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DEFINITION OF LATENT ANTROPOMETRIC FACTORS OF THE HANDBALL PLAYERS FROM THE SUPER LEAGUE OF KOSOVO

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Abstract

The aim of this study is to describe the morphological structure of the handball players and to define the anthropometric factors from morphological structure of players who compete in "Super League" (Superliga) in the Kosovo Handball Championship.

Subject of this study were 128 male, active handball players from senior teams who compete in regular competition of the " Super League" in Handball Federation. Players were from eight different teams, sixteen players from each club: H.C. "Trepça", H.C. "Kastrioti", H.C. "Besa Famglia", H.C. "Prishtina",H.C. " Kosova, H.C. " Liridoni", H.C. "Drenica" and H.C. "Vjosa".

Anthropometric measurements were conducted in nine anthropometric variables for which the author of this study believes is sufficient for the purpose of this scientific paper. The specific variables were: Body Weight, Body Height, Length of Arms, Length of Hand, Breadth of Hand, Biacromial Breadth, Chest Girth, Waist Girth, and Arm Girth. Measurements are realized by protocol (ISAK) International Scientific Advanced Kinanthropometric . The data was analyzed by statistical package ,they are processed in the SPPS program , version 23.0 for windows.

The first purpose of the research was the evaluation of the morphological structure of the all senior teams at the same time, but as well to define the anthropometric factors which affect the players who compete in the same rank of "Super League" (Superliga) in the Kosovo Handball Championship. Through this study we will try to examine the morphological structure of Kosovo handball players from many different teams throughout the cities of Kosovo

Keywords: Handball, boys, Senior league, anthropometric space, factors

Introduction

Handball is a collective game that is based on high physical fitness. Regarding the structure of the movement, it is part of the polystructural sports group and should be played for 60 minutes of the game both in the offensive and defensive phase. In fact, what is making this sport the most attractive one in the Olympic sports family is the movements of the handball players in the defense and the attack, as well as the execution of technical elements such as quick ball passes, strong strikes, ball moves and the tactical elements applied during the handball game.

There are different factors which influence a Handball player to be complete and ready for the game (Moncef, Ch., Said, M., Olfa, N., & Dagbaji, G, 2011), and these elements contain anthropometric, physiological and morphological characteristics. (Selimi, M. 2001; Srhoj, V., Marinovic, M . & Rogulj, 2002).

The anthropometric characteristics are an important factor in many sports. In scientific literature it is stated that the handball game consists of many complex anthropological characteristics and the intensity, agility, explosive strength and speed are important determinants of performance. Similar studies in the field of handball were conducted by many authors. By practicing the results of these studies, many athletes with high scores have had an adaptability between the morphological structure and their performance in sports,(Hoppe,Ë.M., Brochhagen,J., Baumgart,Ch., Bauer,J., & Juergen. 2017; Ghobadi,H., Rajabi, H., Farzad, B., Bayati,M., & Jeffreys,I. 2013; Vuleta et al., 2006; Srhoj,V., Marinovic,M., & Rogulj,N. 2002; Moncef et al., 2001).

The aim of this study is to describe the morphological structure of the handball players and to examine what influences their performance during the championship, while the purpose of the study, is the evaluation of the morphological structure of the all senior teams

at the same time, but as well to define the anthropometric factors which affect the players who compete in the same rank of "Super League" (Superliga) in the Kosovo Handball Championship. Through this study we will try to examine the morphological structure of Kosovo handball players from many different teams throughout the cities of Kosovo.

Material & Method

Subject of this study were 128 male, active handball players from senior teams who compete in regular competition of the " Super League" in Handball Federation, Kosovo (Alaj et al., 2015; Koca, A. 2009;). Players were from eight different teams, sixteen players from each: H.C. "Trepça" from Mitrovica, H.C. "Kastrioti" from Ferizaj, H.C. "Besa Famglia" from Peja, H.C. "Prishtina" from Prishtina,H.C. " Kosova" from Vushtrri, H.C. " Liridoni" from Deçan, H.C. "Drenica" from Drenas and H.C. "Vjosa" from Shtimje.

Anthropometric measurements were conducted in nine anthropometric variables for which the author of this study believes is sufficient for the purpose of this scientific paper. The specific variables were: Body Weight, Body Height, Length of Arms, Length of Hand, Breadth of Hand, Biacromial Breadth, Chest Girth, Waist Girth, and Arm Girth.

The anthropometric measurements were made in the Institute of Sports Medicine in Prishtina, during the morning time (Rexhepi, A. 2009; Mišigoj-Duraković, M. 2008). Measurements are realized by protocol (ISAK) by a team of experts form same Institute and they are based in the International Scientific Advanced Kinanthropometric from (Marfell-Jones, Olds, Stewart, & Carter, 2006). The anthropometric measurements were conducted with anthropometers according to Martin with an accuracy of 0.1cm, for Body Height, Length of Arms, Length of Hand, Breadth of Hand, Biacromial Breadth, Chest Girth, Waist Girth, and Arm Girth, while for Body Weight an accuracy within 0.1kg.

Scientific research is completed in the composition of the anthropometric space. The data collection was analyzed by mathematical statistical package; SPPS program, version 23.0 of Windows. The processed results have been analyzed throughout with the method of descriptive analysis. Correlation analysis is used to confirm the coefficient of correlations between

anthropometric latent factors, while factor analysis according to Kaiser is used to define the anthropometric factors in this study. Statistical significance was set at $p<0.05$.

Results

Table 1 shows the five anthropometric variables which are important for this paper. The statistics results from table 1 show the nine variables for senior handball teams which compete in Handball Super League of the Republic of Kosovo. The teams are: H.C. “Trepça”, H.C. “Kastrioti”, H.C. “Besa Famglia”, H.C. “Prishtina”,H.C. “ Kosova”, H.C. “ Liridoni”, H.C. “Drenica” and H.C. “Vjosa” .

The results of Body Weight show that the minimum weight is 47.90 kg , maximal weight is 99.80, and the average and standard deviations are (mean±SD) 68.76±10.65. Body Height minimum is 158 cm, maximum is 197.00 and the average and standard deviations are177.53±6.70. Length of Arms minimum is 68.00 cm, maximum is 89.00, while the average and standard deviations are 78.90±4.44. Length of Hand minimum is 17.00 cm , maximum is 25.00, the average and standard deviations are 20.14±1.75. Breadth of Hand minimum is 19.00 cm , maximum is 26.00, the average and standard deviations are 22.46±1.44. Biacromial Breadth minimum is 26.00 cm , maximum is 48.00, the average and standard deviations are 38.44±2.94. Chest Girth minimum is 71.00 cm , maximum is 99.00, the average and standard deviations are 85.92±5.76. Waist Girth minimum is 62.00 cm , maximum is 98.00, the average and standard deviations are 75.58±7.35. Arm Girth minimum is 18.00 cm , maximum is 37.00, the average and standard deviations are 26.50±3.19.

Table 1.Basic statistical indicators in anthropometric space in handball players measurements

Variables	N	Min.	Max.	Mean±SD	Skew	Kurt

Body Weight	128	47,90	99,80	68,76±10,65	,801	1,115
Body Height	128	158,00	197,00	177,53±6,70	-,085	,331
Length of Arms	128	68,00	89,00	78,90±4,44	-,266	-,627
Length of Hand	128	17,00	25,00	20,14±1,75	,891	,136
Breadth of Hand	128	19,00	26,00	22,46±1,44	,182	-,360
Biacromial Breadth	128	26,00	48,00	38,44±2,94	-,400	2,582
Chest Girth	128	71,00	99,00	85,92±5,76	,094	-,049
Waist Girth	128	62,00	98,00	75,58±7,35	,571	,434
Arm Girth	128	18,00	37,00	26,50±3,19	,879	1,298

Considering the results of the table 2 where the base of the characteristic equations can be seen, we can explain the system of manifest variables of the anthropometric space where three factors were extracted with special variance components expressed by the compositional contribution of the roots. The results explain 79.52% of the common variance of anthropometric variables. The first component explains 4.18% of the common variance, while the second component explains 1.69% of the common variance, while the third component explains 1.29% of the common variance.

Table 2. Characteristic roots and explained variance parts

Factors	Total	% of Variance	Cumulative %
Factor 1	4,176	46,401	46,401
Factor 2	1,686	18,731	65,131
Factor 3	1,295	14,384	79,516

Table 3 shows the results of the main component with the variability of the variables, the results are processed with the direct oblimin technique, where high values of the component have been achieved and three latent anthropometric factors are obtained. High values have also shown the values of communality in all variables.

Table 3. Main base components and communal components (h^2)

Component Matrix[a]

Variables	Factor 1	Factor 2	Factor 3	h²
Body Weight	,899	-,141	-,153	,851
Body Height	,591	-,172	,664	,820
Length of Arms	,465	-,484	,571	,777
Length of Hand	,371	,826	,234	,875
Breadth of Hand	,437	,764	,307	,870
Biacromial Breadth	,657	-,350	,120	,568
Chest Girth	,855	-,032	-,275	,807
Waist Girth	,831	,105	-,329	,811
Arm Girth	,788	-,023	-,396	,778

Table 4 shows the results of parallel projections by means of spin rotation, where there are three anthropometric factors defined as: Mass and volume factor of the body, the second factor is the palm factor and the third one is the longitudinal factor .

Table 4. The base of the structure of parallel projections

Pattern Matrix[a]

Variables	1	2	3
Body Weight	,835	-,008	,198
Body Height	-,024	,239	,873
Length of Arms	-,023	-,111	,886
Length of Hand	,035	,929	-,034
Breadth of Hand	,038	,916	,081
Biacromial Breadth	,457	-,136	,468
Chest Girth	,882	,032	,024
Waist Girth	,892	,130	-,094
Arm Girth	,921	-,024	-,112

In the table no. 5 are presented the results of the orthogonal projection structure based on the spin rotation, where approximately identical values are obtained within the base of parallel projections.

Table 5. The base of the orthogonal projection structure

Structure Matrix

Variables	1	2	3
Body Weight	,904	,179	,495

Body Height	,338	,270	,875
Length of Arms	,269	-,079	,874
Length of Hand	,223	,935	,017
Breadth of Hand	,263	,927	,133
Biacromial Breadth	,595	-,018	,626
Chest Girth	,898	,223	,340
Waist Girth	,886	,318	,229
Arm Girth	,875	,169	,214

In the Table 6 are shown the results of the correlations between the latent factors. The highest correlation is seen in the factor of mass and body volume (F1) with longitudinal factor (F3) in r = 0.356 factor of body mass, and body volume (F3) with the palm factor (F2) has shown a lower correlation in r = 0.215

Table 6. Anthropometric Factor Correlation Results

Component Correlation Matrix

Component	Factor 1	Factor 2	Factor 3
Factor 1	1,000		
Factor 2	,215	1,000	
Factor 3	,356	,041	1,000

Discussion

The results achieved by handball players from eight different clubs give us the opportunity to compare it with other players of handball. In this case, the average handball player height from the handball championship was from 177.53 ± 6,70 compared to the Croatian championship where their average was 190.79 ± 6.59 (Srhhoj et al., 2002). In the modern handball, the height of the body is very important, which is also verified by other authors (Ghobadi et al., 2013) in their scientific work measured in the Elite Handball World Championships of all participating teams in which case the players have a high enough average of the longest players from 194.39 ± 8.99 to 183.72 ± 6.25, while the average body weight of the Croats was 91.29 ± 7.54 higher than the Kosovars which was 68.76 ± 10.65.

Considering the research method of this paper, the theoretical and practical value of it can be used to evaluate the variables in the anthropometric space through basic statistical analysis as well as to defined the latent anthropometric factors and correlation between them (Hoppe et al. al., 2017; Koca, A. 2009; Vuleta et al., 2006; Ghobadi, H. et al., 2013; Srhoj, V., Marinovic, M., & Rogulj, 2002;

The results of this paper were confirmed by the defined anthropometric latent factors of anthropometric variables. In this case three significant latent factors are present among the anthropometric space of nine variables, which confirm that morphological characteristics are very important to show good results in handball. Again, this was confirmed even by other authors (Ghobadi et al., 2013).

Finally, it can be concluded that with the results obtained in this paper we have realized the main purpose, that of proving the influence of anthropometric factors in achieving performance in handball. The results of this paper also confirm the need for the development of the same models for handball clubs in Kosovo, both for men and women.

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