MORPHOLOGICAL CHARACTERISTICS AND FUNCTIONAL ABILITIES OF AN ELITE FOLK ENSEMBLE DANCER

Abstract
Morphological characteristics and physiological abilities of dancers, members of an elite folklore ensemble, are estimated by EUROFIT measurement and assessment method. Both sub samples (males and females) are characterized by an above average height. Percentage values of body fat component in both sub samples is considerably higher than that reported for athletes, or for sedentary persons. Maximal oxygen uptake values, as an index of aerobic capacity, were considerably lower than athletes’ maximal oxygen uptake and they were within average range reported for sedentary persons. It was concluded that physical preparation was not enough represented in folk dancers’ class work.

Key words: ELITE FOLK DANCERS / BODY FAT PERCENTAGE / BODY MASS INDEX / AEROBIC POWER / PHYSICAL FITNESS

INTRODUCTION

Athletes, by certain morphological characteristics and functional abilities, differ from sedentary persons who do not train and are not physically active. They differ among themselves as well, depending on the sport they go in for. Differences in body height and characteristics which are in considerable correlation with body height are greatly in connection with different demands athletes meet during selection. Differences in muscles’ percentage and body fat component of an athlete can be, and are in great proportion caused by adjusting the organism to different demands in some sports. Adjustment to different training and competition demands causes differences in functional abilities.
are in range of 15-18% (Ugarkovic, 1996). Average values measured for ballet male dancers are in range of 5-15% (Koutedakis and Jamurtas, 2004). Dancers of classical, folk, and modern dances have, according to data, higher body fat percentage than ballerinas and male ballet dancers. According to data of Yannakouli et al. (2000) female students of modern dances have the average of 19.4% of body fat. According to data of Evans et al. (1985), body fat percentage in body mass of girls performing modern dances has the average of 19.8%, while of jazz ballet dancers it has the average of 23%.

Maximal oxygen uptake values, as a proof of aerobic capacity, are lower for dancers than for most athletes, and do not considerably differ from values measured for sedentary persons, according to Eremija (1997). The cited reason for that is a fact that different forms of dancing do not provide enough stimuli for increase of aerobic capacity (Koutedakis and Jamurtas, 2004). Slightly higher values of aerobic capacity, measured in modern dance performers, are in connection with the duration and frequency of performing more than practicing during lessons and rehearsals. Wion et al. (2004) found that the heart beat frequency of dancers during lessons and rehearsal were rarely in the zone of aerobic training (60-90% of maximum frequency), while during dancing performance the value was considerably higher. They also found considerably higher oxygen uptake value during dancing performance, which was more than during regular lessons and rehearsals.

Despite higher energy demands during folk dances in relation to other types of dances (table 1); folk dancers generally do not differ from other dancers in morphological and physiological characteristics. Wigaeus and Kilbom (1980) measured relatively low oxygen uptake of 42.8 ml/kg/min for female and 53.2 ml/kg/min for male folk dancers. Oreb et al. (2006) found the average relative oxygen uptake of 37.62 ml/kg/min for Croatian folk ensemble “Lado” female dancers. The difference in relation to relative oxygen uptake of ballerinas (50.22 ml/kg/min) was explained as a consequence of their lower body mass, since the considerable differences in absolute oxygen uptake were not found (2.65 compared to 2.35 l/min).

Since there is a lack of data in our scientific literature, the aim of this research is the assessment of physical fitness of dancers of the first elite folk ensemble Cultural artistic society „Branko Krsmanovic“, Belgrade, by comparing their morphological and functional characteristics with related characteristics of other dancers and athletes.

Table 1. Energy “cost” of different types of dances (Koutedakis and Jamurtas, 2004)

<table>
<thead>
<tr>
<th>Energy “cost” (kcal/kg(min)</th>
<th>Number of references</th>
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<tbody>
<tr>
<td>Aerobics</td>
<td>0.143</td>
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<tr>
<td>Ballet</td>
<td>0.085</td>
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<tr>
<td>Disco dance</td>
<td>0.143</td>
</tr>
<tr>
<td>Folk dances</td>
<td>0.181</td>
</tr>
<tr>
<td>Modern dance</td>
<td>0.120</td>
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<tr>
<td>“Square” dance</td>
<td>0.083</td>
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</table>

**METHOD**

The sample of subjects

The sample of subjects comprised of thirteen male and eighteen female dancers, members of the first folk ensemble of Cultural artistic society „Branko Krsmanovic“, Belgrade. The average age was 22.8. At the time of measuring, the subjects were at the end of preparation for European tour, and rehearsals took place twice a week, with duration of three hours.

The sample of variables and the way of measurement

Morphological variables for the research taken by direct measurement are:
- Body height,
- Body mass,
- Thickness of skinfold over the brachial biceps,
- Thickness of skinfold over the brachial triceps,
- Thickness of skinfold under the lower angle of left scapula and
- Thickness of skinfold at suprailiac crest.

Height was measured with anthropometer by Martin, with precision of 1mm. During measuring, the subjects stood upright, with arms sagging by the body, heels joined, feet apart. Body mass was measured with standard digital scale, with accuracy of 0.1kg.

Thickness of skinfold was measured by hydraulic caliper with accuracy of 0.2 mm. Thickness of skinfold over the brachial biceps and triceps was measured on the level of medium distance between acromion and olecranon. A subject in standard standing position, bends his/her left hand in elbow-joint at 90º angle. The evaluator from the back marks the middle of the distance acromion and olecranon. The subject, then, relaxes the arm and the evaluator from the front takes vertically an intake of skinfold over the brachial biceps, places a caliper under the fingers and pronounces the measured value of thickness of skinfold over the brachial biceps. The procedure of measurement of thickness of skinfold over the brachial triceps is the same except that the skinfold is taken from back side of upper arm. When measuring of skinfold under scapula, the subject is in standing position, and the skinfold at suprailliac crest, for the purpose of measurement of thickness of skinfold, is taken horizontally on the level of front axilary line. Again, the subject is standing.

Based on the sum of skinfolds, by EUROFIT method, the values of the percentage of fat tissue (%D) in body composition of subjects are determined in tables. The percentage of “pure body mass” (%LBM), i.e. body mass without subcutaneous fat tissue (fatless components), is calculated as subtraction of an overall body mass (100%) and percentage of fat component. Body mass index (BMI), known also as Quetelet’s index is calculated per form \( BM_{(kg)} / BH^2_{(m)} \).

For assessment of subjects’ functional abilities a test of multi degree progressive loading with reverse 20- meter running was used, i.e. the so called Shuttle run test. On the basis of the results of this test, a maximum oxygen uptake value \( (VO_2)_{max} \) was determined for each subject.

**Statistical data processing**

Data obtained by this research have been processed by descriptive and comparative analysis. From descriptive analysis field the following was determined:
- arithmetic mean and
- standard deviation,
as usual measures of central tendency and variability of samples. In order to have a better view on the variability of samples, a quotient of variability was determined.

Importance of differences of average values of variables according to gender has been determined by t-test for independent samples.

**RESULTS**

Average values of important measured and calculated variables, with values of standard deviation and variability quotient, are given in table 2. Men and women differ considerably in all variables, but the relative oxygen uptake is on the lower level of importance than the difference in morphological characteristics.

The average height in male sub sample has the value 9 cm higher than the average height in the world, i.e. it corresponds to the average male height of the Dinaric range inhabitants (Pineau et al., 2005), who are the highest in Europe, according to Wikipedia, the most famous on-line encyclopedia. Compared to the sample of male ballet dancers (Wyon et al., 2006), the male sub sample has the value 3-6cm higher than the average height. The average height in female sub sample has a higher value than the one in the world, too, and 1sm higher than the average female height of the Dinaric range inhabitants (Pineau et al., 2005). Compared to the sample of ballerinas
(Wyon et al., 2006), the female sub sample has the value 3-8cm higher than the average height.

The percentage of body fat in male sub sample is 3-13% greater than the percentage of body fat of male ballet dancers, according to the data in Koutedakis and Jamurtas (2004). When these values are compared with those of body fat component for male ballet dancers, the sub sample of male folk dancers has 20-36% greater value. Female folk dancers have 6-13% higher body fat component than ballerinas and up to 4% compared to those girls who perform other type of dances.

Table 2. Average values, standard deviations and correlations quotients of tested variables for sub samples of male and female, with t-test values.

<table>
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</thead>
<tbody>
<tr>
<td>BH</td>
<td>185,96</td>
<td>6,15</td>
<td>0,03</td>
<td>169,78</td>
<td>5,00</td>
<td>0,03</td>
<td>8,08</td>
<td>0,000</td>
</tr>
<tr>
<td>BM</td>
<td>82,69</td>
<td>7,96</td>
<td>0,10</td>
<td>55,61</td>
<td>4,91</td>
<td>0,09</td>
<td>11,71</td>
<td>0,000</td>
</tr>
<tr>
<td>%D</td>
<td>18,15</td>
<td>3,07</td>
<td>0,17</td>
<td>24,44</td>
<td>2,14</td>
<td>0,09</td>
<td>-6,74</td>
<td>0,000</td>
</tr>
<tr>
<td>%LBM</td>
<td>81,85</td>
<td>3,07</td>
<td>0,04</td>
<td>75,56</td>
<td>2,14</td>
<td>0,03</td>
<td>6,74</td>
<td>0,000</td>
</tr>
<tr>
<td>BMI</td>
<td>23,9</td>
<td>1,7</td>
<td>0,07</td>
<td>19,3</td>
<td>1,3</td>
<td>0,07</td>
<td>8,56</td>
<td>0,000</td>
</tr>
<tr>
<td>VO₂max</td>
<td>45,34</td>
<td>4,11</td>
<td>0,09</td>
<td>42,15</td>
<td>4,03</td>
<td>0,10</td>
<td>2,16</td>
<td>0,039</td>
</tr>
</tbody>
</table>

Compared to the table values according to Ugarkovic, (1996), the male dancers have 3-6% higher body fat component values than average men, while the female dancers have 6-9% higher body fat component values than average women. If compared to the collective sports athletes, the male dancers have 8-10% more body fat in their bodies, while the girls have 10-14% more body fat than the girls who compete in team sports. If expressed in relative values, men in examined sample have 20-50% more body fat than average men and 80-125% than athletes, while girls have 50-60% more body fat than average women and 70-140% than female handball players, basketball players and volleyball players.

The average value of body mass index for male sub sample is in the range of normal, but close to the upper value (18.5-24.99) according to the classification of World Health Organization (http://www.who.int/bmi). For female sub sample, the average value of body mass index is also in the range of normal, but close to the lower level of normal range (diagram 1).

Diagram 1. Body mass index (BMI) values in sub sample of female and male compared with table values according to World Health Organization.
Oxygen uptake values in sub sample of men are in lower part of average values that, according to Eremija (1997), are the characteristic of sedentary men of the same age. For the sub sample of girls, oxygen uptake values are on the level of average value for sedentary girls (women) of the same age, according to the same source. Compared to the oxygen uptake values of athletes, these values are considerably lower.

**DISCUSSION**

Body height is the only variable in which the subjects in this research show levels above the average, and that shows, with the emphasis on homogeneous of both sub samples on the criterion of this variable, leads to presumption that it was one of the criteria of selection. The reliability of this presumption is intensified by some important characteristics of „kolo“, as one of the most often forms of folk dances in this area. Since „kolo“ is, by its form, a group folk dance in which, most often, all the dancers perform the same choreography at the same time („Moravac“, „Cacak“, „Uzicko kolo“, „Devojacko kolo“), the aesthetic component of performance depends mostly on homogeneous appearance of ensemble, both of dancing quality and their appearance. The most notable characteristic of appearance of dancers is their height, and this is the reason that homogeneous appearance as a criterion considerably contributes to the aesthetic component of a folk dance ensemble performance.

Body fat tissue percentage in subjects of both genders is considerably higher than in athletes. Since that the low body fat tissue percentage is in correlation with physical fitness, this data is expected up to the certain point. Competitive successfulness in most sports depends considerably on physical fitness of athletes, while in dances the most important are aesthetic and technical components of performance. Besides, dances usually do not provide enough stimuli for physical fitness development (Koutedakis and Jamurtas, 2004), and important influence on the morphological consistency of dancers. The fact that subjects of both genders have higher body fat percentage than sedentary, untrained men and women, draws more attention. Since folk dances are characterized by higher energetic „value“ than other dances, this fact leads to a presumption that in the ensemble to which these dancers belong, little attention is paid to physical abilities of its members.

Although body mass component in body values of girls for this type of activity is higher than usual, the average value of body mass index (BMI) is 1.93 and is near the lower part of normal range. That shows the reduction of body mass by lowering daily energy food intake. This way of body mass reduction is frequent among female dancers, especially ballerinas. Since few of them consult nutrition specialist when creating their diet, there are often malfunctions such as anorexia, amenorrhea, even osteoporosis. Besides, unbalanced and irregular nourishment is connected with injuries of locomotor system.

According to oxygen intake values, both sub samples can be compared with sedentary, average men and girls of the same age. Therefore, it can be concluded that folk dancing, as a physical activity, did not considerably contribute to the development of functional abilities of subjects. The reason for this is most probably an insufficient number of trainings (only two per a week), but it is partially due to relatively low level of difficulty during folk dance performances. On the other hand, insufficient stimuli for development of functional and other abilities of dancers, as shown in their morphological characteristics, is the result of training organization in most dancing clubs and societies all over the world, and in Serbia as well. During lessons, trainings and rehearsals most attention is paid to aesthetic and technical side of performance. Little attention is paid to development of physical abilities or it is intentionally avoided, because of the standpoint that any physical activity, which is not in connection with dancing directly, can disrupt technical and aesthetic side of basic, dancing performance. The most dangerous fact of such an attitude is that low level of physical fitness is one of major causes of injuries.

**CONCLUSION**

High level of body fat component, together with low level of oxygen intake, show insufficient physical fitness of subjects. An average value of body mass index in the sub sample of girls...
demonstrates the reduction and sustain of body mass by lowering of calorie intake, i.e. unbalanced diets. Since the subjects are the members of the first ensemble of an elite cultural artistic society, it can be presumed that the members of other ensembles have similar morphological and physiological characteristics, as well as the level of physical fitness. However, in order to estimate the level and importance of physical fitness of folk and other dancers with higher reliability, it is necessary to make a research with a greater number of dancers, members of other folk and dance groups. It is also necessary to expand the group of tests in order to examine motor ability of dancers, as well as the relation of physical fitness and successfulness of dancers.

REFERENCES

/1/ BMI classification. http://www.who.int/bmi