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DIFFERENCES IN MORPHOLOGICAL CHARACTERISTICS BETWEEN JUNIOR BASKETBALL PLAYERS WHO HAVE DIFFERENT LEVELS OF EXPLOSIVE STRENGTH

Introduction

Basketball is a complex changeable polistructural activity, which is characterized by cyclic and acyclic types of movement (Jukic, 1998). Basketball is an aerobic-based anaerobic sport (Delextrat & Cohen, 2009; Meckell, et al., 2009; Metaxas, et al., 2009) which requires high intensity activities such as jumping (for rebounds, blocks and shots), turns, dribbles, sprints, screens and low intensity activities such as walking, stopping and jogging.

Morphology is a scientific discipline that studies structure and development of living organisms and their component parts at the level of visibility to the naked eye and microscope (Sekulic & Metikos, 2007).

Explosive strength in basketball represents capability of neuromuscular system that enables sportsman maximal acceleration of own body and some subject of relatively bigger mass like ball in the activities like throwing, jumping and sprint (Milanovic, 2005). It is known that morphological dimensions define explosive strength to some eytent (Sekulic & Metikos 2007), however, there is an evident lack of studies which examined the problem in the basketball.

The aim of this research is to define differences in morphological characteristics between junior basketball players who have different level of explosive power.

Methods

Subjects

The research is conducted on the sample of 84 junior basketball players from Bosnia and Herzegovina, age category from 16-18 years.

Variables

Sample variables in this study included three tests of explosive strength: vertical jump, standing long jump, throwing a medicine from chest with 3 kg in a standing position, and ten morphological characteristics: body height, leg length, body weight, upper arm girth in extension, calf girth, triceps skinfold, abdominal skinfold, front thigh skinfold, body mass index, relative percentage of fat (Salaj & Markovic, 2011; Delextrat & Cohen, 2009; Jelicic, et al., 2002).

Statistical analyses

Descriptive statistics were calculated for all variables (Means, Standard deviations). Next, on a basis of the explosive strength variables, the subjects were clustered using the hierarchical cluster analysis (Wards method, based on the Euclidean distances). Formed homogenous were then differentiated by means of analysis of variance (and additional post-hoc Schafee test), first - for their explosive strength, and then – for the studied morphological characteristics. Such approach allowed us to indirectly define the influence of morphological variables to the manifestation of explosive strength. Statistical significance of 95% ($p < 0.05$) was applied, while Statsoft's Statistica (ver. 11) was used for all analyses.

Results

On a basis of explosive strength performance, the hierarchical analysis defined four groups of subjects (clusters), (GROUP 1 = 23, GROUP 2 = 20, GROUP 3 = 18 and GROUP 4 = 23 subjects), (Figure 1).

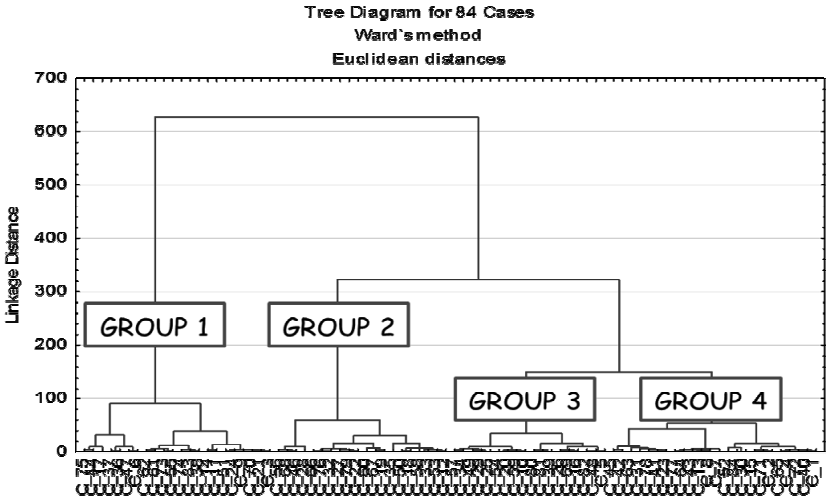

Figure 1. *Dendogram of hierarchical grouping of 84 respondents based on the three tests of explosive strength (vertical jump, standing long jump, throwing a medicine ball from chest) of junior basketball players*

ANOVA revealed significant differences between clusters in vertical jump and standing long jump. The post-hoc analysis indicated significant differences in the variables standing long jump between all groups. In the variable vertical jump, groups 1 and 3 differ from groups 2 and 4 (Table 1).

Table 1. *Descriptive statistics and analysis of the differences between clusters for explosive strength variables (ANOVA – univariate analysis of variance, M - arithmetic mean, SD - standard deviation, F - F value)*

Variables	ALL GROUPS	GROUP 1	GROUP 2	GROUP 3	GROUP 4	ANOVA
	M±SD	M±SD	M±SD	M±SD	M±SD	F
VJ (cm)	52.95±5.82	48.78±4.47 $_{2,4}$	57.45±3.85 $_{1,3}$	49.44±3.09 $_{2,4}$	55.96±5.63 $_{1,3}$	20.82*
SLJ (cm)	243.07±17.78	221.91±12.01 $_{2,3,4}$	265.15±6.82 $_{1,3,4}$	239.22±3.98 $_{1,2,4}$	248.04±6.89 $_{1,2,3}$	103.68*
MBT (m)	7.77±0.99	7.44±0.87	8.10±0.91	7.50±0.85	8.02±1.17	2.62

Legend: 1,2,3,4 - number of exhibits that indicates a significant difference between groups calculated post-hoc analysis by Scheffe-in; *- level of significance 0.05.

Analysis of variance showed statistically significant differences between clusters in variables: forearm skinfold-triceps, abdomen skinfold and thigh skinfold. Post-hoc analysis showed differences between groups more accurately. In general members of the cluster 2 have lowest values of the subcoutaneous fat, while the highest levels are evidenced for cluster 1 (Table 2).

Table 2. *Descriptive statistics and analysis of the differences between clusters for anthropometric variables (ANOVA – univariate analysis of variance, M - arithmetic mean, SD - standard deviation, F - F value)*

Variables	ALL GROUPS	GROUP 1	GROUP 2	GROUP 3	GROUP 4	ANOVA
	M±SD	M±SD	M±SD	M±SD	M±SD	F
Body height	186.48±8.06	185.73±8.45	186.81±6.37	187.00±8.71	186.54±8.91	0.10
Leg length	113.80±6.44	113.27±6.33	114.09±6.16	114.96±7.02	113.18±6.62	0.32
Body weight	76.54±10.66	76.49±11.73	74.68±8.48	75.76±11.80	78.83±10.60	0.58
Upper arm girth	27.63±2.44	27.47±2.72	27.15±2.15	27.68±2.73	28.16±2.20	0.65
Calf girth	37.98±2.65	37.84±2.70	37.72±2.17	37.49±3.07	38.73±2.63	0.90
Triceps skinfold	10.24±3.31	12.34±4.30 $_{2,4}$	8.63±1.66 $_{1}$	10.53±3.03	9.31±2.33 $_{1}$	6.35*
Abdominal skinfold	10.58±3.99	12.67±4.47 $_{2}$	7.59±1.70 $_{1,3}$	11.73±4.44 $_{2}$	10.20±2.89	8.08*
Front thigh skinfold	14.07±4.78	15.23±5.07	11.47±2.61	15.52±5.91	14.03±4.28	3.22*
BMI ($kg \cdot m^{-2}$)	21.95±2.48	22.15±3.13	21.32±1.67	21.59±2.63	22.59±2.20	1.12
FAT (%)	8.44±3.75	8.88±4.42	8.03±4.13	8.61±3.16	8.22±3.25	0.22

Legend: BMI - body mass index, FAT- relative percentage of fat.

Discussion

This research has several main findings. First, methodological approach of defining homogeneous clusters in a set of explosive strength variables and subsequent differentiation of these clusters with regard to morphological characteristics allowed the definition of indirect influence of morphological variables on the explosive capacities. Secondly, concerning that it is the case of negative influence of adipose tissue on explosive strength of relative type, such defined influence of morphological variables on explosive strength can be considered expected.

Gholamali, et al. (2012), studied 34 athletes cadets and didn't find statistically significant influence of relative fat percentage and index of body mass on the performance of the long jump. The negative influence of the sum of skinfolds to the explosive performances has been confirmed in research of Milanese, et al. (2010) who studied 152 boys and girls, age groups 6-12 years, while skinfold measures were the strongest predictor of motor manifestiations. The possible explanations are discussed in the following text.

During the performance of vertical jump and long jump, respondents have manifested relative component of explosive strength. In this case, the ballast was actually their body weight and especially subcutaneous adipose tissue. The respondents of the first group who had the largest skinfolds of the upper extremity achieved the poorest performance in explosive strength, as they had to overcome their own excess weight. Respondents of the second group with the lowest skinfold upper reaches of the limbs and body weight achieved the best results in the performance of relative explosive strength. Possible explanations can be sought in the number of trainings, intensity and training quality. Although at this point we cannot determine with certainty about which of these factors was the case, this can be confirmed by the results of research conducted by Piucoo, et al. (2009). In this study conducted on 12 amateur volleyball players, the authors concluded that the reason for the high percentage of fat is relatively low frequency, intensity and greater representation of anaerobic regime of work in training. As the basketball trainings in this age category are mainly of anaerobic type, it takes a long time, and the appropriate intensity and frequency of training in order to reach the reduction of subcutaneous fat. A more intensive use of aerobic regime for 6 weeks can create the conditions for the reduction of subcutaneous fat and indirect effects on the improvement of explosive strength (Males, et al., 2007). This issue should be further explored in the coming longitudinal researches which would include other significant motor performances important for the success in this activity (agility, speed, accuracy, balance etc.).

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Introduction: The aim of this study was to determine differences in morphological characteristics between junior basketball players who have different levels of explosive strength. Methods: The study was conducted on a sample of 84 junior basketball players from (B&H) Bosnia and Herzegovina (16-18 years) in spring 2013th. The sample of morphological variables consited of: body height, leg length, body weight,

upper arm girth in extension, calf girth, triceps skinfold, abdominal skinfold, front thigh skinfold, BMI, the relative body fat percentage. The variables of explosive strength were: vertical jump (VJ), broad jump (BJ) and throwing a medicine ball from chest with 3 kg from a standing position. Ward's method of cluster analysis, based on variables of explosive strength we formed four homogeneous groups. Subsequently, using the ANOVA and post-hoc analysis, these groups are differentiated with regard to morphological characteristics. Results: Clusters differed significantly in BJ and VJ. ANOVA found significant differences between clusters in variables of skinfolds, such as the: triceps, abdomen and thigh. Discussion: Defined the influence of morphological variables on explosive strength can be regarded as expected, given that it is primarily about a negative influence of the amount of body fat on relative explosive strength type. This research has shown that junior basketball players in B&H are shorter and ligther when compared to top-level European juniors (Jelicic et al., 2002). Subjects with the lowest skinfolds of the upper limbs and body weight, achieved the best results in the manifestation of relative explosive strength, which has so far rarely been found in samples of trained subjects (Milanese et al., 2010). Possible explanations can be required in a number of training, the intensity and quality of training. Although at this point with certainty, we can't determine on which of these factors involved. This can be confirmed by the results of research of Piucco et al., 2009 who studied female amateur volleyball athltes. References: Jelicic M, Sekulic D, Marinovic M (2002). Coll. Antropol, 26, 69-76. Milanese C, Bortolami O, Bertucco M, Verlato G, Zancanaro C (2010). Journal of Human Sport and Exercise, 5(2), 265-79. Piucco T, Santos SG (2009). Fitness Performance Journal, 8(1), 9-15.

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НАУЧНИ СКУПОВИ ЦРНОГОРСКЕ СПОРТСКЕ АКАДЕМИЈЕ ПОЧЕЛИ РАД НА РЕКТОРАТУ УНИВЕРЗИТЕТА ЦРНЕ ГОРЕ

Научна елита на окупу


Скуп отворила министар Сања Влаховић

Традиционални скупови Црногорске спортске академије – 11. међународна научна конференција о трансформационим процесима у спорту „Спортска достигнућа“ и десети Конгрес почели су са радом јуче на Ректорату Универзитета Црне Горе. Званично отварање уприличено је у свечаној сали Ректората у присуству бројних гостију и научника са свих страна свијета, а након поздравног говора ректора, проф. др **Предрага Мирановића,** присутнима се, занимљивом елаборацијом свог вишења науке и спорта обратила и скуп званично прогласила отвореним министарка науке **Сања Влаховић.** Иначе, овогодишњој конференцији присуствује 63 научника који ће излагати своје радове, док је укупно на радовима 138 аутора и коаутора. Поред двије оралне паралелне сесије, на програму су први пут и двије паралелне постер сесије гдје аутори путем постер презентација излажу своја научна достигнућа.

Т.Б.