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Original Research Article

Anthropometric Study of the Length of Digits in the Left and Right Hands of the String Players in Port Harcourt

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Abstract

Purpose*:* This work was aimed at documenting the anthropometric variations of the lengths of digits in the left and right hands of string players. ***Materials and methods*****:** A total of 100 subjects were randomly selected on voluntary consent (50 string players and 50 non-string players used as control) irrespective of ethnicity. Vernier caliper was used in measuring the medial four fingers of their left and right hands and documented. ***Findings***: Data was analyzed using statistical package for social science (SPSS) software version 20.0 and the differences compared using student's t-test at 95% confidence level, at 0.05 level of significance($P< 0.05$). The results showed a difference in the mean digit lengths of the right hand with the control group being greater, this was however only statistically significant ($P< 0.05$) in the Right Middle Finger (8.13±0.53) as against the string players (7.99±0.69). The mean digits lengths of the left hand was greater in string players with the average difference of 0.32cm, this was however only significant ($P<0.05$) in the Left Middle Finger (8.14±0.70) when compared to that of the control (8.04±0.49). The mean digits length of the left hand is statistically significantly greater than the right hand in string players ($P<0.05$). However, the mean digits lengths of the right fingers in every humans are greater as seen in the control though not statistically significant ($P>0.05$). ***Conclusion***: Length of digits is greater in the right hand in non-strings players but greater in the left in spring players and could be a useful tool in forensic science especially in identification of individuals in relation to their skills during investigation.

Keywords: Anthropometry, Digits Length, String Players.

INTRODUCTION

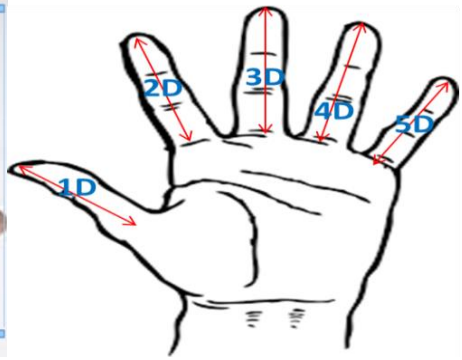
Anthropometry is a branch of anthropology that deals with the comparative measurement of the human body (Stedman 2006). It is a key component of nutritional status assessment in children and adults (Simko *et al*., 1995). Anthropometric data for children reflect general health status, dietary adequacy, and growth and development over time. In adult, body measurement data are used to evaluate health and dietary status, disease risk, and body composition changes that occur over the adult lifespan (Margaret *et al*., 2008). Anatomically the hand (Lat.: Manus) is the manual and mechanical part of the upper limb, distal to the forearm consisting of the thumb, four fingers which are represented by (thumb-1D, index -2D, middle -3D, ring -4D and little -5D respectively) and a palm (Moore *et al*., 2006).It is a sensory and manipulating tool used for both gross motor skills (such as grasping a large object) and fine motor skills(such as picking up a small object), (Warwick and William 1973). The hand as part of the upper limb develops from the limb buds which appear as out-pocketing from the anterolateral body wall at the onset of 5th week of development (Sadler 2010).

Music is a vocal or instrumental sound (or both) combined in such a way to produce beauty of form, harmony and expression of emotion. Thus, music is an integral part of life. It is both an art and a science (Oxford Dictionary). A string player is a person who plays an instrument of the violin family or stringed instrument (Dictionary .com). The instruments include plucking (guitar, harp, and banjo), bowing (violin, cello, viola etc) and striking (piano). The interaction of handle size and shape with the kinematics and anthropometry of the hand have great effect on hand posture and grip strength (Buchholz *et al*., 1992). Irwin and Radwin 2008 reported that internal biomechanical loads of the hand from external loads and finger lengths that were themselves estimated from measured hand length and

breadth and found that hand anthropometric measurements especially palm width are better predictors of hand strength than stature and body weight. Men with shorter index fingers are more likely to pick fight; women with the same hand shape are more likely to react with aggression after being provoked. Those with very little difference between the index and the ring finger or those with a longer index finger was found among men with oral cancer, compared with men with pre-cancerous oral lesion or non-lesion according to one all male study (Cassity 2013). Young *et al*., 2010 reported that force distribution at the hand /handle interface for grip and pull tasks , the greatest pressure was exerted on the distal segment of the phalanges and at the base of the thumb and palm during maximum isometric gripping. Poor ergonomic hand tools design is a well-known factor contributing to biomechanical stresses and increasing the risk of cumulative trauma and carpal tunnel syndrome disorders of users (Chandra *et al*., 2009; Claudon 2000; Loslever and Ranaivosoa 1993). Ecker 1875 reported sexual differences in finger patterning. Second digits in males are shorter than their fourth and the reverse for females (Manning *et al*., 1998; George 1930; Phelp 1952). Palace *et al*., 2004 reported significant difference between the right and left hands. Wagner, 1988 reported that males hand showed significant higher mean value than females in all absolute hand size variables with the exception of fingertip prominence 3-5. Elbert *et al*., 1995 reported that magnetic imaging revealed that the cortical representation of the digits of the left hand of string players was larger than that in controls. The effect was smaller for the left thumb and no such difference was observed for the representation of the right hand digits. Schlaug 2001 also reported that patterning of brain activity differ very considerably between professional and amateur musicians even when playing quite simple pieces of music. Activity was tightly focused spatially and primary motor cortex was more intense and confined to the right side of the brain of professionals while for amateur it was more diffuse and present on both sides (Amunts *et al*., 1997). Gruhn *et al*., 2003 reported significant advantage found among music student with regards to IQ measurement, mental speed and general intelligence that appear to be related to their higher scores on the eye movement task. The brain of string players is larger and part of it is sensitive to left hand fingers motion and more responsive than those of non-musicians as reported by Elbert *et al*., 1995.

MATERIALS AND METHOD

One hundred (100) subjects were randomly selected on voluntary consent (50 string players and 50 non-string players as control) irrespective of ethnicity within the age of 18years and above. Digital Vernier caliper was used in measuring the medial four fingers of their left and right hands and documented, the instruments they play, the age they started, their present age, handedness were also documented. Parameters were measured as follows.



1. Participant open their palms and straighten their fingers in full extended position
2. Lengths of the medial four digits (index -2D, MIDDLE -3D, RING -4D AND LIITTLE -5D FINGERS) of both hands were measured with the aid of a digital Vernier caliper.
3. The length of the digits were measured from the single crease at the base of the fingers to the tip of the fingers for those with single crease (index and little fingers), while for the middle and ring fingers that has double creases at their base, the measurement was done from the most proximal crease to the tip of the fingers.
4. The values were then recorded accordingly in tabular form.

Data was analyzed using statistical package for social science (SPSS) software version 20.0 and the differences compared using student's t-test at 95% confidence level, at 0.05 level of significance ($P< 0.05$)

RESULTS

The results of this study are presented in tables as shown below:

Table 1: Shows the comparison of results for left and right hands of string players

Parameters	LEFT HAND	RIGHT HAND	f- ratio	LEVEL OF SIGNIFICANCE
index finger(cm)	7.31 ± 0.68	7.14 ± 0.73	1.65	Yes(P<0.05)
middle finger(cm)	8.14 ± 0.70	7.99 ± 0.69	6.01	Yes(P<0.05)
ring finger(cm)	7.57 ± 0.71	7.34 ± 0.74	0.82	Yes(P<0.05)
little finger(cm)	6.28 ± 0.63	6.09 ± 0.62	1.86	Yes(P<0.05)

Table 2: Shows the comparison of results for left and right hands of controls

Parameters	LEFT HAND	RIGHT HAND	f- ratio	LEVEL OF SIGNIFICANCE
index finger(cm)	7.16 ± 0.56	7.22 ± 0.59	1.921	NOT (P>0.05)
middle finger(cm)	8.04 ± 0.49	8.13±0.53	0.036	NOT (P>0.05)
ring finger(cm)	7.39 ± 0.72	7.42 ± 0.63	0.539	NOT (P>0.05)
little finger(cm)	6.06 ± 0.54	6.15 ± 0.57	0.551	NOT (P>0.05)

Table 3: Shows the comparison of results for string players and control

Parameters	Control	String players	f- ratio	LEVEL OF SIGNIFICANCE
Right index finger(cm)	7.22 ± 0.59	7.14 ± 0.73	1.424	NOT (P>0.05)
Right middle finger(cm)	8.13±0.53	7.99 ± 0.69	4.146	YES (P<0.05)
Right ring finger(cm)	7.42 ± 0.63	7.34 ± 0.74	1.351	NOT (P>0.05)
Right little finger(cm)	6.15 ± 0.57	6.09 ± 0.62	1.201	NOT (P>0.05)
left index finger(cm)	7.16 ± 0.56	7.31 ± 0.68	1.879	NOT (P>0.05)
Left middle finger(cm)	8.04 ± 0.49	8.14 ± 0.70	7.886	YES (P<0.05)
Left ring finger(cm)	7.39 ± 0.72	7.57 ± 0.71	0.288	NOT (P>0.05)
Left little finger(cm)	6.06 ± 0.54	6.28 ± 0.63	2.534	NOT (P>0.05)

N/B: All values are represented as mean ± S.EM as shown in all tables

It was observed that for all parameters that the left hand digits lengths in string players were significantly greater than that of the right (P<0.05).

There was no statistical difference (P>0.05) between the right and left hand digits lengths in the control, however the right showed greater values.

Mean values of right middle finger differs significantly with control being greater and also in left middle finger with string players being greater (P<0.05). However, control was greater in the right index, ring and little finger while on the left string players were greater in digits length though these differences were not statistically significant (P>0.05).

DISCUSION

The left digits lengths in string players were significantly greater than the right hand, similar to the observations of Elbert *et al*., 1995; Palace *et al*., 2004. This may be attributed to the cortical representation of the digits of the left hand of string players which is larger in the brain and the pattern of brain activity differ considerably (Elbert *et al*., 1995, Schlaug 2001, and Amunts *et al*., 1997).

No significant difference between the right and left hand digits length in the control, contradicting the findings of (Palace *et al*., 2004). Significant advantage is found among music student with regards to IQ measurement, mental speed and general intelligence that appear to be related to their higher scores on the eye movement task (Gruhn *et al*., 2003). The brain of string players is larger and part of it is sensitive to left hand fingers motion were more responsive than those of non-musicians (Elbert *et al*., 1995).

Right middle finger is significantly greater in control. Mean values of left middle finger of string players is significantly greater than the control, similar to the observation of (Elbert et al 1995),which may be attributed to the fact that the brain of string players is larger and part of it is sensitive to left hand fingers motion (Elbert *et al*., 1995).

No significant difference in the right index, ring and little finger with control having greater values on the right and spring players having greater values on the left, similar to the report of (Schlaug, 2001).

In conclusion, from this study it is obvious that the mean digits lengths of the left hand is greater than the right hand in string players whereas in the control the right is greater, the left digits length generally is greater in spring players than every other. This is a useful tool in forensic science especially in identification of individuals in relation to their skills during investigation.

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