

ORIGINAL SCIENTIFIC PAPER

Stature and Its Estimation Utilizing Arm Span Measurements of both gender Adolescents from Southern Region in Kosovo

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Abstract

This study is based on measurements of Southern region Kosovan adolescents. The aim of this study was to examine the stature of adolescents from Southern region as well relationship between arm span and stature in both Kosovar genders. A total measured subject participated in this research was 225 out of which (105 girls and 120 boys), females average of age is 18.36 ± 0.50 years old (range 18-20 years) and for male 18.40 ± 0.55 years old (range 18-20 years). The anthropometric measurements were done by trained people and were taken according to the ISAK manual. Relationship between stature and arm span has been analyzed by the simple correlation coefficient at a 95% confidence interval. The linear regression analysis was carried out to examine extent to which arm span can reliably predict of stature. Statistical importance was placed at level $p < 0.05$. As a result anthropometric measurements for both sexes showed that the average of stature for boys adolescents from Southern region are 178.60 ± 5.73 centimeters and have the arm span average of 180.92 ± 6.92 centimeters, while girls from Southern 165.33 ± 4.45 centimeters tall, and have the arm span average of 165.60 ± 6.03 centimeters. The results have shown that the arm span was estimated as a reliable indicator of stature assessment to the both genders adolescents from Southern region of Kosovo population. This study also confirms the necessity for developing separate height models for each region in Kosovo.

Key words: Stature, arm span, region, boys and girls, southern region Kosovo

Introduction

Kosovo is geographically clearly defined at the center of the Southwestern part of the Balkan Peninsula. Throughout Kosovo's territory pass roads, which connect Adriatic Sea, Aegean Sea with the center of Balkan Peninsula. Mountain ranges consist of about 63% of the Kosovo's territory. Sorted by their location or altitudes, they would be: peripheral and central mountains, high, average and low mountains. Dinaric Mountains extend in the western and interior part of the land. In central part of the land, such as Mokna Forest, Dry Forest (Mali i Thatë) and Cursed Mountains (Bjeshkët e Nemura), with their geographical position create special climate conditions in Kosovo. Considering that Kosovo's population is

part of the central area of population from the Dinaric Race, it was of special significance to complete a professional study and a realistic assessment of morphometric evaluation adolescents from the Southern Region of Kosovo which contains five municipalities (Dragas, Malisheva, Mamusha, Prizren and Suva Reka/Suharekë), mostly due to the reason some regional differences were confirmed in Montenegro (Bubanja, Vujovic, Tanase, Hadzic, & Milasinovic, 2015; Milasinovic, Popovic, Jaksic, Gardasevic, & Bjelica, 2016a; Milasinovic, Popovic, Matic, Gardasevic, & Bjelica, 2016b; Popovic, 2017; Popovic, Bjelica, Tanase, & Milasinovic, 2015; Vujovic, Bubanja, Tanase, & Milasinovic, 2015) and some parameters in Kosovo too (Arifi., 2017a; Arifi, Sermaxhaj, Zejnullahu-Raçi, Alaj, & Metaj,



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2017; Arifi, Sermaxhaj, Alaj, Metaj, & Toverlani; Popovic, Arifi, & Bjelica, 2017a; Popovic, Gardasevic, Masanovic, Arifi, & Bjelica, 2017b) as well as some socio-demographic characteristics (Quanjer et al., 2014).

In scientific literature is known that the measurement of stature is important in many settings (cited in Grasgruber et al., 2017): it is an important measure of body size and gives an assessment of nutritional status (cited in Datta Banik, 2011; Bjelica, Popovic, Kezunovic, Petkovic, Jurak, & Grasgruber, 2012; Gardasevic, Rasidagic, Krivokapic, Corluca, & Bjelica, 2017), as well as in the determination of basic energy requirements, physical capacity abilities based on drugs quantity, as well as the evaluation of children growth, predicting and standardization of physiologic standards such as lungs capability, muscle strength, glomerular filtering, metabolism, etc (cited in Popovic, Bjelica, & Hadzic, 2014a; Golshan, Amra, & Hoghogi, 2003; M. Golshan, Crapo, Amra, Jensen, & R. Golshan, 2007; Mohanty, Babu, & Nair, 2001; Ter Goon, Toriola, Musa, & Akusu, 2011; Arifi et al., 2017a). The stature might also be a relevant factor that can success of some athletes in various sports (Popovic, Bjelica, Petkovic, & Muratovic, 2012; Popovic, Bjelica, Jaksic, & Hadzic, 2014b). The researches by European anthropologists a century ago, which have studied body height of the population living in the surrounding of Dinaric Alps (Pineau, Delamarche, & Bozinovic, 2005). As the modern Kosovars, belongs Dinaric racial classification, it is assumed by the authors of this study that adolescents that live in Southern region, It can be as tall from other parts of Kosovo and might by equally tall or at least very close to Europe's top nations (Popovic, 2016; Popović, Bjelica, Tanase, & Milasinović, 2015), Bosnian and Hercegovinians (male 183.9 cm; female 171.8 cm) Dutch (male 183.8 cm; female 170.7 cm), Montenegrins (male 183.21 cm; female 168.37 cm) and Serbians (male 182.0 cm; female 166.8 cm). Wherefore, the first purpose was to examine the stature in Kosovar adolescents from Southern region as the

authors did believe this is the place where the population can reach the full potential of the Sharr Mountains, while the second purpose of this research was to examine the stature in both Kosovar genders and its relationship between arm span.

Methods

The subject of this study was 225, students from high schools, in total there, Included are from Southern region of Kosovo, 120 are male and 105 females average of age is 18.36±0.50 years old (range 18-20 years) and for male 18.40±0.55 years old (range 18-20 years). The Criteria for the selection was that the researches have excluded from the data analysis the individuals with physical deformities as well as those without informed consent. The exclusion criterion was also being non-Kosovan and non-Southern region. Anthropometric measurements of stature and arm span have been conducted according to the protocol of the International Society for the Advancement of Kinanthropometry (Marfell-Jones, Olds, Stewart, & Carter, 2006). The trained measures have measured selected anthropometric indicators (same measurer for each indicator), while the quality of their performance was evaluated against the prescribed "ISAK Manual".

The data was analyzed by Statistical Package for Social Sciences (SPSS) for Windows 23.00. The results obtained were analyzed through descriptive parameters: Means and standard deviation (SD) of the stature and arm span of Kosovars, the ratio between stature and arm span have been analyzed through correlation coefficient according to Pearson with reliability level of 95%. The linear regression analysis was carried out to examine extent to which arm span can reliably predict of stature. In the end, these relationships were plotted as scatter diagram for both genders. Statistical significance was set at p<0.05.

Results

A summary of the anthropometric measurements for both sexes is shown in Table 1. Arithmetic average of stature for

Table 1. Anthropometric Measurements of the Adolescents

Subjects	Stature Range (Mean±SD)	Arm Span Range (Mean±SD)
Male	164.6-192.3 (178.60±5.73)	161.2-196.3 (180.91±6.92)
Female	158.0-184.0 (165.33±4.45)	154.0-195.0 (165.60±6.03)

boys is 178.60±5.73 centimeters, ranked with minimum and maximum results as 164.6-192.3 centimeters. For girls the average was 165.33±4.45 centimeters, ranked with minimum and maximum results as 158.0-184.0 centimeters. These are the

results of the arm span for both sexes; the arm span arithmetic average length for boys is 180.91±6.92 centimeters, ranked with minimum and maximum results 161.2-196.3 centimeters. For girls this was 165.60±6.03 centimeters, ranked with minimum

Table 2. Correlation between Stature and Arm Span of the Study Subjects

Subjects	Correlation Coefficient	95% confidence interval	Significance p-value
Male	0.776	0,661–0,891	<0.000
Female	0.688	0,547–0,830	<0.000

and maximum results 154.0-195.0 centimeters.

The simple correlation coefficient and their 95% confidence interval analysis between the anthropometric measurements are presented in Table 2. For both sexes correlative relation

between stature and arm span is significant (p<0.000), with these correlation coefficients (boys 0.776; girls 0.688).

Table 3. shows the results of linear regression where high values of regression coefficient are shown suggesting a positive

Table 3. Results of Linear Regression Analysis Where the Arm Span Predicts the Stature

Subjects	Regression Coefficient	Standard Error (SE)	R-square (%)	t-value	p-value
Male	0.776	3.632	60.2	13.361	0.000
Female	0.688	3.247	47.4	9.632	0.000

relation (boys 0.776; girls 0.688) which shows that arm span predicts stature for both Kosovar sexes (boys $t=13.361$, $p<0.000$, girls $t=9.632$, $p<0.000$), which confirms the R-square

(%) for boys (60.2), and for girls (47.4).

The relationships between armspan measurements and stature among the above models is plotted as a scatter diagram.

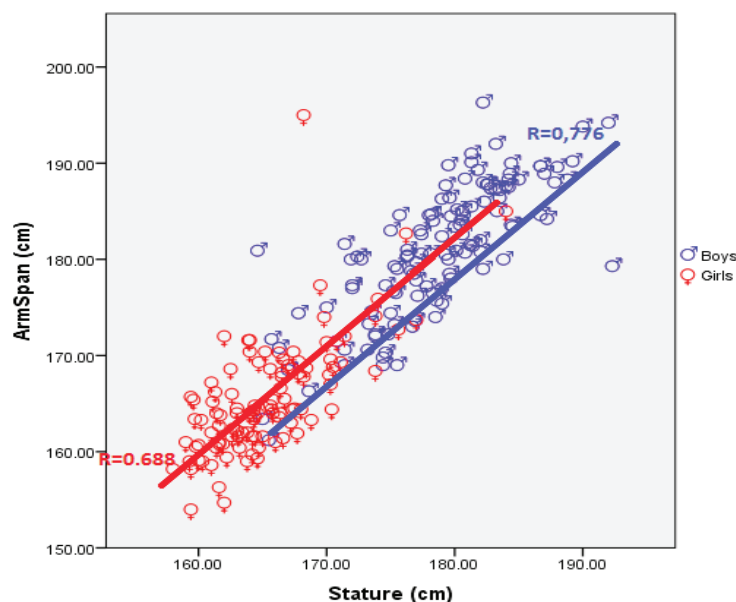


Figure 1. Scatter Diagram and Relationship between Arm Span Measurements and Stature among the Above Models

Discussion

Throughout this work we can prove that the adolescents from Southern region of Kosovo are very tall with an average of 178.60 centimeters for boys and 165.33 centimeters for girls. The results proved that the adolescents from Southern region are tall on average, taller than male population in Macedonia with 178.10 centimeters and taller than female population in Macedonia with 164.58 centimeters (Popovic, Bjelica, Georgiev, Krivokapic, & Milasinovic, 2016), and is very close to the data that was reached in the measurement of Serbian female 166.8 centimeters (Popovic, Bjelica, Molnar, Jaksic, & Akpinar, 2013), but not taller than male population.

However, there is a hypothesis that both sexes adolescents from Southern region of Kosovo did not reach their full genetic potential yet, since they have been influenced by various environmental factors (wars, in the former Yugoslavia, poor economic situation, etc.) in the last few decades (Popovic et al., 2016). Wherefore, the authors believe that these circumstances had a negative bearing on the secular trend in Kosovo, while it is expected that the secular changes influencing stature will ascend in following two decades, comparing it to developed countries where this trend has already completed such as Dutch (Schonbeck et al., 2013).

The results of this study confirm that the arm span reliably predicts stature, with significant (p -value 0.000) by linear regression analysis based on results achieved for male and female. The relationship between stature and arm span we have been able to verify throughout Pearson's correlation analysis with validity of 95% in male as well as female, which have given very high value (0.776 and 0.688) of correlations

between them. The results of this study confirm the necessity for developing height models for each region in Kosovo.

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Conflict of Interest

The authors declare that there are no conflict of interest.

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