardless of the area where it occurs, becomes quickly known to the whole world and can imply further spreading and deepening (Vejnović, 2011, p. 183). In that discourse, a special focus should be given to visitors and spectators of sports competitions. Namely, most people claim they go to sports competitions to “unload”, and that it involves nothing more than defusing the pressures mentioned by famous social psychologists, sociologists, pedagogues such as Freud, Jung, Le Bon, etc. The contemporary pace of living, characterized basically by speed, has produced a new kind of personality of men, citizens, tourists, sportsmen as well as new patterns of thinking and behavior. Mass sports competitions imply many different people in one place in a short period of time and can easily develop from a sports atmosphere into a confrontation of social antagonisms of all kinds, in the shape of an aggravated and uncontrolled mass within a limited space. Such a gathering can easily be transformed into an unrestrained mass of people demolishing everything they encounter.

The professionalization and commercialization of sports place profit and proceeds in the first place and suppress the humanistic values of sports, due to which there is more immorality as well as violence.

One of the greatest problems which many countries are faced with is hooliganism and violence at sports games, which jeopardizes the security of the players and the spectators at such sports manifestations.

The international law which regulates the area of fighting against violence and inappropriate behavior at sports manifestations is the European convention on violence and inappropriate behavior of spectators at sports manifestations, especially football games, adopted in August 19, 1985 in Strasbourg. The Council of Europe Convention imposes the obligation for member states to prescribe appropriate criminal offenses and violations from this area and thus create a legal mechanism for the protection of sports and sports manifestations. The Republic of Serbia ratified this European Convention in 1990 by bringing a law to authorize the European Convention on violence and inappropriate behavior of spectators at sports manifestations, especially at football games.

In 2003 the National Assembly of the Republic of Serbia brought the Law on Preventing Violence and Inappropriate Behavior at Sports Manifestations (with changes and addenda), which is coordinated with the existing international legal standards and gives a possibility of carrying out adequate measures by state bodies authorized to fight against violent behavior at sports manifestations.
This law established measures for preventing violence and inappropriate behavior at sports manifestations (sports competitions and sports manifestations) as well as the commitments of the organizers (sports associations, sports societies, sport organizations - clubs, other companies or individuals who permanently or temporarily deal with organizing sports events) and the authorities of the endorsed bodies in carrying out these measures.

Sports organizations, societies, associations, and other companies and individuals who deal with organizing sports manifestations are obliged to coordinate their legal acts with the law on preventing violence and inappropriate behavior at sports manifestations.

Based on the Law on Sports, the government founded a National Council of fighting against violence and inappropriate behavior of spectators at sports manifestations as the strategic body for preventing violence in sports.

The task of the Council is to coordinate activities of preventing violence and inappropriate behavior of spectators at sports manifestations and meeting international commitments in this area. The Council is personally presided over by the president, and also contains the first vice president (the second-in-command), the ministers of justice, state administration and youth and sports, the republic public prosecutor and the presidents of the Football, Basketball, Handball, Volleyball and Water polo Associations of Serbia as well as the presidents of the Association of Sports Journalists of Serbia, the Sports Association of Serbia and the Olympic Committee of Serbia (Bošković, Petrović, 2013, p. 197).

Along with the Law, there is also the National Strategy for fighting against violence and inappropriate behavior at sports manifestations for the period from 2013 to 2018, which defines the strategic areas and aims, the roles and responsibility of social subjects and establishes the framework for the implementation and creating of an action plan, and creating additional conditions for a more efficient inclusion of the Republic of Serbia into a regional, European and world concept of preventing violence at sports manifestations.

It is without doubt that violence in sports is not linked only with the hooligan behavior of the fans, but also other, more subtle and less visible, but very serious forms of violence, which have become almost customary at sports competitions. Thus, the sports public is facing a great problem and challenge – how to transform passion for sport and direct it towards human and cultural forms of behavior.

This leads to the conclusion that managing the security of people at sports competitions must be the primary worry of the organizer of such events. The safety of the public is a priority of every larger sports competition, considering that there are risks present which can have various results, such as accidents which can demand quick evacuation.
Some authors warn about the link between the organization and collective behavior. The problems of behavior deviation in a group, mass, or the general public occur precisely due to neglecting the problem of group organization, i.e. group management or event management due to which the group is being formed. Sports managers invest much effort in the organization of the event itself but they neglect this large segment. Understanding risk has a large significance for sportsmen and women, as well as for sports management. The organization of sports competitions has also become a lucrative business, as well as an open “risk area” and thus sports organizations and competition managers must come to terms with the problems linked with the management of risk and crises.

Organizers of sports competitions often think about risk in the sense of security and insurance. However, the concept of risk is much wider than that. It can also imply the crisis of money flow, staff strikes, negative publicity, and weather conditions (bad weather). This last risk segment is the greatest risk for the organizers. Even if there is no direct impact on the competition, bad weather can reduce the number of visitors to an event, and rainy and stormy weather also has an impact on the mood and motivation of people, which can be a serious problem demanding careful planning. The basic question which is imposed is the following: whether managers in sports, on all levels, are capable to plan, prepare and carry out a secure sports competition. Transferring responsibility onto third persons, such as insurance companies, protection agencies and similar does not absolve them of responsibility, as maintaining order at sports competitions is just one of the problems which crisis management in sports is faced with.

Sports organizations and managers in sports can and should differ in various ways from the other types of organizations, including specific relations between them and the spectators (fans) and the direct participants of competitions - sportsmen. What should also be taken into consideration is the high degree of media interest for sports competitions and clubs on a local and national level. For a successful organizing of a sports competition, it is necessary to plan all the needed activities in regards with competitions. Bad organization represents the greatest danger for realizing the planned aims of competing, and poor interrelations such as disagreement regarding organizational problems which can lead to firing key persons can also be included in this. Special attention should be paid to public order during violence. Accidents, revolt, terrorism, and sabotage are security risks. Thus it is necessary to carry out all security measures (identifying the situations for which the police is needed or security staff, to adhere to the law, the regulations, the standards which pertain to health and security at work, to develop procedures in order to meet the security standards, to carry out training of employees in order to prevent risks for health and security, to use systems which limit security risks, and to build communication systems for reporting incidents and emergency cases). Along with the mentioned risks, there are also financial risks, which imply unexpected costs and income lower
than expected, high foreign currency rates, a general deteriorating of economic conditions, a drop in disposable income, embezzlement, fines and money flow issues. The system of business crises in sport is shown in Table 2.

Table 2. The system of business crises in sport (Source: Beech & Chadwick, 2010, p. 420)

<table>
<thead>
<tr>
<th>TYPE OF CRISIS/ENVIRONMENT</th>
<th>INTERNAL ENVIRONMENT</th>
<th>EXTERNAL ENVIRONMENT</th>
</tr>
</thead>
</table>
| Technical/economic         | • Demolishing set seats  
                            | • Fire                
                            | • Poor maintenance of key equipment | • Dependency on the main sponsor  
                            |                         | • Sudden income loss from TV copyrights | • Demolishing of stadium due to earthquake  
                            |                         |                         | • Grave weather disruptions  
                            |                         |                         | • Viruses which are a threat for sports travel |
| Human/social/organizational| • Riots at stadiums  
                          | • Use of doping        
                          | • Corruption           
                          | • Lack of responsibility of key employees  
                          | • Accusations of children molestation | • Bad media coverage     
                          |                         |                         | • Leading players accused of racism  
                          |                         |                         | • Changes in the law     
                          |                         |                         | • Hooliganism            
                          |                         |                         | • An oversight of a key supplier |

However, the perception of risk is very often formed by a variety of subjective factors – our mood, interaction with people around us, attitude towards the competition, understanding the situation. All these factors are combined and have an impact on the final decision. Thus, due to all these mentioned processes, the risk management process can and should be aided by using different scientific approaches and methods.

**Risk management at sports competitions**

Every sports competition represents a certain conceptual and operational problem for the environment in which it transpires, as well as a new challenge for the stakeholders on the sports market. This especially pertains to larger sports competitions which have a wider social significance and must be coordinated with the general social movements and strategic directions of the development of sports in a certain environment. However, regardless of the type and size of a sports competition, the management of the process of competing adhere to certain rules and procedures in the existing economic, market, financial, media and cultural environment, starting from the known weaknesses and potential risks within sports organizations and with a special
focus on managing the risks which are characteristic for specific environments and conditions of preparation and carrying out competitions.

Of a vital significance for a good preparation and secure realization of sports competition is the understanding of the security elements undertaken by the organizer, and which pertain to the following:

- Preventive measures;
- General measures at sports competitions;
- Special measures which are undertaken at high-risk sports competitions and
- Measures which are undertaken by the authorized state bodies.

Preventive measures are undertaken in planning all kinds of sports competitions in accordance with sports regulations and general legal norms. They have the task of preventing possible risks, and making sure violence and inappropriate behavior do not occur. This refers to stimulating the fans to civilized and fair behavior during competitions.

General security measures refer to registering sports competitions in the appropriate state bodies; a mandatory founding of an appropriate stewarding service which cooperates with the state institutions, that is, the police; also, creating a plan of preventive security activities and securing the presence of appropriate services in accordance with the character of the competition and the space in which it transpires. It implies a sufficient number of medical teams, fire security, electricity distribution services, technical services, inspection and communal services.

Special measures imply some additional activities of the organizers:

- Informing the authorized bodies about high-risk circumstances prior to the start of the competition by 48 hours at the latest;
- Naming the persons responsible for managing the measures of preventive action;
- Realizing a direct cooperation with the police for acting on the orders which pertain to securing public order at sports competitions;
- Realizing a direct cooperation with the representatives of fan clubs;
- Separating the groups of visiting fans;
- Cooperation with sports organizations which participate at competitions, with their fans as well as keeping records on the procurers of tickets;
- Providing special entrances, exits and a part of the venue for the visiting fans in case a planned arrival is expected.

Measures which are undertaken by the authorized state bodies ensue from their legal authority. In accordance with their authority, the authorized police body, during the holding of high-risk sports competitions, can carry out the following:

- To organize for the visiting fans certain directions during arrival and departure;
- To order the organizers the removing of observed deficiencies on sports facilities;
– To ban entry to those whose behavior is inclined towards violence;
– To carry out a safety check of all sports facilities prior to every sports event;
– To ban the sale of alcoholic beverages at the entrances, in the vicinity and within the sports facility, three hours prior to and after the end of a sports competition.

The risk management process consists of three stages or steps – risk identification, risk assessment and risk management – and that process should be integrated into all the functions of sports competition management. Problems such as displaying various risks at sports competitions often ensue due to an insufficient understanding or neglecting of the mentioned steps of risk management within certain management functions on the part of sports managers, especially managers responsible for organizing competitions and sports facilities managers. Furthermore, it is especially important for the organizer of the competitions to establish good cooperation with the Ministry of the Interior (Pelević, 2011, p. 187).

In order to successfully resist various challenges and survive in the “theater of international events, sports competitions demand a creative application of the mentioned stages of risk management within the tested functions of competition management, depending on the types and set aims of competitions and disposable resources for setting these aims” (Masterman, 2008, p. 57). This concept of managing sports competitions and the risks which such events carry with them can be seen as a dynamic group and a process with five linked management functions which are in interaction: predicting, planning, organizing, performing and controlling. Schematically, this can be shown in the following way.

Picture 1. Schematic representation of the sports competitions management process and competing risks
The function of predicting implies a continuous endeavor of sports managers to find an answer to future events of impact for the appearing of risks at sports competitions which ensue from changes in the environment. That activity should lead to some indications on the trends and tendencies in their manifest forms and sizes and to an identification of risks for the sports competitions. Risk identification leads to an answer to two key questions: what can happen?, and how can it happen?

This leads to presumptions for making decisions and secures a strategic framework for all the following functions and stages of competition management.

In the frame of the planning function, it is necessary to carry out an analysis and risk assessment and based on this to define the aims and decide the strategy and tactics in their prevention or suppression. In this stage, a concept of risk management should be established, with defined aims, criteria, stakeholder and key elements.

The main task of organizing as a function of management is an efficient structuring and activating of the potential of a sports organization and other participants in the preparation and carrying out of competitions for the sake of processing risks and realizing defined aims. Risk processing implies determining the types, intensity and possibilities of risk escalation. In that process, established are relations among activities and people who are included in the system of competing. Its end result should be an efficient organizational and functional structure of authority, responsibility, coordination, and communication links and through plans and programs, concrete measures and processes of neutralizing risks and procedures for carrying out these measures.

The function of performing implies a coordinated activity of formed organizational bodies on the implementing of planned measures and proceedings of risk suppression and practical activities for battling risks should they occur. This process also includes managing all the established organizational levels and realizing the prepared operational plans and programs.

Controlling the carrying out of the planned measures for risk prevention includes determining standards, following and coordinating the planned activities for establishing deviations from these standards and undertaking the needed corrective actions. The controlling realizes an insight into the dynamics and quality of the real and planned realization of activities within the competition, that is, it carries out a comparison between the task and the realization.

Adhering to the accepted categorization of managers according to the classical management theory, there is in the area of sports a classification into three levels of managers: the highest level (top managers); the medium level (functional managers) and the lowest level (operational managers). Each of the
mentioned types of managers is equally responsible for preventing unacceptable behavior and violence at sports competitions and has their appropriate places and roles in competition management.

Each of the mentioned types of managers is also equally responsible for risk management at sports competitions and has their appropriate places and roles in competition management. Top managers enact the function of predicting, functional managers the function of planning and organizing, and operative managers the function of performing. The function of controlling should be carried out on all three managerial levels, each from their set authority.

**CONCLUSION**

Unlike in the past, risks in contemporary society are less evident and often appear as unexpected effects, due to which every organization has the need for a systematic way of dealing with dangers and insecurities, caused and introduced by processes of modernization and globalization.

Sport is becoming an increasingly greater part of the everyday life of man and a relevant part of leisure and traveling for the purpose of attending sports competitions, as the most dynamic part of the sports industry, and thus also a potential source of risk.

Today there is no organizer of sports competitions who does not face risks, as there is no competition which fails to carry some sort of risk. The causes for this is a significantly larger massive scale of those attending competitions which are organized in today's age, whereupon venues and facilities of sports competitions become an arena for leisure and somewhere where passion can be let loose, as well as an especially developed system of information and telecommunication due to which every crisis, regardless of the area where it occurs, becomes quickly known to the whole world and can imply further spreading and deepening.

One of the potential and more risky and constantly threatening accompanying risks at sports competitions, especially those of a larger size, are various forms of inappropriate behavior and violence. In the aim of their preventing, appropriate preventive, general and special measures are prescribed on the international well as interior levels. Carrying out the prescribed measures largely depends on the ability of the sports competition organizers for a well-timed recognizing of such dangers and a clever and successful application of tested management functions in the process of competition management.

The organization of sports competitions has also become a lucrative business, as well as an open “risk area” and thus sports organizations and
competition managers must come to terms with the problems linked with the management of risk and crises. The risk management process consists of three stages or steps – risk identification, risk assessment and risk management – and that process should be integrated into all the functions of sports competition management.

Problems such as displaying various risks at sports competitions often ensue due to an insufficient understanding or neglecting of the mentioned steps of risk management within certain management functions on the part of sports managers, especially managers responsible for organizing competitions and sports facilities managers.

In order to successfully resist various challenges and survive in the “theater of international events, sports competitions demand a creative application of the mentioned stages of risk management within the tested functions of competition management, depending on the types and set aims of competitions and disposable resources for setting these aims” (Masterman, 2008, p. 57). This concept of managing sports competitions and the risks which such events carry with them can be seen as a dynamic group and a process with five linked management functions which are in interaction: predicting, planning, organizing, performing and controlling.

The dedication to the risks of sports competitions should be ever-present in all the process functions of competition management. Integration is needed for successful risk management, which reflects a critical need for coordination, synchronization and connecting various diverse interactions, dependency and interlinked elements included in the plan and program of competing, in order to secure that the decisions linked with risks involve all the factors and subjects relating to competitions.
REFERENCES

Abstract: The character of sports activity and sports industry, embodied in multidisciplinarity and interdisciplinarity, demands a significantly higher degree of scientific and professional information than before. This required management to increasingly and more systematically deal with the questions of modern sports practice, which correspond to the realization of top sports scores. This is how special areas of sports management emerged – management of sports facilities and management of sports projects, which engage in: planning, drafting and funding of the construction and daily operations of sports facilities, drafting and organization of training and business processes, leading those activities and controlling a wide range of participants, processes and sub-elements of these systems.

In the second half of the 20th century (in different socio-economic circumstances), this region and professional clubs developed awareness about the need for professional management. This is how the first generation of sports managers emerged. However, recently, sports practice saw the examples of two biggest football clubs in Serbia, which appointed management boards composed of distinguished businesspeople with major experience in economy. After a ten-month period, the clubs operated significantly weakened in both sports (weak teams) and economic sense (big debts, affairs), and even in the sense of visible perspective of future development.

Therefore, management and corporate administration of a sports organization is not completely the same as management of a company in some other industry. Specific knowledge is required to administer all resources of a particular sports organization in line with the Law on Sport, Law on High Education and Rulebook on Nomenclature of Sports Vocations and Titles. Problems of
contemporary sports practice should be solved by competent sports managers who acquired necessary knowledge in accredited higher education institutions and faculties, and who possess required experience.

**Key words:** sports facilities, sports facilities management, models of sports facilities management, sports projects management, restructuring sports facilities

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**INTRODUCTION**

Sports facilities management studies various aspects of ownership forms, models of sports facilities management, and the questions of their designing, construction and operation. The need to study sports projects management arises from the necessity of cost-effectiveness of sports-service processes and contemporary forms of funding sport.

Initially, sports facilities used to serve to maintain military readiness and entertain noblemen, but they gradually turned into predecessors of today’s sports complexes intended for the whole society. At the beginning of the 21st century, there was an increase in demand for leisure services, and consequently the need to create sports-recreational complexes. Together with that, the need to perfect and make these services more effective becomes higher than ever. That is why it is crucial for facilities managers to possess visionary abilities when it comes to the anticipation of desires and needs of potential users.

**THEORETICAL FRAMEWORK**

According to the Law on Sport (Official Gazette of the Republic of Serbia, no. 24/2011, Art. 145-155), a sports facility is a building, i.e. a space (construction space, its part or an organized area), intended for sports activities, which can have accompanying space (for sanitary, wardrobe, depository, audience, and other purposes) as well as installed equipment (construction and sports equipment). Sports facility is an infrastructure (material-technical base) of programming and production of sports activities programs for various users, such as: professional sportspeople, audience, professional sports and other organizations (Raič, 1999). Today, sports facilities imply solid constructions and accompanying flat surfaces used to achieve sports results in order to deliver satisfaction to sports event visitors (Dugalić, 2007). Therefore, sports facilities are resources of production of sports and recreational programs that include all spaces, buildings, supplies and equipment within sport and recreation.

Sports facilities represent the most significant material resource of sports system, whose structure, planned purpose and functional status largely determine planning-and-programming orientation when designing sports
programs on all organization level. A special place among sports facilities is occupied by sports centers as polyvalent construction complexes which, by offering services on the market, enable the provision of conditions for practicing different modalities of sports activities (sports education, competitive sport, recreational sport, school sport), for different user categories (children, youth, adults, persons with special needs...).

Sports facilities may contain one or more courts – training grounds, main and secondary courts; accompanying facilities such as changing rooms, bursarship, storage room, ambulance, personnel premises, administration, gyms, saunas, solariums, massage rooms; audience space – grandstands with accompanying premises; relaxation, recreation and studying premises; adequate space communication: hallways, access points, passages, elevators, parking spaces: signalization (for general instructions, scoring panels); sound system; lavatories, etc. Modern sports facilities, such as football stadiums, multifunctional arenas, etc. increasingly contain commercial or business premises which are usually leased to other persons and represent a significant source of income in the function of rational management and business operations (covering maintenance, insurance and sports facility exploitation expenses).

The tradition of sports facilities construction dates 2500 years back (to Egypt, China, Greece), and since then a particular stress has been on esthetic and functional quality. What has been changed in the concept of construction and purpose of facilities, is conditioned by latter cultural, technological and social changes. Today, sports facilities management is also focused on the efficiency of use of this resource by its owner and manager, but also the expectations in regard to entertainment, comfort, and overall user satisfaction (Dugalić, 2005).

The emergence of contemporary form of sports facilities is conditioned by their purpose and increased interest of the public, while architectural forms drop regional attributes and types, gaining universal shape. Sports facilities become a reflection of unique culture and technology of construction, and they are often observed separately from the building type of their environment by creating unique units, Olympic villages, sports-entertainment complexes, etc. (Farmer, Mulrooney, Ammon, 1996). Sports facilities built today are mostly of closed type, while open type of construction is still used only in case on hippodromes, ski jump ramps and stadiums (but even more and more of them are constructed as semi-closed or closed). Stadiums gather the highest numbers of sports audience, which is why these facilities get proportionally more attention in media and public.

The construction technology of modern sports facilities is conditioned by their purpose, so they are distinguished as single-purpose facilities of civil engineering construction (hippodromes, racing tracks, sports airports)
and building construction (sports-recreational centers, school halls, etc.) or multi-purpose (multifunctional) sports facilities (such as “Kombank Arena”). Apart from the division of sports facilities according to their purpose and architectural type, they can also be differentiated according to: different playing surfaces, technology of sports-service processes, ownership and management modalities, etc.

**THE SUBJECT OF THE PAPER**

The aims of this paper’s research refer to the validation of results, facts, expectations and enlargement of the existing knowledge in order to improve sports business practice. The basic goal is to find innovative, interesting, practical solutions and raise awareness of sports professionals and professionals in sport about the significance of keeping up with modern global tendencies in sports practice in the conditions of market economy. They can be realized so as to find guidelines that enable more positive view of investment into sport, and all types of resources (human, material, financial, informational, and infrastructural). This makes the extermination of negative phenomena in sport and other influences surrounding it much easier, thus providing conditions for sport to even become a generator of positive flows and changes in the society in general.

These guidelines can be projected as long-term, strategic goals and activities for more successful management of sports potential: to explain and differentiate property-legal relations, collect capital by means of securities emission, elect professional management personnel, trained in the field of sports management, form professional management on the principles and rules of successful team organization, professionalize professional services and accompanying personnel, estimate possibilities and potential (sports and financial), and aim for maximum success (target function of club) in all areas of work (coaching, professional services, responsibility and effort of top management) (Dugalić, 2011).

The rights, obligations and responsibilities in sports clubs in Serbia, to which sports facilities are assigned for management, are not based on competences, previous sports results and financial effects on the basis of planned strategy. Voluntarism in sports facility management has created vague property-legal, organizational and administrative relations, which contributed to business inefficiency, losses and probable loss of control over the assigned infrastructure (Dugalić, 2005). This is why redefinition of position of interest groups according to the existing, market conditions and projections of future visions (ownership, culture and social atmosphere) is absolutely necessary.

Considering the existing situation with material-technical base of sport
in Serbia, as the subject of this paper, there are topics that require scientific research and definition:

- What are sports facilities, and how when and where did they emerge; who were the first builders of sports buildings; which stages in the development of sports facilities exist and which tasks are imposed to a sports facility investor by modern age;
- The criteria according to which sports facilities can be classified;
- How is the construction of sports facilities a representation of art, and why is there a need for futuristic orientation and design of sports facilities;
- How social-economic factors influence the design, construction and operation of a sports facility;
- Who are the users of sports facilities (before and now), what do the users of sports services expect from a contemporary sports facility, what should it feature to attract users back and to be socially beneficial;
- What is the commercialization of sports facilities, and what is flexibility in relation to target groups (consumers);
- Who is in charge of a sports facility’s image and what are the activities taken by the sports facility’s management in relation to that;
- The importance of sports facilities for the country (city) where it’s situated;
- What are the possible directions of further development of sports facilities in Serbia and to what extent does the Serbian sport keep up with global trends in designing, constructing, operating and funding sports facilities.

In order to reach valid conclusions and solutions, the subject of the paper encompassed situational analysis of European experiences and ownership models so they can potentially be implemented to the domestic sports practice in restructuring, after scientific verification. Only competent management in a sports facility can realize functions such as: investment and current maintenance, satisfying lessees’ needs, providing a clean, comfortable environment for visitors, providing necessary amounts of food, drinks, and newspapers during sports events, providing security, regular cleaning and maintenance, designing the facility’s image, marketing, advertising and PR, as well as electing suitable management (Farmer, Mulrooney, Ammon, 1996; Beech, Chadwick, 2013).

**METHOD OF WORK**

The methods used in the paper encompass the procedure of analysis and research of the role of management models of sports facilities, which should help elaborate the set goals and key demands of the paper. For that purpose, literature from the field of sports management, sports facilities management
and sports marketing was used. In addition to it, publications, newspaper articles and ads, columns and scientific articles were also used, as well as the Internet, websites engaging in the questions of modern sport, various analyses and research of phenomena related to the subject of the paper, impressions and experiences of the authors, gained by observing the phenomena and by discussing them with people engaged in sports business (sports professionals, professionals in sport and sportspeople), as well as by acquiring information from daily newspapers and forums.

By implementing adequate methods, an attempt was made through comparative analysis and examples from practice to draw a parallel between the conditions found in developed countries and Serbia at the time, with a particular overview of the importance and role of sports facility management as a significant factor of sport and condition for their successful existence. Considering the current state of sports facilities, a particular stress was put on the potential directions of their development, advantages and disadvantages of previous practice, good and bad examples, along with innovative ideas and suggestions for business improvement.

In line with that, the following research methods were used: description, explicit method, i.e. explanation method, comparative analysis method, historical method and case study.

**RESULTS**

**Situational analysis**

The condition of sports facilities in Serbia is mostly bad. Investment and ongoing maintenance is not carried out regularly due to the lack of funds, not only for the maintenance of key sports facilities, but also physical education facilities. There are many towns which have no major sports facility or a universal location where sport and recreational activities of the population can be successfully realized. There is often, with exceptions, a lack of sports locations – open and closed, in tourist places (spas, mountain resorts) where they would successfully complement tourist offer. Those facilities very often do not satisfy engineering parameters related to safety during sports activities, especially when it comes to major sports competitions and events, where the issue of security arises.

It is common to find a lack of adequate parking space for passenger vehicles and even busses that transport sports teams. Insufficient number of sanitary facilities for audience is particularly characteristic. Another major problem is inadequate ancillary space for sports services users and competitors – small number of changing rooms, inadequate sanitary facilities and hygiene
facilities which are often in bad condition that needs repair or change of plumbing or sewage installations. Very often, there is not adequate (“clean”) connection between changing rooms and sports halls, which is bad from hygienic aspect.

The biggest problem related to sports facilities in Serbia is non-existence of a unique register of sports infrastructure. The 2011 census did not encompass sports facilities, which leads to the conclusion that the country is not particularly interested in resolving major issues in the sports system, above all in regard to the restructuring process, which is inevitable. The only attempt to register sports infrastructure was made by the Serbian Association of Sports Centers, which currently counts 36 biggest and most important sports centers in the Republic of Serbia. Their address file contains the most significant sports centers for every town, in alphabetical order, with all the basic data about sports facilities, and this publication of the Serbian Association of Sports Centers is available in electronic form on their official website.

European experiences and ownership models of stadiums

Stadiums are single-purpose or multi-purpose facilities constructed to take at least 40,000 visitors. There is a great number of these facilities in the world, and they are characterized by open structure. These facilities host a smaller number of sports events within a branch of sport (football, javelin, races…) with cyclic repetition (rounds, seasons), and they are also suitable for other mass manifestations such as cultural and entertainment events, celebrations, etc. Considering that they are constructed in open space, functional demands during the 21st century speak in favour of the comfort of audience, not just sportspeople, so the existing facilities are covered, new ones are constructed as closed or semi-closed facilities, at the same time offering other services such as participants’ safety, heated seats, better visibility of the game, etc. (Dugalić, 2007).

The fundamental characteristic of countries whose practice is analyzed in this paper is that in their history they were not ruled by communist regimes, so their systems embody centuries-long tradition of equality of all forms of property (above all, the equality of private property in relation to state-owned one). For that reason, those countries never saw the need to privatize state-owned sports facilities, because there were no such facilities. There is almost no record of privatization of state-owned sports facilities, since those countries had rational economic orientation, and used budget funds to construct only those sports facilities whose purpose was to realize public interest in the field of sport. Unlike them, the former communist bloc countries often used the construction of sports facilities for political promotion and creation of memory to certain party leaders and their rule (Šuput, 2009, p. 102).
Italy

It is common in Italy, that sports clubs, which are privately owned (in form of citizens’ association or private companies), to use city (municipal) stadiums. Therefore, clubs Roma and Lazio use the same stadium – Olympic Stadium in Rome, owned by the City of Rome. Both clubs pay lease and own their own, smaller representative facilities, used for daily training of sports teams. The situation is the same in case of football club Milan, which uses Milan’s city stadium called San Siro, also used by their city rival, FC Inter.

The most successful Italian football club Juventus has its own stadium Delle Alpi in Turin. When its stadium was in the process of remodeling, Juventus played on the Olympic Stadium in Turin, owned by the town – municipality of Turin. Another lessee of the stadium is also FC Torino, which does not have a stadium of its own.

In terms of privatization, a particularly interesting case is that of Societa Sportiva Lazio, not just FC Lazio. This sports association is famous for its football selection Europe-wide, but apart from it, there are numerous other selections operating as part of the sports association. The selections compete in 37 sports disciplines (similarly to sports associations Crvena Zvezda and Partizan). The association was founded in 1900. When the president of Sport Association Lazio was Sergio Cragnotti, Lazio was transformed into a joint-stock company. One person – Claudio Lotito owns 61,312% of Lazio’s shares, while the remaining 38,688% is owned by other shareholders. Lazio’s property includes a big sports center, with all accompanying sports facilities, but it does not possess a football stadium, but uses Olympic Stadium in Rome, which is owned by the City of Rome. Despite successful financial operations with achieved income of as much as EUR83 million in the season 2004/5, Lazio did not start the construction of its own stadium. Experts assessed that the construction and maintenance costs for such stadium in Rome would be too high for a club which strives to do rational market business in future. An annual report of consultants from Deloitte, titled „Football Money League“, states that in the season 2004/5 Lazio was the 20th financially most successful team in the world. In the meantime, Lazio’s income has significantly decreased, so in the „Football Money League“ report for the season 2006/07, Lazio was no longer on the list of top 20 richest football clubs in the world (Football Money League, Deloitte, February 2008, http://www.deloitte.com/dtt/cda/content/UK_SBG_FML08.pdf, quote Šuput 2009, p. 103). The club follows the trend today as well.

Apart from Lazio shares, Juventus and Roma shares are also available for trade on the Italian stock exchange, which is not the case with sports club Milan, which was bought by Silvio Berlusconi in 1986. Milan is one of the richest clubs in the world, and it is not a joint stock company, but rather a
form of a private company owned by a single owner. That is why Milan shares do not exist on the stock exchange. Even though that club has been using the city stadium San Siro for years, there are plans to start the construction of its own stadium in line with standards that exist on the stadiums built in the past years in the USA. Such a venture seemed possible before the global economic crisis, before the fall of 2008, when the Forbes magazine published that Milan is the 6th richest club in the world and the richest club in Italy. Not even such financial state enables Milan to own a football stadium, and there are assessments that the construction of a new stadium that would match all the existing UEFA criteria would cost Milan between EUR600-800 million. Today, Milan occupies the 8th position on the list of the richest European football clubs with annual income of EUR 256.9 million.

Spain

Unlike Italy, most football and basketball clubs in Spain own stadiums and other sports facilities (sports halls and open courts) as real estate in their ownership. Actually, citizens’ associations – sports clubs, have their own property that includes real estate, which is logical considering the fact that private ownership of land and buildings constructed on it exists as a legitimate and legally permitted fact in Spain, as well as every other Western European country, for centuries. For example, FC Barcelona and FC Real Madrid possess stadiums in their ownership (Mašić, 2005). FC Barcelona possesses the biggest stadium in Europe - Camp Nou, which has a capacity of 98,787 viewers with a 5 star comfort. Due to its size and looks, but also because FC Barcelona is a famous European and global brand, the stadium attracts thousands of tourists and other visitors every year, even when there are no games, which brings additional income to the club, which serve to fund the stadium maintenance.

Apart from that, an interesting example is that of FC Espanol from Barcelona, which plays on the stadium owned by the city (municipality), and uses it based on a lease contract. But over the years, the club management reached a conclusion that it would be significantly more cost-efficient and simpler in regard to organization and logistics, if the stadium started the construction of their own stadium, rather than to keep paying the lease for the city’s sports facility. A new stadium Estadi Cornellá – El Prat was opened in 2009, and it is situated outside the city center. There were multiple bad sides of renting a state-municipality-owned sports facility in case of Espanol, and they were related to both the lessor and lessee. As the owner of the stadium, the City of Barcelona raised the lease price every year, and it was not ready to invest a lot of funds into the stadium reconstruction which would boost its capacity and comfort for viewers. On the other side, Espanol wanted a bigger and more modern stadium which would be capable of taking significantly
more audience, but it was not willing to invest additional funds into the reconstruction of a stadium it does not own, so after years of preparations, it opted for the construction of its own stadium.

**England**

In England, it is considered perfectly normal and common if major sports clubs, especially football clubs, whether registered as companies or in form of citizens’ associations, own sports facilities and land where those facilities are situated.

Football club Manchester United owns Old Trafford stadium. Back in 1909, Henry Davies donated GBP 60,000 as a natural person to purchase land and construct a stadium for FC Manchester United. During its long history, the club itself, its sponsors and donors, occasionally invested necessary funds to expand and modernize the stadium. Old Trafford is considered the best stadium in Great Britain, and it is the only stadium in the country that received 5 stars during the first ranking and standardization regularly conducted by the UEFA.

Similarly to Manchester United, FC Liverpool owns stadium Anfield.

The case of FC Chelsea is particularly interesting. Back in 1904, businessman Gus Mears and his brother bought land in order to build a football stadium. At the same time, they founded FC Chelsea. In England at the end of the 19th and the beginning of the 20th century, it was common to first establish football clubs, which played in fields and improvise stadiums, and then, after several competition seasons, to construct stadiums for them. Contrary to such practice, Chelsea was established to make use of a stadium whose construction had already begun. In 1960s and 1970s, the club faced major financial crisis, which led to the sale of the stadium to big construction companies. It wasn’t until mid-1990s that the club managed to reclaim the ownership of the stadium by founding a non-profit association, mostly composed of fans and supporters of the club, who became stockholders who own the stadium to this day. The goal of the founded association was to fight in the future to keep the stadium from ever being sold again, and to stay in Chelsea’s hands.

A special case in England is Wembley stadium where football representation of England plays its games, and where the games of the FA Cup finals are held. The old Wembley stadium was built in 1923 under the name “British Empire Exhibition Stadium”, but it was shut down in 2000, and demolished in 2003 to make room for the construction of a new stadium.

The old stadium changed ownership over time, and its longest-standing owner was Wembley Company, which gave it its name. The new Wembley stadium was constructed in 2007 thanks to the funds provided by:

- Football association,
Ministry of Culture, Media and Sport,
Construction Agency of London City,
Public service titled “Sport England” which represents a government organization similar to the Serbian ministry’s directorate, and based on its services, it mostly reminds of the Republic Institute for Sports of the Republic of Serbia (quote according to Šuput, 2009, p. 108).

Switzerland

Switzerland is a country with the highest number of sports facilities (294.55) in relation to the number of citizens (100,000) in the world. In Serbia, there are only 58,9 (SGJ, 2003), less than a half of which are closed type facilities (26,79), and the least favourable situation (deficit) is for sports which require material-technical basis ranked as: closed pools, shooting ranges, athletic tracks and sports halls. The example of Switzerland is interesting for multiple reasons: in the structure of sports facilities, the stadium networks are fewer in line with the population’s preference for other sports, such as tennis, skiing, etc. Here we can see the so-called model of responsibility distribution (similarly to France), which has some advantages (and lower income, especially from TV broadcasts, but also lower expenses). In Switzerland, sponsor income represents over 50% of income, with tendency to drop, while income from tickets is higher than the EU average (they make up around 20%), and the infrastructure is becoming more socialized (the opposite of what is attempted to be imposed in Serbia).

Ownership models of sports facilities in Serbia and the restructuring process

Sport today, in all of its sectors, represents a result of state’s investment into sports infrastructure, above all into facilities for training and competition (Tomić, 2007). The dilemma, which preoccupied experts in post-socialist period, was: which type of ownership is economically more efficient – private or state? This question has caused a century-long conflict between theory and practice even in developed countries. For now, history has ruled that private ownership is the only healthy foundation of economic life, so the systems based on state and social ownership have disappeared. Contemporary economic theory says that state and private ownership models are equally efficient if assumptions on perfect market, complete information and complete contracts are fulfilled.

A classical argument in favour of state ownership is the one about market weaknesses, i.e. the breach of the assumption on perfect competition in those branches where average costs drop, which leads to monopolies. And since monopolies are a bad thing in private ownership, then the company should be
state-owned, because it is assumed that the state has good intentions.

Although there was much talk about privatization in sport in the past decades, the attention of state bodies in charge of the preparation of regulations, attracting potential investors and wider public was mostly directed to the question of potential privatization of football stadiums and their surrounding land. The truth is that most sports centers in Serbia exist and work in form of public companies, social companies and public utility companies, so their privatization would be possible based on the Law on Privatization. However, the privatization of sports centers that would be based on the Law on Privatization would represent an utterly inappropriate model of privatization, since in that case, sports centers would be treated and privatized as all other companies engaged in industrial, production and commercial activities. (Šuput, 2009, p. 108-109).

Still, we cannot neglect the fact that their construction and maintenance were funded from budget sources, and the origin of capital and the favourable conditions under which it was generated, open room for speculative activities, which have a negative impact on the market value of sports facilities in the open market we aspire to. In the theory of sports management it is considered that capital concentration contributes to the efficiency of sport (and sports facilities), but has a negative impact on market value, and property without market value is unattractive, becomes inefficient and is therefore prone to decadence.

Besides, sports centers in Serbia serve to realize public interest in the field of sport which is embodied in the creation of technical and logistic conditions for sports activities of children, youth and other citizens who seek organized recreation. Sports centers are facilities intended for mass sport. Therefore, the privatization of sports centers should follow special rules, which would forbid a new – private owner to change the purpose of the sports facility, and enable them to keep developing and improving the existing sports centers and acquire ownership and management rights in line with the value of their ownership share.

Sports centers which exist in operate throughout Serbia in different legal and organizational forms are considered to be state and socially owned sports companies. One such social company is Sports and Recreational Center “Banjica” in Belgrade. Operating in form of public companies are “Kombank Arena”, “Ada Ciganlija”, Hippodrome Belgrade, SPENS, Sports and Cultural Center “Obrenovac”, etc. One of the companies operating as a public utility company is Public Utility Company for Organization and Maintenance of Sports Courts and Facilities “Mladost” from Pančevo. Sports Center “Novi Pazar” and many others operate in form of public institutions.

Practice has shown that state is a bad manager, and that management structure, maintenance quality, usage organization and overall efficiency of use of a sports center depend on the owner of the sports center (state, society, or private company). In cases where the state was the owner and manager of
sports centers as companies, they failed, while privately-owned sports centers developed, advanced, and operated successfully. However, even the existing private sports centers in Serbia did not get enough stimulation for development from the state, even though they are in the service industry, which is not solely commercial, but represents a socially-beneficial activity. In case of acceptance of the idea that creation of conditions for population’s recreation is a socially-beneficial activity and that it stimulates the development of sport in the country and influences population’s health preventively, it would be logical to tax services and income from services provided by sports center at a lower taxation rate than some other economic activities that do not have such character. Those and many other system measures would facilitate sports centers’ operations in the future and provide more interest from private investors in that domain.

**DISCUSSION**

The given comparative examples from practice lead to a conclusion that in some countries practice in the domain of ownership of sports centers and management of sports centers is different. However, regardless of a concrete country, there are certain characteristics they all have in common. So, in European countries, sports centers are mostly owned by private companies and local self-administration units (municipalities and cities), while the number of state-owned sports centers is small. State sports centers in European countries are mostly called “National Sports Center” and are used for the preparation, training and development of the country’s top sportspeople. Serbia should also aspire to such practice. Sports centers intended for population’s recreation are mostly owned by local self-administration units or private companies. There are also sports centers owned by certain non-profit organizations – citizens’ associations, but those cases are quite rare.

Apart from the given ownership forms and methods of management of sports centers, a new model appeared in the past few years, called 3P model (Public Private Partnership). This model represents an exercise of certain affairs related to the realization of public interest by means of joint funds provided by state or local self-administration units on one side, and private companies on the other side. This model makes it possible for the state to use budget funds to construct a sports center, and to contractually grant management of the sports center to a private company which returns a part of profit to the state and keeps another part for itself, provided that it manages the sports center in a rational and efficient way. Such a contract must be public, transparent and available to everyone under equal terms, and favouring can be made solely on the grounds of expense leadership and business efficiency.
Another option in this model is that the state or municipality, and private company jointly invest funds into the construction of a sports center and jointly manage it based on a previously signed contract which defines mutual rights and obligations. Examples of such cooperation in sports center management exist in Great Britain, where municipalities partner with private companies interested in the industry.

The examples described in this paper point out that even in the economically most developed European countries, where capitalist system of doing business has long and continuous tradition, the biggest sports centers are not always privately owned. However, competitiveness within the sector stimulates their efficiency. Some circumstances should not be used as an argument by opponents of privatization in Serbia to prevent privatization of capital sports facilities, but rather serve as a warning and opportunity to the state to choose and plan well which sports facilities it will keep in its ownership, and which in mixed type, in order to have mechanisms for the stimulation of sport and adequate infrastructure for major international sports competition. Besides, before the privatization of sports facilities, whether of football stadiums or sports centers as social, public, or public utility companies, it is necessary to determine what the goal of privatization is and how privatization income will be used. It would be good to invest this income only in further construction of sports infrastructure in Serbia.

In the past 3 decades, several representative sports facilities were constructed in Serbia, in towns where population has been increasing: Belgrade Arena, Millennium Hall in Vršac, The House of Football in St. Pazova, a sports hall in Smederevo (for the needs of Universiade 2009), as well as some open and closed multi-purpose sports facilities in other towns in Serbia, using the funds from the National Investment Plan. However, there are numerous facilities that need thorough reconstruction to satisfy the criteria of international sports associations, in order to be categorized and gain rights to organize competitions of European and international type.

Privatization income realized by selling state- and socially-owned sports facilities could help at least partially solve problems with aged sports infrastructure, increase the number of sports facilities in Serbia, and make infrastructure network more adequate to the current needs of sports development. If privatization income realized by selling sports facilities would instead be used for current budget expenses (pensions, state officers’ salaries, health care, military expenses...), Serbia’s sports system would be in an even more difficult position, and numerous sports clubs which cannot produce commercial income (especially clubs from sports such as athletics, gymnastics, swimming, boxing, judo, etc.) would find themselves in an even worse position because they would be forced to pay full market price for use of
Restructuring sports facilities is an opportunity for professional sports clubs whose sportspeople are engaged in top competitive sport, to get facilities in their ownership, and for the state to use the obtained income to construct new ones, whose purpose is the realization of public interest in the field of sport and stimulation of development of so-called basic sports and school recreational sports activities. Instead of financial compensations from the budget (based on the medals won on World Championships, European Championships and Olympic Games), the state could give sportspeople ownership rights over sports facilities in form of shares. That would provide budget savings, and on the other side, sportspeople would be stimulated to increase their ownership share by purchasing shares. That would also boost their motivation and dedication to long-term development of the branches of sport in which they achieved top scores. The fact is that sports facilities have an irreplaceable role in the development of sport in all countries, and that they represent a condition without which most sports and sports disciplines cannot be organized and practiced.

In order to avoid numerous issues regarding location, construction and operation of new sports facilities, and solve problems with management and maintenance of the existing state-owned sports facilities, it is necessary not only to improve legal regulation of the status of sports facilities, but to legally regulate privatization of facilities in a way that will provide financial cost-effectiveness of sports facilities’ operation and at the same time create conditions for further development of sport in Serbia.

The most significant questions related to the coming privatization in sport are:

- What is actually privatized in sport?
- Are clubs or sports associations privatized?
- Are clubs and sports associations going to be privatized as well as the property they acquired in the meantime with the state’s help?
- Is privatization going to encompass all state-owned sports facilities or only those given for use to sports clubs?

Besides, the legal obligation to determine the share of social property in the existing sports organizations has not been done, which disables fair and transparent transformation/change of ownership rights in the field of sport. The confusion created in the public by the lack of a publicly announced response to the above questions and defined legal stand regarding privatization in sport, leaves room for unrealistic expectations of all those who currently manage those facilities in sports organizations.
It can be said with certainty that private interest is not more efficient for the society as well, that the private ownership form is not always a better solution, and that company status does not guarantee economic success or even sustainability to an organization.

Every sports organization is obliged to do business professionally and in a financially transparent way. Certain affairs must be conducted in every sports organization (management, financial management, public relations, security, etc.) provided that qualified professional coaches are engaged for all player categories (with compulsory junior selection), and that at the same time conditions in stadiums are improved.

Having in mind that Serbia is a country in transition and that its sports system is characterized by insufficiently developed standard market institutions in this domain, there is high demand for innovative solutions and accesses to management of sports organizations and organizations in sport (Dugalić, 2006).

State has always meddled into sport, whether to use it to promote positive social values, or to manipulate masses, which is evident in the saying “bread and circuses”. The state strives to include sport (as a significant social phenomenon, suitable to influence masses, youth, culture) into important social frameworks which will serve it for its own affirmation, and which it will be able to fully control. Precisely because of sport’s great significance for a country, the existing problems in Serbia’s sports system must be solved radically and professionally.

It can be concluded that hardly any problem can be solved without state’s intervention. The road of sports system transformation can be like those implemented in developed Western European countries. That does not mean to “copy” the examples of successful transformations, because every problem is unique and cannot be solved by universal formula, and its solution depends on social-economic and political situation in the country (Krsteska, 2013).

The reason why Serbia is behind developed sports practice is not lack of human resources in the field of sports management, but rather the fact that professionals with the best education and competencies are unable to take over professional work in sport (Dugalić, 2012). The state has to use inspection to prevent people who do not possess necessary education in line with the law to manage its valuable property and infrastructure. Another disputable matter is the role of state institutions which through the Rulebook on Nomenclature of Sports Vocations and Titles (The Official Gazette of the Republic of Serbia 52/96 and 101/05, art. 2) stimulate the acquisition of amateur titles and do not prevent professional training by organizations that do not perform such activities in line with the Law on Sport, Law on High Education and the Rulebook itself. This Rulebook is not harmonized with the Law on High Education, for example, in terms of the degree of high education (for over a
decade, Serbia has educated PhD Managers in Sport – III degree, on accredited study programs, while the rulebook adopted after the Law on Sport and the Law on High Education entered into force, envisages that the highest title is - specialist manager, which is acquired on the II degree of studies). Also, amateur titles within which the state does not conduct inspection are favoured, so these trainings are often conducted illegally (in terms of space, equipment, misuse). That is how traditional values in sport collapse; instead of enabling competent sports managers to create efficient strategies to maintain competitive advantages of the Serbian sport, and capitalize on the realized sports result in favor of sportspeople, sports organizations, the state and its citizens.

It is known that the most numerous category, after sports coaches, is the profile of professionals for administration and management in sport – sports organizations, various types of sports manifestations and competitions of all levels (Dugalić, 2013). Management in contemporary sport is a highly professional activity, which does not only imply wide knowledge of sport, but also knowledge of economic and management disciplines in sport itself and around it. That is why some academic institutions have realized and recognized on time the need to educate managers in sport. Study programs with tradition of almost 2 decades, based on the most modern global and European findings in the field of sports science, professional teaching staff (with the highest scientific titles) who realize it and the conditions in which instruction is conducted guarantee quality of future professionals in the field of management in sport, and thereby sport and society as a whole (Krsteska, 2013).

**CONCLUSION**

Modern management in sport, sports facilities and projects, demands acquisition of knowledge, skills, abilities and competencies which are gained through professional and academic education in line with the law. Management in sport is an activity which demands multidisciplinary knowledge and professional education and specialization. What should characterize every sports manager, apart from their formal education acquired at a relevant academic institution or faculty, are reasoning skills, decision-making ability and clear insight into the issues of administration and management of sports organization and infrastructure.

Also, a modern sports manager must be capable of applying the acquired knowledge from the field of management and other sciences in given situations; to improve sport through scientific-research work: to analyze problems; be critical towards a situation; to make adequate conclusions when making decisions; to treat organization structures and managers on certain levels of the structures in a polite manner; to possess communication skills crucial for
their role as managers; to know organization and its culture, and in line with that, to perform his/her work; to be familiar with different management styles; to work on good and productive interpersonal relations in the organization; to be capable to work on administrative, technical and other similar positions in sports organizations, associations, societies, clubs, etc.

The appearance of private entrepreneurship in the field of education created possibilities for future faster and clearer definition of the space of sports managers’ education, which at present has very sparse program structure. These ideas and educational contents can be considered a major step forward. However, sports trade and practice of sports management left to randomness and improvisations, in near future faces qualitative and major changes by means of establishment of a special market of sports products and services in competitive conditions. By drawing experiences from developed countries, new generations of educated sports managers in Serbia should create assumptions for the creation of more successful systems and institutions of sport, faster and more energetic transformation of sports trade into sports industry and its approaching and inclusion into global flows.
REFERENCES

Abstract: In physical education classes in the Republic of Serbia the development of strength belongs to the first thematic area of physical education teaching, and it belongs to the development of physical abilities, which apart from strength includes speed, endurance, coordination, agility and balance. The most frequently used method in classes where the strength of body musculature is being developed is the method of dynamic repetitions. Working with these parallel groups, we wanted to show the influence of the Core Method and its advantages and benefits in body musculature strength development compared to the formerly used methods. The experimental group was systematically subjected to the experimental Core Method of physical strength development. The control group was subjected to the dynamic method – repeated strains (the development of repetitive physical strength). At the initial and final measuring the pupils were tested by the elements of the Eurofit battery and IPFT test. The progress we made after a four-month-research in motor variables with the sixth grade elementary school pupils can be entirely attributed to the use of the experimental core training method in physical education classes.

Key words: physical education, physical development, muscle strength, comparative testing
INTRODUCTION

Physical strength is man’s ability to overcome external resistance by using muscular contractions or oppose that very same resistance.

In physical education (hereinafter: PE) classes, physical strength development belongs to the first thematic area of the PE curriculum in Serbia (the development of physical abilities). Physical strength is considered to be the dominant motoric ability as it enables all the movements of man.

“The physical strength is the ability of an individual to create muscle force” (Barov, McGee, 1975).

There are a few methods for physical strength development:
- the method of maximum strain
- the method of repeated strain (70-80% straining of the maximum)
- the method of dynamic strain (developing speed and explosive strength)
- the plyometric method (uses eccentric contractions for physical strength development)
- the method of isometric strain (static work regime - different ways of keeping the body still in one position)
- the core training (proprioceptive) method for deep muscles development
  – stabilizers;

At the elementary school age, the most applied exercises for physical strength development are repetitive exercises (the dynamic work regime), dynamic fast movements important for explosive strength development and to a lesser extent, the static work regime - different ways of keeping the body still in one position.

The core training method was taken from physiatrist medicine and physical therapy –using this method a patient functionally recovers much faster than by applying earlier methods. It is also characterized by a large engagement of the proprioceptors (Grey, Norris, 2003).

Apart from the superficial trunk muscles which are active while performing exercises, the core training method activates proprioceptors which then activate deep layers of muscles and joint connections. The movements are multidimensional and are frequently made in two or three planes (frontal, sagittal and vertical). In the majority of applied exercises, the abdominal muscles and the muscles of the back maintain the position of the body and they are in the constant isometric work regime. Gray calls these exercises 2D or 3D exercises (2013). The core training method activates proprioceptors which then activate deep layers of muscles and joint connections.

The method is also very efficient in injury prevention and rehabilitation. In their tests, G. Cook (1997) and M. Boyle (2003) also justified the use of the core training method.
In the area of physical education and sports it is a training used for deep muscles-stabilizers (core muscles) development.

In PE classes, most frequently used for developing the strength of the trunk muscles (abdominal, back, pectoral and shoulder) is the method of dynamic strain.

This paper tests the possibility of developing the strength of the mentioned muscle groups by way of the Core method in PE classes.

Foreign literature calls this method Core performance (Verstegen, 2005). This method for developing strength is considered by some authors more economic and quicker for developing strength in children of school age as well as those involved with recreational sports and athletes.

**METHODOLOGY**

The research was of an experimental type, lasting one whole half-term, from February 1 to May 31, 2012/2013.

**Sample and participants**

The subject sample, defined as suitable, was created by sixth grade elementary school children divided into the experimental and control group. The experimental group numbered 99 pupils and the control group contained 92 pupils. The experimental group was systematically subjected to the core method of physical strength development. The control group was subjected to the dynamic method – repeated strains (the development of repetitive physical strength).

**Variables**

The motor space contained changes of the following variables:
- The test of repetitive abdominal musculature strength;
- The test of repetitive back musculature strength;
- The test of repetitive chest and shoulder strength and arm extension strength test of repetitive chest and shoulder strength and arm extension strength.

The morphological space contained changes of the following variables:
- Body height;
- Body weight;
- BMI (body mass index).
Study instruments

At the initial and final measuring, the pupils were tested by the elements of the Eurofit battery and IPFT test: Body bend in 30 seconds (test of repetitive abdominal musculature strength), PRC – DTE – test (test of repetitive back musculature strength), Push-ups on a chair in 30 seconds (test of repetitive chest and shoulder strength and arm extension strength), Body height, Body weight, BMI (body mass index).

The experimental group carried out strength exercises during the period of 4 months, 3 times a week at the end of the preparatory stage of the lesson. This is an example of a weekly exercises program:
1. Support on the forearms;
2. Support on a ball, medicine ball, or a sideways bridge;
3. A little candle with knees bent, lowering them to the angle of 90 degrees;
4. Lying on the back, children touch their soles, lifting the shoulder blades and delaying them at the upper point with legs bent in hips and knees;
5. Dead lifting with a ball on one leg;
6. Lifting to a position of a bridge on the shoulder blades with a delay at the upper point;
7. Trunk twist with a medicine ball.

All the exercises were done in two series, lasting 30 - 45 sec each.

The control group was practicing within the same time interval 3 times a week. The following is an example of a weekly exercise program:
1. Bend body at an angle of 45 degrees.
2. Lift legs at an angle of 45 degrees while lying on the back.
3. Contract and stretch legs while sitting.
4. Extend and lift the opposite leg and arm while lying on the stomach.
5. Hyperextend back with palms on the floor, imitating breaststroke swimming with the chest lifted from the floor.
6. Lift the ball with extended arms to a forehead level while standing.
7. Sideway arms lifting from the position of arms extended to the level of shoulders to the position of arms above the head (sideway arms lifting).

The exercises were done in three series of 15-20 repetitions at the same lesson stage as in the experimental group.

Data analysis

The data obtained during the study were analyzed using descriptive and comparative statistics.

As for descriptive statistics, we used the following representative and dispersion parameters to analyze each variable:
– The distribution of frequencies
– Mean
– Standard deviation and variance
– Standard error of the mean
– Variation width (minimum and maximum)
– Measuring normality schedule - Skwens & Curtosis

From the area of comparative statistics, we used the discriminate procedure by which we tested the differences among the mean values between groups and within them, as follows:
– T - test for independent samples - when testing the significance of differences between the average results of the experimental and control groups received at the initial and final measurement for each variable;
– T - test for dependent samples - when testing significance between the average results obtained at the initial and final measurement for each variable, separately for control and separately for the experimental group;
– Analysis of variance - F test.

Both discriminant procedures were carried out in the process of analysis of co-variation.

RESULTS

The charts below show the research results.

Table 1. Descriptive statistics at the final measurement for both groups of sixth graders

<table>
<thead>
<tr>
<th>GROUP</th>
<th>EXPERIMENTAL (N = 92)</th>
<th>CONTROL (N = 99)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>SD</td>
<td>MIN</td>
</tr>
<tr>
<td>Repetitive strength of abdominal musculature</td>
<td>24,46</td>
<td>1,95</td>
</tr>
<tr>
<td>Repetitive strength of back musculature</td>
<td>44,51</td>
<td>5,84</td>
</tr>
<tr>
<td>Repetitive strength of arms and shoulders</td>
<td>14,36</td>
<td>2,68</td>
</tr>
<tr>
<td>Body height</td>
<td>161,91</td>
<td>5,29</td>
</tr>
<tr>
<td>Body weight</td>
<td>56,97</td>
<td>7,12</td>
</tr>
<tr>
<td>BMI</td>
<td>21,73</td>
<td>2,32</td>
</tr>
</tbody>
</table>
Table 2. The results of t-test for independent samples used for the final measuring of both groups of sixth grade boys

<table>
<thead>
<tr>
<th></th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repetitive abdominal musculature strength</td>
<td>1.986</td>
<td>0.049</td>
</tr>
<tr>
<td>Repetitive strength of back musculature</td>
<td>5.224</td>
<td>0.000</td>
</tr>
<tr>
<td>Repetitive strength of arms and shoulders</td>
<td>-3.909</td>
<td>0.000</td>
</tr>
<tr>
<td>Body height</td>
<td>2.553</td>
<td>0.012</td>
</tr>
<tr>
<td>Body weight</td>
<td>7.012</td>
<td>0.000</td>
</tr>
<tr>
<td>BMI</td>
<td>7.128</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Table 3. t – test for dependant samples – establishing the importance of differences in arithmetic means at the initial and final measuring in the control group (N=92; df=91)

<table>
<thead>
<tr>
<th></th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repetitive abdominal musculature strength</td>
<td>-5.938</td>
<td>0.000</td>
</tr>
<tr>
<td>Repetitive back musculature strength</td>
<td>-17.241</td>
<td>0.000</td>
</tr>
<tr>
<td>Repetitive strength of arms and shoulders</td>
<td>-8.499</td>
<td>0.000</td>
</tr>
<tr>
<td>Body height</td>
<td>-4.079</td>
<td>0.000</td>
</tr>
<tr>
<td>Body weight</td>
<td>-0.815</td>
<td>0.417</td>
</tr>
<tr>
<td>BMI</td>
<td>0.968</td>
<td>0.335</td>
</tr>
</tbody>
</table>

Table 4. t – test for dependent samples – establishing the importance of arithmetic means differences at the initial and final measuring in the experimental group (N = 99; df = 98)

<table>
<thead>
<tr>
<th></th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repetitive abdominal musculature strength</td>
<td>-37.923</td>
<td>0.000</td>
</tr>
<tr>
<td>Repetitive back musculature strength</td>
<td>-15.665</td>
<td>0.000</td>
</tr>
<tr>
<td>Repetitive strength of arms and shoulders</td>
<td>-14.862</td>
<td>0.000</td>
</tr>
<tr>
<td>Body height</td>
<td>-8.998</td>
<td>0.000</td>
</tr>
<tr>
<td>Body weight</td>
<td>-6.405</td>
<td>0.000</td>
</tr>
<tr>
<td>BMI</td>
<td>2.664</td>
<td>0.009</td>
</tr>
</tbody>
</table>

After four months of research (one term) and the obtained results, we can conclude that the t-test for independent samples (Tables 1. and 2), when the final measuring of pupils (experimental group N=92 and control N=99) are compared, showed statistically significant differences in the following variables:

Repetitive abdominal musculature strength: the sixth graders in the experimental group had an approximately better score (M=24.46; SD=1.95) compared to the sixth graders in the control group (M=23.41; SD=4.81) - t=1.986; p < .049 at the final measuring, which we can consider a result of the applied experimental core training method of practice.
Repetitive back musculature strength - the sixth graders in the experimental group had an approximately better score ($M = 44.51; SD = 5.84$) compared with the sixth graders in the control group ($M = 40.56; SD = 4.48$) – $t = 5.224; p < .000$ at the final measuring. We can notice the advantage of the applied experimental core training method in this motor variable, compared with the programs for strength development used before with children of this age.

Repetitive strength of arms and shoulders: the sixth graders in the experimental group had an approximately lower score ($M = 14.36; SD = 2.68$) compared with the sixth graders in the control group ($M = 16.61; SD = 5$) – $t = -3.909; p < .000$ at the final measuring. As for this variable, the core training method increased the strength with the experimental group but the control group showed better results in this variable.

Body height – the sixth grade pupils in the experimental group were approximately taller ($M=161.91; SD=5.29$) compared to the control group pupils ($M=159.36; SD=8.29$) – $t = 2.553; p < .012$ at the final measuring.

Body weight – the sixth grade pupils in the experimental group were approximately heavier ($M = 56.97; SD = 7.12$) compared to the control group pupils ($M = 48.1; SD = 10.19$) – $t = 7.012; p < .000$ at the final measuring.

BMI – the sixth grade pupils in the experimental group had an approximately better score ($M = 21.73; SD = 2.32$) compared to the experimental group pupils ($M = 18.66; SD = 3.54$) – $t = 7.128; p < .000$ at the final measuring.

**DISCUSSION**

The progress we made after a four-month-research in the motor variables - repetitive abdominal musculature strength ($t = 1.986; p < .049$) and the repetitive back musculature strength ($t = 5.224; p < .000$) with the sixth grade pupils can be completely attributed to the use of the experimental core training method in PE classes. The results of the t-test for independent samples used for the final measuring of both groups of sixth grade boys confirm this progress. During the four-month-period of the experiment, the experimental group pupils made bigger progress in repetitive strength development than the control group pupils, although progress in strength is visible in pupils of both groups (Tables 3 and 4).

Considering the fact that PE classes are specific, and the time pupils spend exercising actively (which is sometimes shorter than 25 minutes), the core training method can be used in every class, regardless of the planned unit, thus contributing to continuous physical strength development with the children. Former exercise methods demand a special organization (particular devices, props) which leads to much less time devoted to the main part of the class, and thus children fail to acquire the necessary skills and knowledge.
Development of physical strength with elementary school children is necessary for their growth and development. Body muscle power has a very important role in a child’s growth process as that musculature itself enables a correct posture and decreases the possibility of spine deformities. The core training method in physical strength development is based on abdominal and back musculature strength development. Unlike the classic methods of physical strength development, this training method creates the same or even better results in physical strength development for the same period of time.

The applied exercises are easy for a pupil to carry out, as well as for a teacher (trainer) who controls him/her. The teacher (trainer) does not have to provide the rhythm, the pupils (sportspeople) perform the exercises in their own pace. Errors in performing are easily and quickly removed. The exercises are done in periods lasting from 35 to 40 sec at the beginning. Later the time for the exercises can be extended.

Unlike the classic methods for muscle power development, the core training method consists of three types of muscle contractions (static, exocentric and concentric). Former methods for physical strength development are based on concentric muscle contractions.

The exercises used in the core training method belong to a group of complex exercises because they engage more groups of muscles at the same time, which is very important for the muscle groups surrounding a child’s spinal column. Performing exercises for abdominal musculature simultaneously develop the back and shoulder musculature.

The exercises can be easily and quickly modified (they can be made easier or more difficult) by changing the position of body parts or by shutting down one of the senses.

The differences in the variables of morphological space, especially if there have been changes in both groups (Tables 3 and 4) - (body height, body weight, body mass index (BMI)) cannot be attributed to the influence of the experimental method, but rather, they are a consequence of biological growth and student development.

Former research on the use of the core training method in PE teaching shows that there is not a single study about the influence of this method on physical strength development with elementary school children. The studies are based on the research carried out in professional sports and medicine – physical therapy.
CONCLUSION

The use of the core method resulted in better effects in all variables with pupils of this age except in the variable of repetitive strength of arms and shoulders.

This leads to the conclusion that the core training method of physical strength development with the children at this age gives better results than the former methods.

There are some advantages of this method we have not tested, but which are worth mentioning:
- Using this method, we can make exercises easier or more difficult, depending on the children’s abilities.
- More muscle groups are treated simultaneously, which is possible due to the different positions of the body which activates the muscles.
- A pupil is completely focused on one exercise – the possibility of incorrect performance is less.
- The results of physical strength development are visible in a short period of time, which additionally stimulates the pupils.

The differences in morphological variables (body height, body weight, body mass index (BMI)) cannot be attributed to the use of this method. They depend on natural growth and development of the pupils individually.

All the above mentioned leads to the conclusion that the core training method used for physical strength development with sixth grade elementary school pupils gives better results than any other formerly used methods.
REFERENCES


COMPARATIVE ANALYSIS OF ANTHROPOMETRIC CHARACTERISTICS AND ANTHROPOMOTOR ABILITIES OF THE YOUTH OF SECONDARY SCHOOL POPULATION

UDK 572.51.087-053.6

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Abstract: The subject of this study is the operational plans and programs of a physical education course in a short period of time and how they affect the anthropometric characteristics and anthropomotor abilities of the youths of this age who are engaged in a physical activity, that is, who are engaged in some kind of sport recreationally and those who are not physically active. The overall objective of the study is the comparison of results in order to determine the effect of sports activities on the secondary school population and the course of teaching in the school itself.

The research was of a transversal character because it was aimed to determine the current state of the selected sample. By hypothesizing, we examine the general assumption that, as for the anthropometric characteristics, there will be no significant differences between young athletes and non-athletes, whereas, in regard to anthropomotor abilities, there will be considerable differences, and even greater if the youth are engaged in sports for a long time. The results of anthropometric characteristics and anthropomotor abilities were related, i.e. they were in synergy.

Based on the subject, objective and tasks of the study, the population from which a sample of respondents is taken is defined as a population of young people of secondary school education (the 2nd year) attending the Polytechnic School in the city of Kragujevac, divided into two sub-samples: the sub-sample of young athletes and the sub-sample of young non-athletes. Each sub-sample contained 30 respondents, which made a total sample of 60 respondents. On the day of measurement, the respondents were 17 years and +/-6 months old.
all clinically healthy and without physical disabilities. The average age of the sub-samples was in the range of +/-6 months.

Regarding the sample of variables, i.e. as a part of the assessment of anthropometric characteristics of the young, the measurements were carried out as follows: longitudinal dimensionality of skeleton – body height, volume of body – body mass and, thereafter, the BMI, or body mass index, known also as the Quetlet index, was treated. To assess the anthropomotor abilities of the young, the measurements were carried out using the Eurofit battery of tests, and the criterion for their selection was the relevance of the researches of a number of authors (mentioned later in this paper): the flamingo balance test MFBT, hand tapping test MHTT, standing long jump test MSLJT, sit-ups test MSUT and MBFRT agility test, that is back and forth 10 x 5m running.

The statistical significance of the differences in the arithmetical means of the compared samples was assessed by the t-test for small dependant samples, at the level of statistical significance of 0.05. In order to protect the level of significance of the t-test in this research, the initial value of 0.05 was divided by the number of tests, which is, in the first case, 3 and 5 in the second, and the resulting level of statistical significance is therefore 0.01. In these kinds of researches, this is a generally accepted procedure.

The research results show that we can accept the hypothesis regarding the anthropometric characteristics as well as the anthropomotor abilities of general balance, explosive strength of legs, and endurance strength of the abdominal muscles and running speed, i.e. agility at 0.05 level. The hypothesis regarding the anthropomotor ability of rapid performance of movements with a given amplitude, also at 0.05 level, is rejected. All these indicators were of the same conclusion at the level of significance of 0.01.

Key words: sport and physical education, anthropometry, anthropomotorics, the youths, evaluation

INTRODUCTION

With this research we wish to examine the effect of the program of secondary education institutions in the field of physical education, as already stated. In this field, education in secondary schools aims ‘to form healthy, physically well and harmoniously developed, skillful and bold youth, who completely freely, efficiently and gracefully master their motor skills’.

It is well known that only a few prior researches were essentially engaged in examining the effects of physical education teaching programs in secondary schools on the anthropometric characteristics and anthropomotor abilities of the young, in our case the young male population. Therefore,
the need to define which the impacts of the physical education programs on anthropometric characteristics and anthropomotor abilities are, based on the appropriate sample, i.e. respondents engaged and not engaged in sports, respectively, has emerged as a research problem.

The overall objective of our paper is to compare the results of anthropometric characteristics and anthropomotor abilities of young athletes and non-athletes in order to determine the effect of sports activities on the secondary school population.

Based on the subject and objective of our research, earlier studies and age characteristics of the youth of the secondary school population, by hypothesizing we consider and examine a general assumption that, as for anthropometric characteristics, there are no significant differences between youth athletes and youth non-athletes, whereas, in regard to anthropomotor abilities, there are considerable differences, and even greater if the youth are engaged in sports for a long time.

As already mentioned, there is minimal research on the subject, mainly of an older date, but they were the trigger for the preference of the given research problem and a good reason for the justification of this type of research. On the basis of everything stated here, this study is set to be both methodologically and substantively correct.

In the book by authors Bokan and Radisavljevic (1995) the related studies dealing with very similar issues were mentioned and thus the author of this study, in the course of the research, mentions them as well.

Bokan (1977) in his study The impact of extracurricular activities on improving the motor performance and physical development of pupils in Belgrade high schools, under the mentorship of Slavko Ivančević, PhD, presented a research aimed at determining the level of the transformational impact of extracurricular activities on improving some motor skills (primary) and some characteristics of physical development as well (secondary) of the pupils in Belgrade high schools.

The research included 360 pupils from the Fifth and Fourteenth High School, divided into groups or sub-samples from 15 to 18 years, and additionally divided into an experimental group (E) and two control groups (C1 and C2). Each group counted 120 pupils (60 males and 60 females) so there were 30 pupils in each age group. The ‘ex-post-facto’ method was applied as a special kind of experiment in which the experimental factors already operated.

Within the physical development, body height and body weight were measured, whereas, within the motor skills, the following measurements were carried out: running speed, i.e. 30m flying start running; explosive and repetitive strength, that is standing long jump and the mixed lying pull-up in females and standard pull-up in males; balance, i.e. standing on the front part
of foot of one leg on a narrow backing surface; agility, i.e. bouncing a ball against the wall and catching it in a 15 second period; and endurance, i.e. 500m running for females and 800m running for males.

Respecting the order of hypotheses set up, the results obtained allow the following conclusions:

- in the first group of motor skills in males, where the basic hypothesis was confirmed on the whole, i.e. in all age groups from 15 to 18 years, there is a statistically significant difference between the males of the experimental group and the males of the control groups regarding the following abilities: running speed, explosive strength and endurance. These indicators gave the same results in our research as well;

- in the second group of motor skills in males, where the basic hypothesis was only partly confirmed, that is, in certain age groups from 15 to 18 years, there is a statistically significant difference between the males of the experimental group and the males of the control groups regarding the following characteristics: balance in males of 15, 17 and 18 years of age, agility in males of 16, 17 and 18 years of age and repetitive strength in males of 15 and 18 years of age. The same age of the males was included in our study as well, and identical results were obtained;

- in the group of motor skills in females, where the basic hypothesis was confirmed on the whole, i.e. in all age groups from 15 to 18 years, there is a statistically significant difference between the females of the experimental group and the females of the control groups regarding the following abilities: running speed, repetitive strength and endurance;

- in the group of motor skills in females, where the basic hypothesis was only partly confirmed, that is in certain age groups from 15 to 18 years, there is a statistically significant difference between the females of the experimental group and the females of the control groups regarding repetitive strength in females of 15, 16 and 17 years of age and agility in females of 16 and 17 years of age.

The research results confirm the beneficial effect of an increased range of exercising, a diverse content of exercises and an increased exercise intensity applied in the extracurricular activities in Belgrade high schools.

Stojiljkovic (1983) in his study, The effect of physical education methods, covered by the new program tasks, on the development of anthropometric and biomotor dimensions in pupils of the third grade of secondary vocational education in the city of Nis and Nis region, under the mentorship of Paul Opavski, PhD, presented a research aimed at determining the anthropometric and biomotor latent dimensions of the pupils of mentioned education, who, with two classes per week and other activities, have a well-organized physical education.
The differences in anthropometric and biomotor space between 3rd year males and females involved in this research were determined using the comparative method and they were compared with the results of the researches of Mr. N. Kurelic and his colleagues on the same sample of the Yugoslav population.

The data obtained in the study points out the research conducted on the safe theoretical bases of the impact of elective courses methods in a morphological and biomotor space, on which the process of physical education in terms of reformed school can be diagnosed, programmed, immediately implemented and controlled.

The research results showed the following:

– The implementation of the new curricula with two P.E. classes per week and other extracurricular activities had no statistically significant effect on the development of body height in males in the instrumental group as well as in the control groups, whereas certain statistically significant changes occurred in females but they were negligible and in the limits of systemic error in the measurement. The given results in the males were of the same conclusion as in our research.

– The implementation of the new curricula with two P.E. classes per week and other extracurricular activities statistically significantly developed ballistic muscular potential in terms of larger loads and shorter duration, projected on the development of power and endurance in all respondents of both sexes in the experimental group and control groups as well, so it is assumed that the development of this potential is more the result of a mastered technique of test implementation rather than a real indicator of the development of the aforementioned muscular potential (the tests for determination were the long standing jump and shot put).

– The implementation of new curricula statistically significantly influenced the development of ballistic-repetitive muscular potential (anaerobic repetitions) in terms of larger loads and longer duration, projected on the development of power and endurance in all respondents of both sexes in the experimental group and control groups as well (the test for determination were sit-ups in a 30 second period).

– The implementation of the new curricula statistically significantly influenced the development of ballistic-repetitive muscular potential in terms of smaller loads and shorter duration, projected on the development of speed and endurance in all respondents of both sexes in the experimental group and control groups as well (the test for determination were hand tapping and foot tapping).

The physical education methods with two classes a week are not sufficient to positively influence the development of anthropometric and
biomotor dimensions, which, on the basis of the scientific experiment, indicates that there is a need for a revision of physical education curricula in secondary vocational education.

Djukić (1975) in his study “Some possibilities for improving the quality of physical education in schools by an intensification of classes and a rationalization of learning motor tasks”, under the mentorship of Slavko Ivančević, PhD, showed that the process of adopting motor structures occurs in the conditions of a certain pedagogical impact which, by the most suitable methodological procedures, directs it in a certain way.

The rationalization of physical education teaching in school in order to improve the psychophysical personality traits is achieved by:

– didactic rationalization, that is, the application of economical teaching methods in the training of motor tasks,
– implementation of methods for intensification of classes and reducing ineffective time for exercising, thus increasing performance, and an intensified process of practicing.

The sample consisted of 1st and 2nd year females of the Koca Kolarov High school and the Second High School in the city of Zrenjanin. The research was conducted on 140 respondents of the 1st year and 140 respondents of the 2nd year where, in the course of testing, 134 respondents of the 1st year in the experimental group and control groups completed the experimental procedure, as well as 128 respondents of the 2nd year in the experimental group and control groups.

The selection of variables:

– physical characteristics: body height, body weight, circumference of forearm and wrist diameter;
– physical abilities: factor of explosive strength of the legs, i.e. standing long jump; factor of repetitive strength of abdomen, i.e. sitting-up from lying on the back to sitting position; factor of static strength of arms and legs, i.e. endurance regarding pull-ups on the shaft and endurance regarding squats;
– earlier motor skills: handball, i.e. passing a ball at shoulder height or hand work, the basic stance or leg and abdomen work, and shooting to score by jumping; volleyball, i.e. rebounding the ball by fingers, the basic stance, rebounding by ‘bump’ and serving upwards;
– interview;
– records of teaching.

Based on the results achieved, the research confirmed the running hypotheses:

– that the applied optimal learning processes influenced a faster adopting of motor structures, thus giving a great opportunity for an intensified process
of practicing, and an even greater efficiency of the teaching process regarding the development of primary psychophysical personality traits;

– that rationalization of the teaching processes and increasing of performance also raised the level of physical fitness, enabling a faster adoption of the technical forms of movement;

– that the teaching process primarily depends on the professional and pedagogical guidance of teachers, whereas the improvement of teaching depends on the ability and energy of teachers to use all available instruments. All of these findings also emerged as indisputable facts in our research.

**METHOD OF RESEARCH**

The dialectic method and a specific type of natural experiment were used in this research.

The research was of a transversal character as it was aimed to determine the current state and the value of physical development or anthropometric characteristics and the anthropomotor abilities of the selected sample.

This research has the character of a ‘natural experiment’, where the group of athletes is an experimental group, whereas the group of non-athletes is the control group.

In theory, this kind of experiment is known as the so-called ex-post-facto method, where the experimental factor has already operated, so it is necessary to determine the effect of this factor after the start of its activity (i.e. ex-post) and therefore, the experimental factor is the sports activity itself with all its characteristics in those periods for the young athletes and non-athletes engaged or not engaged in sports, respectively, and what kind of effect the activity will produce on P.E. teaching regarding, in our case, the secondary school pupils.

It was already said that by setting up the hypotheses, we consider and examine a general assumption that, as for the anthropometric characteristic, there will be no significant difference between young athletes and non-athletes, whereas, in regard to anthropomotor abilities, there will be considerable differences, and even greater if the youth are engaged in sports for a long time.

**Sample of respondents**

Based on the subject, objective and tasks of this research, that is, how the recreational activity of the young people itself will contribute to the improvement of physical education and the above mentioned comparisons, the specific population from which the sample of respondents was taken is
defined as the population of young people of secondary school education (the 2nd year), from a secondary school in the city of Kragujevac, divided into two sub-samples:

- a sub-sample of youth athletes and
- a sub-sample of youth non-athletes.

Each sub-sample counted 30 respondents, which makes a total sample of 60 respondents. The sample consisted of youth from the Polytechnic School in Kragujevac. It included youth who, on the day of the measurement, were 17 years and +/- 6 months old, all clinically healthy and without any physical disabilities. Therefore, the average age of the sub-samples was within the limits of +/-6 months. The time spent in sports activities was regarded as the time spent in continuity until the time of measurement, and the given data were taken from the school records which every P.E. teacher keeps for each youth.

All respondents, the recreational athletes as well as the youths not involved in sports, voluntarily agreed to participate in our research. Before they started the recreational exercise program, the recreational athletes were submitted to medical examinations by a specialist in sports medicine. The recreational athletes kept their own records of exercising. The respondents were of those with 3 to 4 years of practicing for 4 times a week with the frequency of one training a day.

The most important part of training for developing endurance and improvement of running techniques was running, so the recreational athletes practiced running 3 times a week for 50 to 60 minutes, whereas the exercises for developing muscular strength and elasticity once a week for 45 minutes were also an important part of the program. All training sessions ended with a 10 minute stretching exercise of all major muscle groups and joints.

Each respondent or youth recreationally engaged in sports had an individual exercise program designed by several P.E. teachers who taught the respondents in primary schools, while, in the first year of secondary education, the author, as a P.E. professor, continued the program of recreational activities of the respondents.

The implementation of training, apart from exceptional individuals, was not fully completed in relation to the scope of the planned program. The average implementation based on the records of the respondents was 82%.

**Sample of variables**

To evaluate the state of the anthropometric characteristics of the youths, the measurement of the following anthropometric measures was carried out:

- body height was measured for the assessment of the longitudinal dimensionality of the skeleton;
- body mass was measured for the assessment of body volume.

After the above mentioned parameters, the body mass index (BMI), also known as Quetlet index, was measured, which is also a method of detecting obesity which is widespread in the world and accepted by reference organizations such as the World Health Organization (WHO) and the International Association for the Study of Obesity (IASO).

To evaluate the anthropomotor abilities, the measurement was carried out using the following tests:
- the flamingo balance test – to measure general balance;
- the hand tapping test – to assess the speed of movements, which is defined as the ability of a rapid performance of movements with a given amplitude;
- standing long jump test – to estimate the explosive strength of legs;
- sit-ups test – to estimate the strength of the abdomen (or endurance strength of the abdominal muscles) and
- back and forth 10 x 5 meters running test – to measure running speed and agility.

All the above mentioned are encrypted with the first letter A to indicate anthropometric measurements, whereas M stands for anthropomotor tests:

Anthropometric dimensions (with encrypts):
1. Body height (AH), cm
2. Body mass (AM), kg, and
3. Body mass index (BMI).

Anthropomotor tests (with encrypts):
1. Flamingo balance test (MFBT), sec., which must always be performed first,
2. Hand tapping test (MHTT), the number of repetitions measured in tenths of a second,
3. Standing long jump test (MSLJT), cm,
4. Sit-ups test (MSUT), number of repetitions in 30 seconds, and
5. Back and forth 10 x 5 meters running test (MBFRT), the number of repetitions, i.e. the performing of 5 complete cycles of running, measured in tenths of a second, and always performed last.

Terms and techniques of measuring anthropometric characteristics

The measurement of anthropometric characteristics of the youths was carried out in the P.E. hall in the Polytechnic, specially prepared for this purpose. The measurements were carried out in the period April – May 2013. The temperature, relative humidity and lighting of facilities made the participants feel comfortable.
The measurement was performed by three appraisers (professors of sport and P.E.) with the help of other teachers, i.e. the author of this paper and another two P.E. professors.

The respondents were in underwear and barefoot. All measurements were performed in the morning between 9 a.m. and 12 a.m.

Before measuring, each respondent was marked by relative anthropometric points and levels:
- the Frankfurt plane – a line connecting the bottom edge of the left orbit and the top edge of the left, external auditory opening.

During the measurement the result was read while the instrument was on the respondent, and the person noting down the result as a form of control, loudly repeated the result while recording it in the list of measures carried by every pupil.

The following instruments were used for the measurement:
- a medical scale with measuring possibility from 0.1 kg,
- Martin type anthropometer with the possibility to read the results from 0.1 cm,
- calculator for measurement of BMI.

All measurements predicted by the program were carried out using the method of the international biological program (Weiner, Lourie 1969), as follows:

The body mass is measured by a scale placed on a horizontal surface. A respondent, barefoot and only in his/her underwear, stands still in the middle of the scale in an upright posture. When the needle on the scale is still, the results are read with the accuracy of 0.1 kg. (manufacturer of medical scales Birotehna Ltd., Smederevo). The body height was measured by the Martin type anthropometer.

During the measurement the respondent, barefoot and in underwear, stands in an upright posture on the firm horizontal surface. The head of the respondent should be in such a position so that the Frankfurt plane is horizontal.

The respondent straightens the back as straight as possible, while pulling the feet together. The appraiser stands to the left of the respondent controlling whether the anthropometer is placed vertically along the back of the body, and then he drops the metal ring-slider so that the horizontal crossbar reaches the head (the top of the head of the respondent). At that point of measurement, the measurer reads the result on the scale at the level of the upper side of the triangular slot of the ring-slider. The result is read with the accuracy of 0.1 cm.

Terms and techniques of the measurement of anthropomotor abilities

The measurement of anthropomotor abilities was carried out in the P.E. in the Polytechnic. All measurements were performed in the morning from 8
a.m. to 12 a.m. in the period April – May 2013. During the measurement, the respondents were in sportswear (shorts, T-shirt, sneakers). The air temperature in the hall ranged from 18 to 22 degrees Celsius throughout the measurement.

The measurement of anthropomotor abilities was performed by three appraisers, professors of sport and P.E., i.e. the author of this paper and another two professors of sport and P.E., especially trained for this purpose.

During the research, the respondents came to the measurement by classes, and each respondent carried a measuring list with himself/herself and handed it over in the next stage. The following instruments were used for the measurement of the anthropomotor abilities: Elan mats, CATIGA CG – 503 stopwatches with the possibility to read the results of 0.1 sec, and traffic cones.

Tests using the Eurofit battery of tests were conducted by Aldin Avdić, Admir Hadžikadunić, and Muriz Hadžikadunić (2000) as well as Franci Ambrožić, Gustav Bala and Dejan Madic (2002), which served to establish the differences in anthropomotor abilities.

During the process of training and research of the youth regarding the development of anthropological characteristics (according to Drabik, 1996, and Malacko, 2002), effective procedures in the selection of the contents of working methods, organizational forms, load intensity and recovery were applied.

In view of that, positive effects of the transformation process can be expected only if the methodological design of training is customized to individual abilities and characteristics of the subject (Kondrić and co-authors, 2002). The tests are explained in the order of performance.

**Flamingo test**

Factor: general balance.

Description of the test: balancing on one leg on the beam of the given dimensions.

Equipment and props needed for the test performance: a metal or wooden 50 cm long x 4 cm high x 3 cm wide beam covered with material with a maximum thickness of 5 mm firmly affixed to the beam. Stability of the beam is provided with two 15 cm long x 2 cm wide supports.

Description of the test: each respondent balances as long as possible on the longitudinal axis of the beam while standing on a chosen leg. S/he bends the leg backwards and, with the ipsilateral hand, catches the upper part of the foot standing like a flamingo. The teacher helps the respondents take the proper position by supporting him/her with his forearm. The test starts when the teacher withdraws his/her hand. The respondent tries to balance in this position as long as possible. The test is finished the moment the respondent
loses balance (i.e. drops the free leg, the one s/he holds) or touches the floor with any part of the body. The test is repeated three times, and the best time is counted. The measurer stands in front of the respondent and the test begins after the trial attempt. The stopwatch is turned on when the respondent lets go of the teacher’s arm. The stopwatch is stopped when the respondent loses balance, drops the free leg and touches the floor with any part of the body. After each fall, the measurer helps the respondent take the starting position.

Assessment of the test: the longest time of balancing in the given position on the beam.

**Hand tapping test**

Factor: assessing the speed of movements which is defined as the ability of rapid performance of movements with a given amplitude.

Description of the test: rapid alternating, touching the two plates by a hand by choice.

Equipment and props needed for test performance: a table whose height is adjustable, two rubber discs of 20 cm diameters attached horizontally on the table, the distance between the centers of the discs is 80 cm (between the edges 60 cm), rectangular 10 x 20 cm plate placed at an equal distance between the two discs, a stopwatch.

Description of the test: the respondent sits at the table with feet slightly spread and with the hand of the free arm placed on the rectangular plate in the centre. The respondent places the hand of the chosen arm on the opposite disc. Then s/he passes the chosen hand back and forth between the two discs as fast as possible over the other hand placed in the middle of the table on the rectangular plate, and the respondent must be sure that each time the disc is touched. When the teacher says ‘Ready… now!’ the respondent should perform 25 cycles as quickly as possible (one cycle is touching the opposite disc and returning to the starting disk). The respondent stops when the teacher gives the signal ‘stop’. During the test, the teacher loudly counts the cycles. The test is repeated twice and the better time is taken. The appraiser must adjust the height of the table so that its surface is just below the level of the respondent’s navel. Throughout the test, the appraiser stands by the table paying attention to the disc the respondent chose at the beginning of the test and counting the respondent’s touching of the disc.

The stopwatch is turned on after the teacher’s word ‘now!’ Assuming that the respondent started the test at the disc marked as A, the stopwatch is stopped when the respondent touches the disc 25 times, so the total number of touches of the two discs (A and B) is 50 or 25 cycles of touches between the discs A and B. It is recommended that the test is performed by two appraisers: one to measure time and encourage the respondent and the other to count the touches.
Assessment of the test: the task consists of 25 cycles. The fastest time is the result recorded and the best result is the assessment. The assessment is the time needed for 25 touchings of the disc, measured in tenths of a second. The appraiser does not count the attempts when the respondent does not touch both plates. If the respondent fails to touch the disk, one touch more is added to attain the obligatory 25 cycles.

Standing long jump test

Factor: Explosive strength, i.e. the assessment of explosive strength which is the ability to activate the maximum number of motor units in a unit of time during the implementing of simple motor structures with a constant resistance or with resistance proportional to body mass. A large number of researchers (Chu 1998, Matvejev 2000, Antekolović 2003) state that explosive strength is the dominant dimension in most sports activities, and that it is the most common in athletic jumps, and we absolutely agreed with this in our research.

Description of the test: long jump from a standing position.

Equipment and props needed for the test performance: Elan mats joined together to the length from 3 to 4 m, chalk, magnesium, a meter tape, a ruler in the ‘T’ shape, a spring board and a picture of tasks.

The respondent takes off with both feet from the end of the reversely set springboard (the higher end of the board faces backward) and jumps as far as possible, always by both feet, on the mat. Arms swinging and lifting on the toes are allowed only before the jump. Double take-off is not permitted. The respondent must jump barefoot. Take-off and landing surface must be in the same plane. The place of take-off is marked by a line (Scotch tape). If possible, the measuring tape up to 300 cm can be placed alongside the landing place, which makes the reading of the length of the jump simpler. The result is recorded in centimeters, for example, a 201 cm jump is written as 2/0/1, or the 95 cm jump is entered as 0/9/5. The test is controlled by a teacher, assistant and recording secretary, who must draw the parallel lines on the landing mat every 10 cm starting from 1 m away from the starting line. The measuring tape (meter) placed on this line give the exact measure. The teacher stands on the side and measures the length of the jump. The length is measured from the front edge of the starting line to the point where the back of the foot (closest to the take-off line) lands down on the mat. If the respondent falls backwards or touches the mat with any part of the body, an extra attempt is allowed. The take-off and landing mat must be in the same plane and firmly attached to the floor. Since the differences in the estimates can be significant, the measurement should be precise.

Assessment of the test: the respondent jumps twice in a row, and the longest jump is assessed. A meter tape is used to measure the distance from the line of take-off to the nearest mark on the landing mat. If footprints are not
clearly visible, it is necessary to smear the respondent’s heels with magnesium. Improperly performed jumps are repeated.

**Sit-ups test**

Factors: abdomen strength (endurance strength of the abdominal muscles).

Description of the test: the maximum number of raises from lying to sitting position done in half a minute.

To perform the test we need two Elan mats (placed one by the other by length), a CATIGA CG – 503 stopwatch.

The respondent sits on the mat with a straight back, hands clasped behind the head, knees bent at 90 degrees, and heels and feet placed flat on the mat. First s/he lies on their back touching the mat with their shoulders, and then s/he returns to a sitting position with their elbows in front of them so that they can touch their knees. All the time, the respondent keeps their hands clasped behind their head. When the teacher says ‘Ready…now!’, the respondent repeats this action as quickly as possible during 30 seconds and continues until the teacher says ‘stop!’ This test is done only once. The appraiser should kneel beside the respondent and make sure that the respondent has taken the proper starting position. The appraiser sits facing the respondent, with legs spread and the thighs over the respondent’s feet to keep them on the ground, and puts the hands under the respondent’s knee, keeping both knees at a right angle of 90 degrees, and legs still. After instructions are given and before starting the test, the respondent performs the entire movement in order to check if the respondent understood the instructions. The stopwatch is started at the words ‘Ready…now!’ and is stopped after 30 seconds. We count each sit-up when the elbows touch the knees, while improper attempt is not counted. During the performance of the test, we correct the respondent if he does not touch the mat properly with the shoulders or knees by elbows when they return to the sitting position.

Assessment of the test: the total number of correctly performed sit-ups in 30 seconds is the assessment of the test.

**Running 10 x 5m test**

Factors: running speed, agility.

Description of the test: running and agility at full speed.

To perform the test, we need a clean non-slip floor, a stopwatch, a tape measure (meter), school chalk or tape, traffic cones.

The respondent gets ready behind the line. One foot must be right behind the line. When the ‘start’ is signaled, the respondent should run as fast
as possible to the other line and return to the starting line, crossing both lines with both feet. This is one cycle, and the respondent must do five cycles. The appraiser draws two parallel lines spaced five meters on the floor (using school chalk or Scotch tape).

The line is 1.20 m long and the ends of each line are marked by traffic cones. The appraiser checks if the respondent had crossed the line with both feet each time s/he ran the given path and whether the turns were performed as quickly as possible. The total number of performed cycles is announced after each cycle. The test ends when the respondent crosses the finish line with one foot. The respondent must not slide during the test and therefore it is necessary that the floor is of a non-slip material.

Assessment of the test: the time required to perform five complete cycles of running back and forth expressed in tenths of a second is the assessment of the test.

**Method of processing data**

The basic descriptive statistics is separately calculated for each of these two sub-samples: the arithmetic mean (Mean), standard deviation (SD), coefficient of variation (cV%) and the minimal and maximal results (Min-Max).

The statistical significance of the differences in the arithmetic means of the appropriate variables between the compared samples is estimated using the t-test for small dependent samples at the level of significance of 0.5. The aforementioned method is applied to the sample of all youths in this research for all anthropometric measures and anthropomotor tests.

The statistical analysis of the data obtained in this research was done on the Pentium IV in the program – Microsoft Office 2010 – Excel.

**RESULTS AND DISCUSSION**

Table 1. *The experimental group (athletes) – the results of anthropometric measures of young athletes of the secondary school population*

<table>
<thead>
<tr>
<th></th>
<th>Year</th>
<th>Gender</th>
<th>AH (cm)</th>
<th>AM (kg)</th>
<th>BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean value - MEAN</td>
<td>1996</td>
<td>M</td>
<td>178.03</td>
<td>69.93</td>
<td>22.05</td>
</tr>
<tr>
<td>Standard deviation - SD</td>
<td>1996</td>
<td>M</td>
<td>6.38</td>
<td>5.99</td>
<td>1.37</td>
</tr>
<tr>
<td>Coefficient of variation - cV%</td>
<td>1996</td>
<td>M</td>
<td>3.58</td>
<td>8.56</td>
<td>6.22</td>
</tr>
<tr>
<td>Min</td>
<td>1996</td>
<td>M</td>
<td>163</td>
<td>58</td>
<td>18.41</td>
</tr>
<tr>
<td>Max</td>
<td>1996</td>
<td>M</td>
<td>190</td>
<td>85</td>
<td>25.66</td>
</tr>
</tbody>
</table>
Table 2. The control group (non-athletes) – the results of anthropometric measures of young non-athletes of the secondary school population

<table>
<thead>
<tr>
<th>Year</th>
<th>Gender</th>
<th>AH (cm)</th>
<th>AM (kg)</th>
<th>BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>M</td>
<td>179.57</td>
<td>71.17</td>
<td>22.01</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Gender</th>
<th>AH (cm)</th>
<th>AM (kg)</th>
<th>BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>M</td>
<td>7.14</td>
<td>11.82</td>
<td>3.02</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Gender</th>
<th>AH (cm)</th>
<th>AM (kg)</th>
<th>BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>M</td>
<td>3.97</td>
<td>16.61</td>
<td>13.73</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Gender</th>
<th>AH (cm)</th>
<th>AM (kg)</th>
<th>BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>M</td>
<td>168</td>
<td>52</td>
<td>16.98</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Gender</th>
<th>AH (cm)</th>
<th>AM (kg)</th>
<th>BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>M</td>
<td>195</td>
<td>94</td>
<td>28.70</td>
</tr>
</tbody>
</table>

Table 3. Significance of differences (t-test) in the arithmetic means of anthropometric characteristics of young athletes and non-athletes of the secondary school population

<table>
<thead>
<tr>
<th>Ordinal number</th>
<th>Parameters</th>
<th>The experimental group – the average</th>
<th>The control group – the average</th>
<th>t-test</th>
<th>The level of significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AH (cm)</td>
<td>178.03</td>
<td>179.57</td>
<td>0.38</td>
<td>t &lt; 0.05</td>
</tr>
<tr>
<td>2</td>
<td>AM (kg)</td>
<td>69.93</td>
<td>71.17</td>
<td>0.61</td>
<td>t &lt; 0.05</td>
</tr>
<tr>
<td>3</td>
<td>BMI</td>
<td>22.05</td>
<td>22.01</td>
<td>0.95</td>
<td>t &lt; 0.05</td>
</tr>
</tbody>
</table>

A discussion of the basic anthropometric characteristics of young people of secondary school age, athletes and non-athletes, produced Table 1, which shows the indicators of young athletes and, Table 2 which shows young non-athletes.

Table 3 shows the statistical significance of the differences (t-test) in the arithmetic means of anthropometric characteristics of young athletes and youth non-athletes.

The average body height of the youths engaged in sports and young non-athletes is 178.03 cm and 179.57 cm, respectively. Between these two groups, there is no statistically significant difference regarding body height (t=0.38) at the significance level of 0.05, and the results obtained can be considered practically equal.

The relative variability of body height of the young athletes (cV% - 3.58) and the young non-athletes (cV% - 3.97) is approximately the same, i.e. the homogeneity of the groups in the observed characteristic is about equal.

The average body mass of the young athletes is 69.93 kg, and 71.17 kg of the young non-athletes. The difference in the mean values of body mass between the observed groups is not statistically significant (t=0.61) at significance level of 0.05, and the results obtained can be considered practically equal.

The relative variability of the body mass of young athletes (cV% - 8.56) is lesser that in the young non-athletes (cV% - 16.61), i.e. young athletes are a more homogenous group in the observed characteristics.
The average value of the BMI of young athletes is 22.05 and of the young non-athletes it is 22.01. Between these two groups, there is no statistically significant difference in the measurement of the BMI (t=0.95) at the significance level of 0.05, and the results obtained can be considered practically equal.

The relative variability of the BMI of young athletes (cV% - 6.22) is lesser than of the young non-athletes (cV% - 13.73), i.e. the young athletes are a more homogenous group in the observed characteristics.

From the above mentioned, we come to the knowledge that the anthropometric characteristics of the young athletes in relation to the anthropometric characteristic of the young non-athletes are practically the same mean (t=0.38, 0.61, 0.95) at the significance level of 0.05.

Table 4. The experimental group (athletes) – the results of anthropomotor tests of young athletes of the secondary school population (in the already described tests and with the given order of testing)

<table>
<thead>
<tr>
<th>MFBT, sec.</th>
<th>MHTT, sec. – number of repetitions</th>
<th>MSLJT, cm</th>
<th>MSUT, sec. – number of repetitions</th>
<th>MBFRT, sec.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean value - MEAN</td>
<td>18.37</td>
<td>14.07</td>
<td>224.60</td>
<td>23.00</td>
</tr>
<tr>
<td>Standard deviation - SD</td>
<td>13.00</td>
<td>3.49</td>
<td>20.28</td>
<td>3.71</td>
</tr>
<tr>
<td>Coefficient of variation - cV%</td>
<td>70.78</td>
<td>24.83</td>
<td>9.03</td>
<td>16.13</td>
</tr>
<tr>
<td>Min.</td>
<td>6</td>
<td>8</td>
<td>190</td>
<td>20</td>
</tr>
<tr>
<td>Max.</td>
<td>70</td>
<td>25</td>
<td>280</td>
<td>36</td>
</tr>
</tbody>
</table>

Table 5. The control group (non-athletes) – the results of anthropomotor tests of young non-athletes of the secondary school population (in already described tests and with the given order of testing)

<table>
<thead>
<tr>
<th>MFTR, sek.</th>
<th>MTR, sek. – br. ponavljanja</th>
<th>MSDM, cm</th>
<th>MLUS, sek. – br. ponavljanja</th>
<th>MTTO, sek.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean value - MEAN</td>
<td>8.63</td>
<td>15.50</td>
<td>200.73</td>
<td>20.97</td>
</tr>
<tr>
<td>Coefficient of variation - cV%</td>
<td>75.47</td>
<td>20.10</td>
<td>9.61</td>
<td>20.18</td>
</tr>
<tr>
<td>Min.</td>
<td>2</td>
<td>8</td>
<td>160</td>
<td>13</td>
</tr>
<tr>
<td>Max.</td>
<td>26</td>
<td>25</td>
<td>240</td>
<td>28</td>
</tr>
</tbody>
</table>
Table 6. Significance of differences (t-test) in the arithmetic means of anthropomotor characteristics of young athletes and young non-athletes of the secondary school population

<table>
<thead>
<tr>
<th>Ordinal number</th>
<th>Parameters</th>
<th>The experimental group – the average</th>
<th>The control group – the average</th>
<th>t-test</th>
<th>The level of significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MFBT, sec.</td>
<td>18.37</td>
<td>8.63</td>
<td>0.000676</td>
<td>t &lt; 0.05</td>
</tr>
<tr>
<td>2</td>
<td>MHTT, sec.-number of repetitions</td>
<td>14.07</td>
<td>15.50</td>
<td>0.098948</td>
<td>t &lt; 0.05</td>
</tr>
<tr>
<td>3</td>
<td>MSLJT, cm</td>
<td>224.60</td>
<td>200.73</td>
<td>0.000018</td>
<td>t &lt; 0.05</td>
</tr>
<tr>
<td>4</td>
<td>MSUT, sec.-number of repetitions</td>
<td>23.00</td>
<td>20.97</td>
<td>0.000004</td>
<td>t &lt; 0.05</td>
</tr>
<tr>
<td>5</td>
<td>MBFRT, sec.</td>
<td>20.10</td>
<td>24.08</td>
<td>0.00002</td>
<td>t &lt; 0.05</td>
</tr>
</tbody>
</table>

A discussion of the basic anthropometric abilities of young people of secondary school age, athletes and non-athletes, produced Table 4, which shows the basic descriptive statistical indicators of anthropomotor abilities of young athletes, and Table 5 which shows young non-athletes. Table 6 shows the statistical significance of the differences (t-test) in the arithmetic means of anthropomotor abilities of young athletes and non-athletes.

The average value of the results of the test for estimating general balance, the Flamingo balance test, of young athletes and non-athletes is 18.37 and 8.63 seconds, respectively. The difference in the mean values of the results of the general balance of young athletes and non-athletes is statistically significant (t=0.000676) at the 0.05 level and the results obtained can be considered practically unequal, i.e. there are significant differences between the groups regarding general balance.

In both groups, there were great variations (from 6-70 to 2-26 seconds) and coefficients of variation (cV% - 70.78, and cV% -75.47) in the test of general balance between young athletes and non-athletes, and greater variability was found in young non-athletes, which indicates that none of these two groups is homogeneous in the observed characteristic, and therefore a conclusion can be made about the weaknesses of the Flamingo test, and large differences in the general balance in both groups.

The average value of the results of the test for the assessment of the ability of rapid performance of movements with a given amplitude, hand tapping, of
young athletes and young non-athletes is 14.07 and 15.50, respectively. The difference in the mean values of the results of the above described test and the given groups is not statistically significant ($t=0.098948$) at the 0.05 level, and the results obtained can be considered practically equal.

The relative variability of the results of the ability of rapid performance of the movements with a given amplitude of young athletes and non-athletes (cV% -24.83 and cV% -20.10, respectively) is approximately equal, i.e. the homogeneity of the groups in the observed characteristic is about equal, but young non-athletes are the more homogenous group regarding the observed characteristic.

The average value of the results of the test for assessing explosive strength, the standing long jump, of young athletes and non-athletes is 224.60 and 200.73 cm, respectively. The difference in the mean values of the results of the explosive strength test of young athletes and non-athletes is statistically significant ($t=0.000018$) at the 0.05 level, and the results obtained can be considered practically unequal, i.e. there are significant differences regarding the explosive strength between the groups.

The relative variability of the results of explosive strength of young athletes and non-athletes (cV% -9.03 and cV% -9.61, respectively) is approximately equal, i.e. the homogeneity of the groups in the observed characteristic is about equal, but young athletes are a more homogenous group regarding the observed characteristic.

The average value of the results of the test for assessing the strength of the abdomen, i.e. endurance strength of the abdominal muscles, sit-ups, of young athletes and non-athletes is 23.00 and 20.97 repeats, respectively. The difference in the mean values of the results of the abdomen strength between the given groups is statistically significant ($t=0.000004$) at the 0.05 level, and the results obtained can be considered practically unequal.

The relative variability of the results of the strength of the abdomen, i.e. endurance strength of the abdominal muscles of young athletes and non-athletes (cV% -16.13 and cV% -20.18, respectively) is approximately equal, i.e. the homogeneity of the groups in the observed characteristic is about equal, but the young athletes are a more homogenous group regarding the observed characteristic.

The average value of the results of the test for assessing running speed, i.e. agility, back and forth 10 x 5m running, of the young athletes and non-athletes is 20.10 and 24.08 seconds, respectively. The difference in the mean values of running speed, i.e. agility results in both groups is statistically significant ($t=0.000002$) at the 0.05 level, and the results obtained can be considered practically unequal.
The relative variability of the results of running speed, i.e. agility, of the young athletes (cV% -12.89) is lesser than that of the young non-athletes (cV% -12.94), i.e. the young athletes are a more homogenous group in the observed characteristic. And the result is approximately the same so the homogeneity of the groups regarding the observed characteristic is about equal.

Based on the results obtained and research of a general assumption, we can accept the hypothesis that between the young athletes and non-athletes, there are no significant differences regarding anthropometric characteristics.

On the other hand, based on the given research, between the young athletes and non-athletes, there are statistically significant differences regarding the anthropomotor ability of general balance, the flamingo balance test, at the 0.05 level, in favor of young athletes, which means that we also confirmed the earlier hypothesis that there will be significant differences regarding the results of anthropomotor abilities, and even greater if the youth are engaged in sports for a long time.

Between the young athletes and non-athletes, there are no statistically significant differences regarding the anthropomotor abilities of rapid performance of the movements with a given amplitude, the hand tapping test, at the 0.05 level.

Based on the results obtained, we reject the hypothesis which states that there are significant differences in the observed characteristic between young athletes and non-athletes, in favor of young athletes.

Between the young athletes and non-athletes, there are statistically significant differences regarding the anthropomotor ability of explosive strength, the standing long jump test, at the 0.05 level.

Based on the results obtained, we can accept the hypothesis that there are significant differences regarding the anthropomotor abilities between young athletes and non-athletes, in favor of young athletes.

Between the young athletes and non-athletes, there are statistically significant differences regarding the anthropomotor ability of the endurance strength of the abdominal muscles, the sit-ups test, at the 0.05 level.

Based on the results obtained, we can accept the hypothesis that there are significant differences regarding the anthropomotor ability between young athletes and non-athletes, in favor of young athletes.

Between the young athletes and non-athletes there are statistically significant differences regarding the anthropomotor ability of running speed, i.e. agility, back and forth 10 x 5 m running test, at the 0.05 level.

Based on the results obtained, we can accept the hypothesis that there are significant differences regarding the given anthropomotor ability between young athletes and young non-athletes, in favor of young athletes.
In order to protect the level of significance of the t-test of this research, it is necessary that the initial value of 0.05 is divided by the number of tests, that is 3, and in that case the resulting level of statistical significance is 0.01. In such researches, this is a generally accepted procedure.

Table 7. *Significance of differences (t-test) in the arithmetic means of anthropometric characteristics of young athletes and non-athletes of the secondary school population (protection of the level of t-test significance)*

<table>
<thead>
<tr>
<th>Ordinal number</th>
<th>Parameters</th>
<th>The experimental group – the average</th>
<th>The control group – the average</th>
<th>t-test</th>
<th>The level of significance</th>
</tr>
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<tr>
<td>1</td>
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<td>t &lt; 0.01</td>
</tr>
<tr>
<td>2</td>
<td>AM (kg)</td>
<td>69.93</td>
<td>71.17</td>
<td>0.61</td>
<td>t &lt; 0.01</td>
</tr>
<tr>
<td>3</td>
<td>BMI</td>
<td>22.05</td>
<td>22.01</td>
<td>0.95</td>
<td>t &lt; 0.01</td>
</tr>
</tbody>
</table>

In order to protect the level of significance of the t-test of this research, we used the same procedure, i.e. it is necessary that the initial value of 0.05 is divided by the number of tests, that is 5, and in that case the resulting level of statistical significance is 0.01. In such researches, this is also a generally accepted procedure.

Table 8. *Significance of differences (t-test) in the arithmetic means of anthropomotor characteristics of young athletes and non-athletes of the secondary school population (protection of the level of t-test significance)*

<table>
<thead>
<tr>
<th>Ordinal number</th>
<th>Parameters</th>
<th>The experimental group – the average</th>
<th>The control group – the average</th>
<th>t-test</th>
<th>The level of significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MFBT, sec.</td>
<td>18.37</td>
<td>8.63</td>
<td>0.000676</td>
<td>t &lt; 0.01</td>
</tr>
<tr>
<td>2</td>
<td>MHTT, sec.-number of repetitions</td>
<td>14.07</td>
<td>15.50</td>
<td>0.098948</td>
<td>t &lt; 0.01</td>
</tr>
<tr>
<td>3</td>
<td>MSLJT, cm</td>
<td>224.60</td>
<td>200.73</td>
<td>0.000018</td>
<td>t &lt; 0.01</td>
</tr>
<tr>
<td>4</td>
<td>MSUT, sec.-number of repetitions</td>
<td>23.00</td>
<td>20.97</td>
<td>0.000004</td>
<td>t &lt; 0.01</td>
</tr>
<tr>
<td>5</td>
<td>MBFRT, sec.</td>
<td>20.10</td>
<td>24.08</td>
<td>0.000002</td>
<td>t &lt; 0.01</td>
</tr>
</tbody>
</table>

A discussion of the research of anthropometric characteristics and anthropomotor abilities of young athletes and non-athletes at the level of
significance of 0.05, which was carried out in order to protect the significance level of t-test of this research, showed equal results, and confirmed the earlier imposed hypothesis in all cases, except the hand taping test, and therefore, we consider this research very relevant. No changes occurred in relation to the level of statistical significance of 0.05.

CONCLUSION

The research carried out in the study ‘A comparative analysis of anthropometric characteristics and anthropomotor abilities of young athletes of the secondary school population’ carried out in the city of Kragujevac, arose as a need and a message about the importance of practice and further research, and that, at this stage of the development of the secondary school system, their effects are to be observed in the field of physical education as well (in other fields, for example, in the field of intellectual and social development, such research has already been carried out).

In regard to the numerous tasks in the field of physical education in primary and secondary schools, which are generally very complex to study, our objective was aimed at determining the effects of physical education programs in secondary schools, especially in the part related to the stimulation of anthropometric characteristics and anthropomotor abilities of the youths.

With respect to the size of the sample, which was relatively small, and an insufficient uniformity of the sub-samples, for example, by socio-economic status and the conative-cognitive abilities of respondents, the results obtained at the conclusion should be taken with reserve.

The differences in anthropometric characteristics and anthropomotor abilities which can be found in youth, should be considered not only in the programming of physical education, which includes extracurricular activities as well, i.e. various forms of recreation of the pupils, but also while forming the 1st year class in secondary school as well, because in forming this class a number of factors is considered, such as intellectual ability, educational and economic status of the family, and others. On the other hand, the factors of anthropometric characteristics and anthropomotor abilities are particularly ignored even though they, among other things, determine to a large extent how the youth will submit school assignments.

Similar research was conducted by the authors Batričević and Jakovljević (2008) in the study “The effects of the models of explosive strength on the development of motor and functional abilities of pupils” and they came to very similar results and parameters as in this study.
Therefore, all these findings can serve as a basis for a new research of this problem and a test of the results obtained on a larger sample with more variables, that is, tests and thorough methods of data processing.

The research gives a contribution to the development of research methodology in the field of physical education, especially in the research of this or similar problems. In the classical approach to evaluation, the experimental group working on a special program is compared with the control group that did not receive such incentives.

However, such a model is subject to various measurement errors (the majority of errors relate to the expectations of the experimenter), and besides, it is not methodologically clean regarding the separation of the effects of the program from the spontaneous process.

In our research, as the final conclusion, we can say that we have conducted an evaluation of the results of a finite product formed in a spontaneous process, which in itself contains the practice of an ‘experimental program’.

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