Relations of Anthropometric and Conative (Normal and Pathological) Dimensions of Volleyball Junior Players

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Abstract

The main objective of this transversal study was to examine the relation of morphological and conative characteristics (normal and pathologic) factors in volleyball junior players. The data were collected on the sample of examinees (N = 126), aged 16 to 17 years from five volleyball clubs. The applied measuring instruments consisted of 23 anthropometric measures, 16 normal and 12 pathological conative variables. Descriptive statistics, Pearson's correlation coefficient and canonical correlation analysis were applied for data processing. The results showed that among the set of anthropometric characteristics and set of normal conative dimensions, with 51

Index terms— anthropometric characteristics, conative variables, volleyball players.

1 I. Introduction

n the last decade of the XXI century, relations between morphological characteristics and conative (normal and pathologic) factors of athletes arouse more and more attention in anthropological studies, as it is reflected in surveys conducted by: (Bla?evik, 2006; Djurkovi?, 2009; Djurkovic, 2009; Sing & Rathore, 2013; ontogenetic development in volleyball population, and specialization, i.e. defining characteristic team positions with specific tasks, which is proven by the research conducted by **??**alacko & Stankovic (2009).

Significant number of authors investigated anthropometric characteristics of volleyball players Dopsaj et methods of multivariate analysis, the researchers isolated latent dimensions in the field of anthropometry and determined their interdependence with other anthropological skills and characteristics of volleyball players.It has been determined that in this sports game, tall athletes, the ones with a greater arm and leg length have a certain advantage when compared to short athletes, or those with short extremities. Furthermore, athletes with greater amounts of fatty tissue are inferior in comparison to the ones with the same weight but unburdened by the unwanted fatty tissue.

Taking into account the influence of genetic and exogenous factors on anthropometric measures of volleyball players, a significant number of authors emphasizes their importance: Bandyopadhyay, 2007 (motivational) component of attitudes refers to an individual's activities directed towards a specific object. Its effect can be positive or negative and harmonized with the knowledge and emotions related to that object. If the knowledge and emotions are favorable, people will try to bring positive actions in relation to the object, for example conative component can be directed from a tendency to help, support and protect the object to the tendency to destroy the object, as it is shown by research done by Bla?evik, (2009), Kalach & Gontarev (2013) **??**2011). In these studies it is emphasized that the action and achievement of effective results during the match demand specific needs integrity of afore mentioned anthropological qualities. In his study, **??**ajevi? (2003) suggests that normal conative factors cause different forms of human behavior, and integrate ego and improve effective communication with the environment. Popovic & Simonovic (2008) find that normal conative characteristics are mutually related in the processes of excitation and prevention of potential of adjustment. On the other hand, inherited pathological conative characteristics cause disorders in unifying the personality, or disturb the balance between reducing and increasing of adaptive powers, according to a survey conducted by Horga, **??**omirovi? & Jankovic (1983).

4 A) DESCRIPTIVE DATA AND CORRELATIONS BETWEEN EXAMINED VARIABLES

The results of previous studies that have observed the relationship of cognitive and anthropometric variables in adolescence are not consistent, many aspects still do not have final explanation, and this transversal study investigates their linear relations. Further empirical research on the interaction of these anthropological characteristics in junior volleyball players population are needed to fully shed light on the mechanism of their correlates.

The aim of this research was to evaluate whether there were any statistically significant relations between the system of morphological characteristics, normal conative characteristics and pathological conative characteristics in the population of junior volleyball players. In order to achieve this goal, the authors of this paper assumed that the systems of anthropometric characteristics and normal and pathological conative dimensions are statistically significantly correlated.

2 II. Research Method and Procedures a) Examinees

The research involved 126 junior volleyball players, aged 16 to 17 years from five volleyball teams: super league "Spartak" (Ljig); I League "?elezni?ar" (Lajkovac); II League "Loznica" (Loznica), "Bravo" (Valjevo) and "Ub" (UB). The average age of a suitable sample of examinees was 16.68 years (SD = 7. Anthropometric measurements were performed according to the instructions and regulations of the International Biological Program, which was formed by (Norton & Olds, 2004). Applied standard measuring instruments (anthropometer according to Martin's scale for measuring height, medical decimal scale with sliding weights to measure body weight, Holtain flexible measuring tape for body volume, Holtain Bicondylar Vernier caliper to measure the diameters of the bones and caliper by John Bull for measuring skin folds), are calibrated before measuring. All morphological characteristics were measured again, with the exception of skin folds, which were presented as the mean value after the three consecutive measurements. The study was conducted in groups during regular trainings in May 2014.

Prior to the implementation of anthropometric measurements, the examinees were explained the aim of the research, they were asked to participate and explained that they could give up whenever they want. On average, anthropometric measurements lasted for 45 min. Examinees were first informed about the research and protection of the anonymity of the data, after which they signed an agreement on participation in the study.

c) The sample of conative (normal and pathological variables)

In order to evaluate the normal conative characteristics, the 16PF battery was used (Cattell, Eber, & Tatsuoka, 1970) with first-order factors: Outgoingreserved (A), High intelligence -low intelligence (B), Higher ego strength -lower ego strength (C), Dominance -submissiveness (E), Surgencydesurgency (F), Stronger superego -weaker superego (G), Bold (parmia) -shy (threctia) (H), Tender-minded (premsia) -tough-minded (I), Protension (L), Autia (imaginative) -practical (M), Shrewdness -artlessness (N), Apprehensive (O), Radicalism -conservatism (Q1), Self-sufficiency -group dependence (Q2), High selfconcept -low self-concept (Q3), Tense -relaxed (Q4).

Pathological conative characteristics were operationalized through the score for selected scales on a test of pathological conative characteristics (Momirovi?, 1971), C.I.-N4 -the efficiency of the regulatory system and control of organic functions (HI):Cardiovascular conversion (K10), Gastrointestinal conversion (G11), Inhibitory conversion (I7),

Hypochondria (H13), the effectiveness of the regulatory system and the control of defensive reactions (ALPHA), Anxiety (A1), Obsession (O3), Hypersensitivity (S5), Phobias (F2), the efficiency of the regulatory system and the control of attack reactions (SIGMA), Impulsiveness (N14), Aggression (T15) and the effectiveness of the system for the coordination of regulatory functions (DELTA), Paranoia (P18), Depression (D6).

3 III. Results

4 a) Descriptive data and correlations between examined variables

Results of morphological variables examined through descriptive statistical parameters are shown in Table 1a, 1b. Obtained values skewnes and kurtosis indicate that there is no significant dispersion of the distribution from normal Gaussian distribution **??**Tenjovi?, 2002). This indicates that the measuring instruments were well suited for the measurement of anthropometric variables in volleyball junior players population, so that further statistical analysis can be performed. Based on the analysis of the cross-correlation matrix (Table 6) we can note statistically significant correlations between normal and pathological conative characteristics for the following variables: affectia -sizia and depression (? = ?. 19), dominancesubmissiveness and cardiovascular conversion (r = .28), dominance -submissiveness and gastrointestinal conversion (r = .30), dominance -submissiveness and aggression (r = ?.33), surgency -desurgency and depression (r = .40),); stronger superego -weaker superego and depression (r = .29),); stronger superego -weaker superego and hypersensitivity(r = .30), boldness-shy and obsession (r = .28), protension and cardiovascular conversion (r = .31), shrewdnessartlessness and inhibitory conversion (r = .32), apprehensive and aggression (r = ?.33), traditionalismlimeralism and hypochondria (r = ?.31), self-sufficiency -group-adherence and obsession (r = ?.39) high selfcontrol-self-conflict and gastrointestinal conversion (r = ?.36) and tense -relaxed and gastrointestinal conversion (r = ?.42). Therefore, obtained results (with the probabilty level of p <. 05) show low correlations between normal and pathological characteristics in conative space. By solving the characteristic equations of the cross-correlation matrix (Table 6), as the roots

of this equation, two canonical factors were isolated. ,While studying the relations between the systems of normal conative variables and systems of pathological conative variables relatively high canonical correlations were determined for both isolated canonical factors (Rc = .74 and Rc = .68), and are statistically significant at the $p < .05$ level. The squares of the canonical correlation (Rc

2), which explain the common variance of the variables of the two groups of the overall variability of the analyzed systems of variables have a value of Rc 2 = .51, ? Rc 2 = .45. Having considered significant intensity of cannocal correlation vand percent of mutual variance, it can be concluded, with the probabilty levele higher than 5%, that pathoplogical conative characteristics of examiness were manifested more that normal conative characteristics. Coefficients within the set of antropmetric variables that show correlation betyween manifested variable with a canonical function, range from 0,30 to ?0,61. Foot length (?.61) and arm length (?.40),show dominant negative correlations of low and moderate intensity with the first canocical factor, whereas hand width (.37), wrist diameter (.33) and knee diameter (.32), hvae positive correaltion, whereas lowerleg volume(.30) is placed at the sixth position. Other anthropometric variablesare not statistically significant for this canonical dimension. Having considered significant resluts, as well as the classification of morphological types in the research done by **??**isigoj-Durakovic (2008), this latent dimnesion can be hypothetically defined as a bipolar ectomesmorphic morphological factor (longitudinal Volume XV Issue I Version I dimensionality of the skeleton and trabnsversal dimensionalty of the skeleton).

The second canonical function is presented in the same matrix of canocical structure. It involves seven normal contaive variables. They range from 0,30 to 0,46 and show negative mutual linearcorrelation between original variable and isolated canoonical function. "Most responsible" variables with negative and low correlation with this cannocial function are: protensia (?.48) and boldness (parmia)-shy (?.46), higher intelligence-lower intelligence (?.39), affectia-sizia (?.38), tense-relaxed (?.37), whereas the results tender-minded (premsia)tough-minded (?.35) and self-sufficiency-group dependence (?.30). are at the last position. The set of the second pair of normal conative factro cannot be precisely explained beacuse of the combinations of complex and laten 'psychological nature'. However, obtained results show that it can be theoretically interpreted as a factor of extroverty-introverty and anxiety.

Obtained results presented in Table **??** show statistically significant and low linear correlation between analyzed normal and pathological variables of the first and second canonical function.

Coefficients that show mutual linear relations between normal conative variables and the first canonical function range from 0,32 ?? ?0,46On the basis of the obtained results contained within the matrix of the canonical structure of normal and pathological conative variables, we can note statistically significant correlations between the applied variables of the first and second canonical factor. The first canonical factor in the space of normal conative variables was defined with the variables of high intelligence -low intelligence (?.46), higher ego -lower ego (?.43), bold (parmia)shy (.41), tender-minded (premsia) -tough-minded (.37), whereas, protension is at the final position (.30). so that it could be defined as the canonical factor which characterizes volleyball players in relation to intelligence, ego, boldness, tough-mindedness and protension.

The second canonical function is defined by four normal conative variables with positive correlation coefficients ranging from 0,32 ?? 0,46. Most dominant variables are: tense-relaxed (.61), self-sufficiencygroup adherence (.47) high self-control -self-conflict (?.46), whereas the result shrewdness -artlessness (.32) has the minimum influence on this function. Therefore, latent structure of junior volleyball players can be theoretically explained as a factor of introspection and shrewdness -artlessness.

Year 2015 depression has the lowest contribution (.48). Therefore, latent structure of junior volleball players can be theroetically labeled as a factor of the regulation of reactions such as defense and attack.

The results of this transversal study are similar to those obtained by the research done by Stankoci et al. (2013).

5 IV. Discussions

Investigation and identification of potential mechanisms for the realization of morphological, normal and pathological conative dimensions in volleyball population is of great theoretical and practical importance. Success in performing sports activities depends on the personality dimensions governed by the modalities of its behavior. Researches done by the authors: Bla?evic, (**??**009 For an explanation of canonically statistically significant relations between morphological and conative factors standard rule that a linear increase in the value of the resulting vector of variables of the first canonical factor from the first analyzed area corresponds to a proportional linear increase of the value of the resultant vector of the variables of canonical factors from another analyzed area and vice versa (Fajgelj, 2003) should be taken into account.

Based on the results contained in the matrix of the canonical structure of anthropometric and normal conative variables we can note a statistically significant correlation between the anthropometric variables and the first canonical factor. The relations between the first canonical factor from the system of anthropometric variables, interpreted as the bipolar canonical factor of the ectomesomorphic morphological type and the first canonical factor from the system of normal conative factors, interpreted as the canonical factor of extraversion -introversion and anxiety indicates that volleyball players of the ectomezomorphic type are characterized at one end by longitudinal measures and on the other by transversal dimensionality of the volume of the femoral region with an increase in the value of the conative variables of extraversion and decreased anxiety.

On the basis of the results obtained and contained within the matrix of the canonical structure of normal and pathological conative variables, we can note statistically significant correlations between the measured variables in the case of the first and second canonical factor. The first canonical factor in the space of normal conative variables can be defined as the canonical factor which characterizes volleyball players in relation to intelligence, ego, boldness, tough mindedness and protension. The second one can be interpreted as a factor of introspection and tendermindedness -tough-mindedness.

The first canonical factor in the space of pathological conative variables can be defined as a canonical factor of effectiveness of the system for the regulation and control of organ function and regulatory function, while the second canonical factor can be interpreted as a canonical factor of the regulator of the reactions of defense and attack. The structure of the correlations indicate that among the volleyball players with more pronounced warm types of behavior, who are more polite, considerate of others, there was an increase in the scores for depression, as with those who indicated more pronounced liveliness and impulsiveness and expressiveness. Volleyball players who usually manifest dominant, competitive, assertive or even aggressive behavior face a greater danger of developing one of the conversions (cardiovascular, gastrointestinal or inhibitory) and are more prone to anxiety. Those who are more moral individuals and who have more respect for the rules are more prone to hypersensitivity, and those who are shyless and adventurous score higher for obsession. Those who are suspicious and skeptical indicate a higher inclination towards cardiovascular conversion. The more agile, inquisitive, and discrete participants indicated a greater tendency for inhibitory conversion, anxiety, phobia and impulsive reactions. Those who were more worried, more insecure, often blaming themselves for everything were less prone to aggression. Those who were more open to change, more liberal, more analytical and critical volleyball players scored lower values for hypochondria, obsession and paranoia. The participants who were more self-satisfied and more self-confident were more prone to obsession, and those with a tendency for perfection, compulsion and self-discipline, who showed a tendency towards more dominant behavior with a lot of self-pity were at a higher risk of gastrointestinal and inhibitory conversion and were more impulsive. Tense, energetic, impatient volleyball players more frequently Volume XV Issue I Version I 32 (A) develop gastrointestinal conversion, hypochondria and phobias.

Although the canonical results of this study section are expected and correspond with previous research studies, it is important to note several methodological shortcomings of this study. The biggest limitation is the relatively small size of the sample of examinees limited by age (16 and 17 year old), composed exclusively of male volleyball players. This structure of the sample greatly reduces the generalization of the results so that the obtained results are to be taken with some reserve. Realistic data could be obtained by experimental research in laboratory and real life conditions.

Finally, we should add that future longitudinal research should include other morphological and conative variables, an equal number of males and females in the population of volleyball players, without age limitation, which would apply the same or similar methodology, in order to get a greater probability of more reliable statistical conclusions about the complex relations of the examined phenomena.

6 V. Conclusions and Recommendations

The results of an empirical research emphasize some important aspects of linear correlations between morphological, normal and pathological conative characteristics. Several conclusions are made according to these findings and their interpretation.

According to the results of applied canonical correlation analysis, this transversal study isolated The results obtained in this study speak of the fact that volleyball players of the ectomesomorphic type are characterized at the one end, by longitudinal measures and at the other the dimensionality and volume of the femoral region if they are extrovert and non-anxious. In the case of volleyball players of this rank of competition, who show pronounced signs of warm behavior, who are more polite, considerate of others, there is an increase in the scores for depression, as in the case of those who indicate pronounced liveliness and impulsiveness and expressiveness. Volleyball players who frequently manifest dominant, competitive, assertive or even aggressive behavior are more prone to anxiety. Those who have higher morals and more respect for the rules are more prone to hypersensitivity, and those who are shyless and adventurous score higher values on the score for obsession. Tense, energetic, impatient volleyball players more frequently develop gastrointestinal conversion, hypochondria and phobia.

Thus, the initial hypothesis of this transversal study on significantly linked set of anthropometric characteristics and a set of normal and pathological conative dimensions, is absolutely proven. The findings are partially consistent with previous studies of relations between morphological and conative (normal and pathologic) factors in our country and abroad.

Based on the results of relations, it is concluded that despite certain methodological limitations (section study design, relatively small and suitable sample, age limitation, mostly male examinees), our research can contribute to the development of predictive model of morphological, normal and pathological conative dimensions in volleyball junior population. Finally, additional longitudinal studies may provide more accurate results, which might significant at the theoretical level -in terms of further development of theoretical and methodological approach to these issues, and in the empirical sense, since statistically significant linear correlations between examined constructs could be noticed if greater population of both genders would be included. [1]

Figure 1:

Figure 2:

Figure 3:

1

Variables											
Body height (cm) Leg length (cm)	M	1820.08	61.785	1631	SD	Min	1033.06	47.929	942	Max 1963 1182	Sk -.257 .263 Ku .295 .301
Habd length (cm)		196.34		11.231		171				239	.572 1.287
Foot length (cm) Arm length (cm) Biacromial range (cm) Foot width (cm) Knee diameter (cm) Elbow diameter (cm)		280,35 409.86 92.56	783.06 92.19 75.06	13,005 50.040 29.871 7.916 5.878 6.606		261 689 311 68 75 61				319 879 539 111 106 89	.799 -.207 -.219 .55
Wrist diameter (cm)		59.04		2.927		52				69	.193 .149
Body mass (kg)		78.543	111.065	549						1079	.393 -.312
Bicristal range (cm)		300.03		26.008		244				389	.728 2.212
Nad width (cm)		86.00		5.437		74				99	.088 -.353

[Note: © 2015 Global Journals Inc. (US) -Legend: AS -aritjmetic mean; SD -standrd deviation; Min -minimum; Max -maximum?; Sk -skeweniss, Ku -]

Figure 4: Table 1 :

3

normal conative variables (raw results)		
Variables	M	SD
Affectia?sizia (?)	13.05	9.114
High intelligence?low intelligence (?)	6.96	1.985
Stronger ego?weaker ego (C)	15.92	3.786
Dominance?submissiveness(?)	14.784	3.992
Surgency-desurgency (F)	14.888	3.651
Stronger superego -weaker superego (G)	10.03	2.063
Boldness?parmia (H)	16.06	4.115
Tender-minded?premsia (I)		
Protension (L)	9.876	3.006
?utia?imaginative	9.993	2.787
Shrewdness?artlessness (?)		
Shrewdness-artlessness (N)	11.04	2.443
Apprehensive (O)	9.982	2.899
Traditionalism?liberalism(Q 1)	8.98	3.007
Self-sufficiency?group adherence (Q 2)	9.99	2.826
High self-control?self conflict (Q 3)	13.01	2.900
Tense-relaxed (Q 4)	10.12	4.05

Figure 5: Table 3 :

5

b) Canonical correlation anlyzsis of examined variables

Based on the results Bartlett Chi-square test (? 2 = 439.05 a statistically significant function, with a canonical correlation of high intensity (R c = .77, p <.05), 59% and the proportion of the mutual variance that explains maximum possible level of linear combinations of single isolated pair of canonical factors is presented in Table 4. The calculated values, with the error probability of 5% suggest that analyzed multivariate system of conative (normal) variables depends on the system of original anthropometric characteristics.

A A BB CC EE	KK 10	GG 11	I7 - .20	HH 13	AA 1 OQ 3 SS 5 -.01 -.07 -.08 -.10 .15 -.06 .0		
FF GG	.10	-	.09	.03			
HH II	.05	.12	.02	.05			
LL MM	.09	.02	.32	.08			
NN OO	.28	.05	.16	.09			
QQ 1	-.09	.30	.07	-.05			
	.05	.07	.16	.03			
	.09	-09	-	.03			
	.11	.13	.10	-.16			
	.31	-	.15	.14			
	.06	.05	-	-.07			
	.10	.08	.06	.14			
	-.03	.03	.32	-.03			
	-.08	.16	-	-.31			
		.10	.06				
		-	-				
		.12	.05				
QQ 2	-.08	-	-	-.00	.12	-	.07
		.05	.07			.39	
QQ1	-.03	.36	.16	.14	.03	-	.15
						.02	
3							
QQ 4	.05	.10	.42	.13	.09	-	.15
						.03	

[Note: Note: statistically significant correlations with p-value <. 05 are presented in bold Volume XV Issue I Version I © 2015 Global Journals Inc. (US) -]

Figure 6: Table 5 :

4

Canonical function	canonical factors R c	Rc 2	? 2	p
1	.77	.59	439.05	.05

Legend: canonical correlation coefficient (Rc), canonical coefficient of determination (R), the value of Bartlett's ?2-test, level of significance, i.e. the proportion of error in reasoning (p)

Figure 7: Table 4 :

6

Canonical function	canonical factors R c	Rc 2	? 2	p
1	.74	.51	256.12	.05
2	.68	.45	201.26	.05

Legend: canonical correlation coefficient (Rc), canonical coefficient of determination (Rc 2), the value of Bartlett's ?2-test, level of significance, i.e. the proportion of error in reasoning (p)

The results presented in (Table 7) show mutual relations between individual morphological and normal conative variables ans the fisrt isolated canonical function.

Figure 8: Table 6 :

7

Morphological variables	Canocvical function 1	Normal conative factors	Canocical function 2
Body height	-.10	?ffectia??izia	-.38
Leg length	-.15	High imtelligence?low intelligence	-.39
Hand length	.11	Higher ego?weaker ego	.09
Foot length	-.61	Dominance?submissiveness	-.18
Arm length	-.40	Surgency?desurgency	.05
Biacromial range	-.12	Higher super ego?weaker super ego	-.04
Bicristal range	.10	Bold (parmia)?shy	-.46
Hand width	.37	Tender -minded (premsia)?tough-minded	-.35
Wrist diameter	.33	Protension	-.48
Elbow diameter	.09	?utia (imaginative) ?practical	.03
Knee diameter	.32	Shrewdness (phitmia) ?artlessness	-.21
Foot width	.03	Apprehensive	-.01
Body mass	-.01	?raditionalism ?liberalism	.11
Upper arm volume	.07	Self-sufficiency?group dependance	-.30
Lower arm volume	.13	High self-control?self conflict	-.04
Upper leg volume	.11	Tense?relaxed	-.37
Lower leg volume	.30		
Average thorax volume	.02		
Morphological variables	Canocvica func-tion 1	Normal conative factors	Canocical function 2
Upper arm skinfold	-.06		
B ack skinfold	-.00		
Armpit skinfold	.08		
Anbdominal skinfold	-09		
Lower leg skinfold	-.04		

Figure 9: Table 7 :

[Sportske nauke i zdravlje] , *Sportske nauke i zdravlje* 3 (1) p. .

[Revista Brasileira de Cineantropometria Desempenho Humano] , *Revista Brasileira de Cineantropometria & Desempenho Humano* 13 (3) p. .

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