

Saliu Hazir, Koca Afrim, Miftari Florian, Arifi Fitim. Stature and Its Estimation Utilizing Arm Span Measurements of both gender Adolescents from Ferizaj Region in Kosovo. Journal of Education, Health and Sport. 2018;8(11):32-43. eISSN 2391-8306. DOI <http://dx.doi.org/10.5281/zenodo.1467864> <http://ojs.ukw.edu.pl/index.php/johs/article/view/6163>

The journal has had 7 points in Ministry of Science and Higher Education parametric evaluation. Part B item 1223 (26/01/2017).
1223 Journal of Education, Health and Sport eISSN 2391-8306 7

© The Authors 2018;

This article is published with open access at Licensee Open Journal Systems of Kazimierz Wielki University in Bydgoszcz, Poland
Open Access. This article is distributed under the terms of the Creative Commons Attribution Noncommercial License which permits any noncommercial use, distribution, and reproduction in any medium, provided the original author (s) and source are credited. This is an open access article licensed under the terms of the Creative Commons Attribution Non commercial license Share alike.
(<http://creativecommons.org/licenses/by-nc-sa/4.0/>) which permits unrestricted, non commercial use, distribution and reproduction in any medium, provided the work is properly cited.

The authors declare that there is no conflict of interests regarding the publication of this paper.

Received: 02.10.2018. Revised: 18.10.2018. Accepted: 19.10.2018.

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

Hazir Saliu

University of Prishtina, Faculty of physical education and sport, Prishtina, Kosovo

Afrim Koca

University of Prishtina, Faculty of physical education and sport, Prishtina, Kosovo

Florian Miftari

University of Prishtina, Faculty of physical education and sport, Prishtina, Kosovo

Fitim Arifi

Institute of Sports Anthropology, Prishtina, Kosovo

Abstract

This study is based on measurements of Ferizaj region Kosovan adolescents. The aim of this study was to examine the stature of adolescents from Ferizaj region as well relationship between arm span and stature in both genders. A total measured subject participated in this research was 174 out of which (79 girls and 95 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 Ferizaj region are $179,83 \pm 5,28$ centimeters and have the arm span average of $182,43 \pm 5,91$ centimeters, while girls from Ferizaj $165,22 \pm 4,80$ centimeters tall, and have the arm span average of $165,01 \pm 5,38$ centimeters. The results have shown that the arm span was estimated as a reliable indicator of stature assessment to the both genders adolescents from Ferizaj 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, Ferizaj 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 Ferizaj Region of Kosovo which contains five municipalities (Ferizaj, Shtime, Kaçanik, Hani i Elezit and

Shterpce), 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, Sermahhaj, Zejnullahu-Raçi, Alaj, & Metaj, 2017; Arifi, Sermahhaj, 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, Corluka, & Bjelica, 2017; Arifi, Sermahhaj, Gardasevic, Alaj & Metaj, 2018a), 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; Arifi, Gardasevic & Masanovic, 2018b). 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 Ferizaj region, It can be as tall from other parts of Kosovo and might be 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 Ferizaj 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 174, students from high schools, in total there, Included are from Ferizaj region of Kosovo, 95 are male and 79 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-Ferizaj 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 boys is $179,83 \pm 5,28$ centimeters, ranked with minimum and maximum results as 169,2-193,8 centimeters. For girls the average was $165,22 \pm 4,80$ centimeters, ranked with minimum and maximum results as 158,2-177,5 centimeters. These are the results of the arm span for both sexes; the arm span arithmetic average length for boys is $182,43 \pm 5,91$ centimeters, ranked with minimum and maximum results 169,2-197,7 centimeters. For girls this was $165,01 \pm 5,38$ centimeters, ranked with minimum and maximum results 155,2-179,5 cm.

Table 1. Anthropometric Measurements of the Adolescents

Subjects	Stature Range (Mean \pm SD)	Arm Span Range (Mean \pm SD)
Male	169,2-193,8 (179,83 \pm 5,28)	169,2-197,7 (182,43 \pm 5,91)
Female	158,2-177,5 (165,22 \pm 4,80)	155,2-179,5 (165,01 \pm 5,38)

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 0.756; girls 0.806).

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

Subjects	Correlation Coefficient	95% confidence interval	Significance p-value
Male	0,756	0,621–0,891	<0.000
Female	0,806	0,671–0,940	<0.000

Table 3. shows the results of linear regression where high values of regression coefficient are shown suggesting a positive relation (boys 0.756; girls 0.806) which shows that arm span predicts stature for both Kosovar sexes (boys $t=11,137$, $p < 0.000$, girls $t=11,934$, $p < 0.000$), which confirms the R-square (%) for boys (57.1), and for girls (64.9).

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

Table 3					
	Regression	Standard Error	R-square		
Subjects	Coefficient	(SE)	(%)	t-value	p-value
Male	0,756	3,475	57,1	11,137	<0.000
Female	0,806	2,866	64,9	11,934	<0.000

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

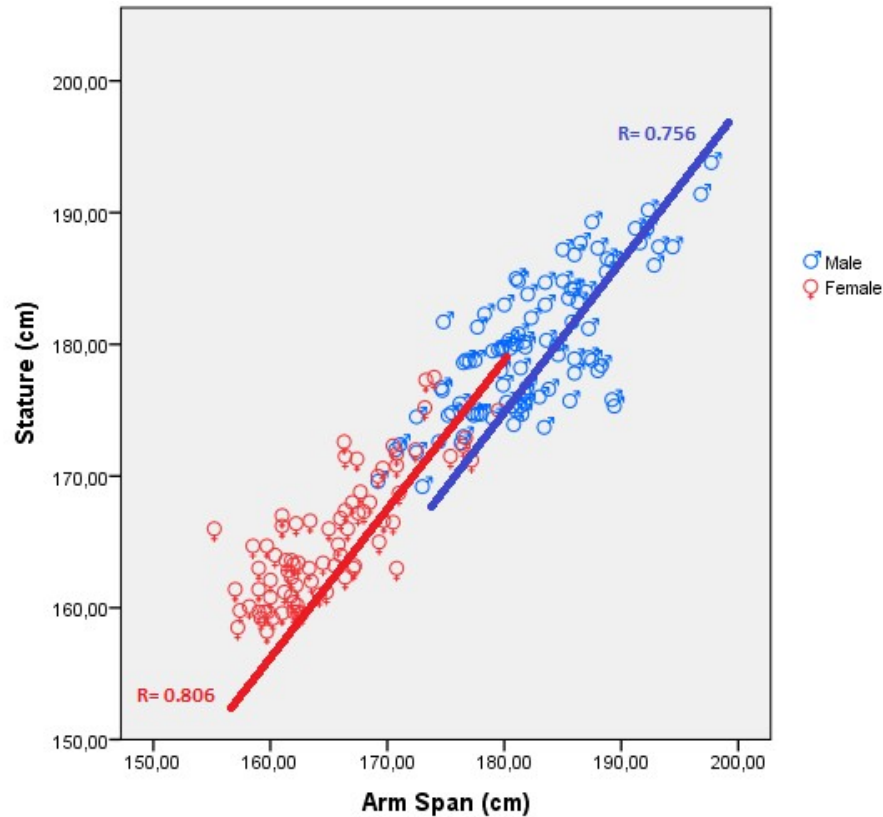


Figure 1. Scatter Diagram and Relationship between Stature Measurements and Arm Span among the Above Models

Discussion

Throughout this work we can prove that the adolescents from Ferizaj region of Kosovo are very tall with an average of $179,83 \pm 5,28$ centimeters for boys and $165,22 \pm 4,80$ centimeters for girls. The results proved that the adolescents from Ferizaj 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 Ferizaj 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 Pearsons' correlation analysis with validity of 95% in male as well as female, which have given very high value (0.756 and 0.806) of correlations between them. The results of this study confirm the necessity for developing height models for each region in Kosovo.

References

- Arifi, F., Sermaxhaj, S., Gardasevic, J., Alaj,I., & Metaj,Z.. (2018a). Stature and its Estimation Utilizing Arm Span Measurements of both gender Adolescents from Southern Region in Kosovo. *Sport Mont Journal* 16(2):51-54.
- Arifi, F., Sermaxhaj, S., Gardasevic, J., Alaj,I., & Metaj,Z.. (2018a). Relationship between Foot Length Measurements and Body Height: A Prospective Regional Study among Adolescents in Central Region of Kosovo. *Sport Mont Journal* 16(3):75-79.

- Arifi, F., Bjelica, D., Sermaxhaj, S., Gardasevic, J., Kezunovic, M., & Popovic, S. (2017a). Stature and its Estimation Utilizing Arm Span Measurements in Kosovan Adults: National Survey. *International Journal of Morphology*, 35(4).
- Arifi, F., Sermaxhaj, S., Zejnullahu-Raçi, P., Alaj, I., & Metaj, Z. (2017b). Stature and its estimation utilizing arm span measurements of both gender adolescents from northern region in Kosovo. *Acta Kinesiologica*, 11(1), 49-52.
- Arifi, F., Sermaxhaj, S., P., Alaj, I., Metaj, Z. & Toverlani, A. (2017). Stature and its estimation utilizing arm span measurements of both gender adolescents from central region in Kosovo. *Sport Mont Journal* 15(2):31-34
- Bjelica, D., Popovic, S., Kezunovic, M., Petkovic, J., Jurak, G., & Grasgruber, P. (2012). Body Height and Its Estimation Utilizing Arm Span Measurements in Montenegrin Adults. *Anthropological Notebooks*, 18(2), 69–83.
- Bubanja, M., Vujovic, D., Tanase, G. D., Hadzic, R., & Milasinovic, R. (2015). Body Height and Its Estimation Utilizing Arm Span Measurements in Female Adolescents from Central Region in Montenegro. *Sport Mont Journal*, 43,44,45/XII, 277-282.
- Datta Banik, S. (2011). Arm span as a proxy measure for height and estimation of nutritional status: A study among Dhimals of Darjeeling in West Bengal India. *Ann. Hum. Biol.*, 38(6), 728-35.
- Gardasevic, J., Rasidagic, F., Krivokapic, D., Corluca, M., & Bjelica, D. (2017). Stature and Its Estimation Utilizing Arm Span Measurements in Male Adolescents from Federation of Bosnia and Herzegovina Entity in Bosnia and Herzegovina. *Montenegrin Journal of Sports Science and Medicine*, 6(1), 37-44.

- Golshan, M., Amra, B., & Hoghogi, M. A. (2003). Is arm span an accurate measure of height to predict pulmonary function parameters? *Monaldi Arch. Chest Dis.*, 59(3), 189-92.
- Golshan, M., Crapo, R. O., Amra, B., Jensen, R. I., & Golshan, R. (2007). Arm span as an independent predictor of pulmonary function parameters: validation and reference values. *Respirology*, 12(3), 361-6.
- Grasgruber, P., Popovic, S., Bokuvka, D., Davidovic, I., Hřebíčková, S., Ingrova, P., Potpara, P., Prce, S., & Stracarova, N. (2017). The mountains of giants: an anthropometric survey of male youths in Bosnia and Herzegovina. *Royal Society Open Science*, 4, 161054.
- Marfell-Jones, M., Olds, T., Stewart, A., & Carter, L. (2006). *International standards for anthropometric assessment*. Potchesfroom: International Society for the Advancement of Kinanthropometry.
- Milasinovic, R., Popovic, S., Jaksic, D., Vasiljevic, I., & Bjelica, D. (2016a). Body Height and its Estimation Utilizing Arm Span Measurements in Female Adolescents from Ferizaj Region in Montenegro. *Sport Mont Journal*, 14(3), 15-18.
- Milasinovic, R., Popovic, S., Matic, R., Vasiljevic, I., & Bjelica, D. (2016b). Body Height and its Estimation Utilizing Arm Span Measurements in Male Adolescents from Ferizaj Region in Montenegro. *Sport Mont Journal*, 14(2), 21-23.
- Mohanty, S. P., Babu, S. S. & Nair, N. S., (2001).The use of arm span as a predictor of height. A study of South Indian women. *J. Orthop.Surg. (Hong Kong)*, 9(1), 19-23.
- Quanjer, P. H., Capderou, A., Mazocioglu, M. M., Aggarwal, A., Popovic, S., Datta Banik, S., Tayie, F. A. K., Golshan, M., Ip, M. S. M., & Zelter, M. (2014). All-age relationship between arm span and height in different ethnic groups. *European Respiratory Journal*, 44, 905-912.

- Pineau, J. C., Delamarche, P., & Bozinovic, S. (2005). Average height of adolescents in the Dinaric Alps (in French). *Comptes Rendus Biologies*, 328(9), 841–846.
- Popovic, S. (2017). Local Geographical Differences in Adult Body Height in Montenegro. *Montenegrin Journal of Sports Science and Medicine*, 6(1), 81-87.
- Popovic, S. (2016). Body Height and its Estimation Utilizing Arm Span Measurements in Montenegrin Adults: National Survey. In *Book of Summaries of 11th FIEP European Congress “Anthropological Aspects of Sport, Physical Education and Recreation”* (5-6), Banjaluka: University of Banjaluka, Faculty of Physical Education and Sport.
- Popovic, S., Arifi, F., & Bjelica, D. (2017a). Standing Height and its Estimation Utilizing Foot Length Measurements in Kosovan Adults: National Survey. *International Journal of Applied Exercise Physiology*, 6(2), 1-7.
- Popovic, S., Bjelica, D., Georgiev, G., Krivokapic, D., & Milasinovic, R. (2016). Body Height and its Estimation Utilizing Arm Span Measurements in Macedonian Adults. *Anthropologist*, 24(3), 737-745.
- Popovic, S., Bjelica, D., Tanase, G. D., & Milasinovic, R. (2015). Body Height and Its Estimation Utilizing Arm Span Measurements in Bosnian and Herzegovinian Adults. *Montenegrin Journal of Sports Science and Medicine*, 4(1), 29-36.
- Popovic, S., Bjelica, D., & Hadzic, R. (2014a). Average body height of adolescents in Montenegro. In *Proceedings book of the 13th International Sport Sciences Congress* (462-463). Konya: Selcuk University.
- Popovic, S., Bjelica, D., Jaksic, D. & Hadzic, R. (2014b). Comparative Study of Anthropometric Measurement and Body Composition between Elite Soccer and Volleyball Players. *International Journal of Morphology*, 32(1), 267-274.

- Popovic, S., Bjelica, D., Molnar, S., Jaksic, D., & Akpinar, S. (2013). Body Height and Its Estimation Utilizing Arm Span Measurements in Serbian Adults. *International Journal of Morphology*, 31(1), 271-279.
- Popovic, S., Bjelica, D., Petkovic, J., & Muratovic, A. (2012). Comparative Study of Anthropometric Measurement and Body Composition between Elite Soccer and Handball Players. In *Proceedings Book of the 4th International Scientific Conference "Contemporary Kinesiology"* (102-108). Split: Faculty of Kinesiology, University of Split.
- Popovic, S., Gardasevic, J., Masanovic, B., Arifi, F., & Bjelica, D. (2017b). Standing Height and its Estimation Utilizing Foot Length Measurements in Adolescents from Western Region in Kosovo. *Sport Mont*, 15(3), 3-7.
- Schönbeck, Y., Talma, H., Van Dommelen, P., Bakker, B., Buitendijk, S., Hirasing, R., & Van Buuren, S. (2013). The world's tallest nation has stopped growing taller: the height of Dutch children from 1955 to 2009. *Pediatric Research*, 73(3), 371-377.
- Ter Goon, D., Toriola, A. T., Musa, D. I., & Akusu, S. (2011). The relationship between a span and stature in Nigerian adults. *Kinesiology*, 43(1), 38-43.
- Vujovic, D., Bubanja, M., Tanase, G. D., & Milasinovic, R. (2015). Body Height and Its Estimation Utilizing Arm Span Measurements in Male Adolescents from Central Region in Montenegro. *Sport Mont Journal*, XII(43-45), 283-288.