THE USE OF ARM SPAN TO ESTIMATE HEIGHT AMONG THE URHOBOS IN DELTA STATE OF NIGERIA

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ABSTRACT

Aim: The purpose of this study is to determine the accuracy of arm span as a measure of height among the Urhobos in Delta State of Nigeria.

Methods: The nature and scope of this study encompassed 401 adults (199 males and 202 females) aged 22 to 65 years from the Urhobo ethnic group in Delta State of Nigeria. Data was collected with subjects in the anatomical position. Height and arm span were measured with a stadiometer and calibrated steel tape respectively. Data analysis was carried out using Statistical Package for Social Sciences (SPSS), version 10.0. Means and standard deviations (SD) were obtained for both anthropometric variables.

Results: The results revealed that the mean of the arm span for males and females were 184.56cm and 173.61cm respectively. The mean of the height was 173.0cm for male and 164.6cm for female.

Conclusion: The arm span is a valid measure of height among adult Urhobos.

Key words: Arm span, Height, Urhobo, Nigeria.

INTRODUCTION

Height means stature, especially of the human body. Human height or stature is the distance from the bottom of the feet to the top of the head in a human body, standing erect. It is measured using a stadiometer, usually in centimetres when using the metric system, and feet and inches when using the imperial system (Carter and Pamela, 2008). It is known that trunks and limbs exhibit consistent ratios among themselves and relative to total body height. The ratio between body segments are age, sex and race dependent (Meadows and Jantz, 1999; Williams et al., 2000). Arm span is defined as the maximum distance between tips of the longest fingers of both hands while a person extends both arms at the level of the shoulders, parallel to the ground and palm facing forward. Arm span is a good alternative for estimating height in the acutely ill elderly population. Arm span is a new method developed to measure the height of adult patients in bed. Arm span is vital in stature estimation in people with physical disabilities (Hickson and Frost, 2003; Luft et al., 2008; Canda, 2009). A study by Aggarwal et al., (2000) in North India on estimation of height from arm span measurement showed that arm span exceeded height in 82.6% subjects while mean height to arm span ratio was 0.9711 and 0.9816 in males and female respectively and was not significantly correlated with age. Another study by Brown et al., (2002) showed that arm span is an accurate alternative when neither measured height nor self reported height is obtainable. The result from an Ethiopian research carried out by Lucia et al., (2002) revealed that there were ethnic and sex differences in the relationship between height and arm span. A Malawian study by Zverev (2003), carried out to access the relationship between height and arm span in adults revealed that arm span exceeded height in all age groups of males and females and the mean difference between the height and arm span values for females was 9.9±4.9cm (t=16.28, p<0.001) and for males was 11.6±4.4cm (t=14.74, p<0.001). The correlation between arm span and stature has been shown to vary in different ethnic groups (Steele and Chenier, 1990; Reeves et al., 1996; Brown et al., 2000). Even though several of these studies are available for western populations, only very little has been documented for the Nigerian population especially the Urhobos. This study is significant to people estimating height of wheelchair athletes or other disabled sports individuals and in identification of individuals in forensic anthropology. The objective of this study is to determine the accuracy of arm span as a

measure of height among the Urhobos in Delta State of Nigeria. The Urhobo ethnic area of Delta State, Nigeria comprises nine(9) local government areas; Ethiope East, Ethiope West, Okpe, Sapele, Udu, Ughelli North, Ughelli South, Uvwie and Warri South.

MATERIALS AND METHODS

This study is based on data collected from Urhobo subjects in Delta State of Nigeria. This cross sectional type of descriptive study was carried out using a total of 401 subjects (199 males and 202 females) aged between 22 to 65 years. The multistage sampling technique was used for the study. The age of the individuals was determined directly from their reported date of birth. The body height was recorded as the perpendicular distance between the top of the head (the vertex) and the bottom of the feet. It was measured using a constructed stadiometer to the nearest 0.1 centimetres in bare feet with the participants standing upright against the stadiometer. The respondents had to put their feet together and move back until their heels touched the bottom of the upright stadiometer. Each respondent's head was placed in the Frankfort horizontal plane. Each respondent had to raise or lower the chin until it was in the Frankfort horizontal plane to align the head properly. The arm span was recorded as the anthropometric measurement of the length between the tips of the middle fingers of the left and right hands when raised parallel to the ground at shoulder height at a one-hundred and eighty degree angle. It was measured using a

calibrated steel tape to the nearest 0.1 centimetres in bare feet on a level concrete floor with their upper backs, buttocks and heels against the wall and stadiometer providing support. Each participant's arms were outstretched at right angles to the body with palms facing forwards. The arm span measurement was taken from one middle fingertip to the other middle fingertip, with the tape passing in front of the clavicles while two field workers supported the elbows. The subjects were allowed to participate if they had no history of physical deformities that could affect body height or arm span. The researchers also excluded persons with goiter and other diseases which affect the neck. Informed consent was obtained from each subject. Ethical approval for this study was obtained from the Anatomy Department Research and Ethics Committee in the Delta State University, Abraka. Data analysis was carried out using Statistical Package for Social Sciences (SPSS) version 10.0. Means and standard deviations (SD) were obtained for both anthropometric variables. A comparison of means of body heights and arm spans within and between the sexes was carried out using t-test. The relationship between body height and arm span was determined using simple correlation coefficients at 95% confidence interval. Linear regression analyses were then performed to examine the extent to which arm span can reliably predict body height. Statistical significance was set at $p < 0.05$.

RESULTS

Table 1: Descriptive data (mean and standard deviation) for adult Urhobos

	GENDER													
	MALE							FEMALE						
AGE GROUP	MEAN ARM SPAN (CM)			MEAN OF HEIGHT (CM)		MEAN DIFFERENCE (CM)		MEAN ARM SPAN (CM)			MEAN HEIGHT (CM)		MEAN DIFFERENCE (CM)	
	Count	Mean	SD	Mean	SD	Mean	SD	Count	Mean	SD	Mean	SD	Mean	SD
22 – 29	181	184.64	9.36	173.0	7.6	11.62	5.58	194	173.47	8.97	164.6	7.0	8.90	5.36
30 – 39	12	186.46	11.61	174.9	8.7	11.58	8.18	6	176.13	13.48	164.5	10.2	11.63	7.06
40 – 49	3	181.33	14.01	168.0	8.5	13.33	5.77	2	179.50	1.41	168.5	2.1	11.00	.71
>50	3	175.50	4.27	171.5	6.9	4.00	3.77	0	.	.	.	.	.	.
Total	199	184.56	9.54	173.0	7.7	11.53	5.79	202	173.61	9.07	164.6	7.0	9.00	5.39

SD-Standard Deviation

Table 1 shows a summary of the subjects and measurements taken. The mean of the arm span was greater than body height for both male and female gender.

Table 2 Correlation between body height and arm span of the Urhobos

SUBJECTS	CORRELATION COEFFICIENT	SIGNIFICANT P-VALUE
Male	.509	<0.05
Female	.498	<0.05

Table 2 reveals that the relationship between body height and arm span are high and significant in both male and female gender.

Table 3. Results of linear regression analysis where the arm span predicts the body height

SUBJECTS	REGRESSION COEFFICIENT	STANDARD ERROR	R- SQUARE (%)	t - VALUE	p - VALUE
MALE	.509	.936	.259	11.762	.000
FEMALE	.498	.740	.248	11.402	.000

Table 3 reveals high values of the regression coefficient and this indicates that arm span significantly predicts body height in both gender.

DISCUSSION

The prediction of stature using arm span measurement has been attempted by many authors (Aggarwal et al., 2000; Brown et al., 2002; Lucia et al., 2002; Steele and Mattox, 1987; Kwok and Whitelaw, 1991; Jalzem and Gledhill, 1993; Yun et al., 1995; Chumlea et al., 1998; Mohanty et al., 2001; Shahar and Pooy, 2003; Ter et al., 2011). It was observed in the present study that males of the Urhobo ethnic group had higher anthropometric measures than the females, in conformity with the reports of Varun et al., (2010); who discovered that Africans and Caucasians have larger body frames than Asians, while males of all ethnicities have higher values than their female counterparts. Christian et al., 2010 also discovered that males have higher values than their female counterparts. The results of this study showed that the mean arm span measurement exceeded stature measurement in the Urhobos which concurs with other studies (Hickson and Frost, 2003; Aggarwal et al., 2000; Steele and Chenier, 1990; Reeves et al., 1996; Yun et al., 1995; Ter et al., 2011). The large difference between the measures of arm span and stature found in this study was also observed by Zverev (2003) among the Malawians, and is a pointer to a relatively short stature of the participants. The correlation between arm span and stature observed in the present study is lower than that seen in other studies (Williams et al., 2000; Lucia et al., 2002; Steele and Mattox, 1987; Chumlea et al., 1998) where strong associations were found between arm span and stature (thus: r=.93; r=.82; r=.86; r=.87 respectively). The correlation between

stature and arm span was high and significant in the present study, and this is similar to other reports by Aggarwal et al., 2000; Zverev; 2003; Steele and Chenier, 1990; Yun et al., 1995; Ter et al., 2011).

CONCLUSION
The arm span is a valid measure of height among adult Urhobos. Utilizing arm span measurement thus offers estimation of the body height and its prediction.

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