Hand index classifications of some selected male in Ilorin, North Central Nigeria

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Abstract

Anthropometric data has numerous usage, and differs from different populations, mostly based on geographical location. The aims of this study were to obtain the hand anthropometric data of the some male locals in Ilorin, a North Central Nigerian city, use this data to estimate the average hand index of these people so as to determine the standard hand index classification they belong to, and to compare the results with some previous works in Nigeria and some other parts of globe. Eighty (80) locals participated willingly. For each, the hand length and handbreadth for both the right hand and the left hand were taken. The hand index for each of them was calculated from the data collected. The result (mean±standard deviation) obtained gave the right hand length, left hand length, right handbreadth, and left handbreadth to be 19.96±0.76, 19.98±0.76, 8.03±0.31, and 7.93±0.3 respectively. The average hand index for combination of both the right hand and left hand for the hand length and handbreadth was estimated to be 39.96±0.4, which falls under the hyperdolichocheri hand index group. This study has established a standard value for hand dimension for both the right hand and left hand of local population, which will be relevance in ergo-design applications of several hand tools. Also, it may be useful in forensic investigation and in the medical field.

Keywords: *local, weavers, hand length, hand breadth, hand index*

1.0 Introduction

Nigeria, being the most populous black nation, is a ready market for several equipment designed for domestical and industrial usage. Several studies have reported mismatch between designed equipment and the anthropometry of the users especially in the developing world, which have led to several health effect, occupational and domestic hazards. Correct anthropometric representation of the population is therefore paramount. Stature has been reported to be closely related to several other anthropometric dimensions and these statures vary geographically. Nigeria is a large Country with several ethic groups in different regions. The regional classification of the Country is the North East, North West, North Central, South West, South East, and South-South. These groups are marked clearly by significant physical disparity between them. On the average in Nigeria, a citizen from one region can be easily identified from another from a different region by their mere physical stature. Since this differing population are involved in various profession in their regions, their industrial and domestic engineering needs have to be put into consideration so as to make them an highly productive and cost efficient citizens. This therefore argues the need for this study and more of such. The age, sex and profession is an individual can influence the hand index. Agnihotri *et. al* (2005)'s study of Mauritius population

suggested that an hand index greater than 44 is of a male while less than 44 is of a female.

An earlier work by Barnabas and Elupko (2008) focused on sexual dimorphism of Nigerians using the stature – hand indices ratio, stature – foot indices ratio and their relationship. Ibeachu *et al.* (2011) collated 150 hand indices each of the male and female students of University of Port-Harcourt. The University whose students' were used is located in the South-South region of Nigeria. The age range of the subjects is 18-30 years. Their study classified the group of people investigated into the dolichocheir and the mesocheir group.

The hand, which is the most used and versatile part of the body is very important in scientific researches, anthropometry and ergonomics. In ergonomics, anthropometric data of the hand length and handbreadth are very important in the design of several handy tools (Xiao *et al.* 2005). Due to the importance of the hand indices for designing tools for different profession, Okunribido (2000) investigated the hand anthropometry of female rural farm workers in a South Western city of Nigeria and observed clear differences from that of their counterparts of different nationalities. A similar work was carried out by Sanjit *et al.* (2003), involving agricultural workers from Eastern India.

To the best of our knowledge, there is no information on hand indices of local weavers in Nigeria. Therefore, this work aimed at determining the hand length, handbreadth and estimate the hand index from male local weavers around the North Central part of Nigeria and make comparison with previous works.

2.0 Materials and method

This study covered eighty (80) local weavers, which were selected randomly from 15 locations in Ilorin, Nigeria in the year 2012. The age of the participants varied between 16-35 years old. The only criteria for the selection of the participants were that they had to be in the local weaving industry.

The hand length for each hand was measured as a straight length of the hand between the stylion landmark on the wrist and the tip of the middle finger; that is, most anterior projecting point using a vernier calliper and a flexible tape rule. The readings were taken thrice and the average was recorded. The handbreadth was also measured for both the hands as a straight distance from the laterally placed point on the hand of the second metacarpal to the most medially placed point on the hand of the fifth metacarpal.

The hand index was obtained as a percentage ratio of the handbreadth to the hand length. This is represented in equation 1 below:

$$Hand\ index = \frac{Handbreadth}{Hand\ length} \times 100$$

The hand index (HI) result was considered based on the standard classification given as:

- Hyperdolichocheri: $HI \leq 40.9$
- Dolichocheri: $41.0 \leq HI \leq 43.9$
- Mesocheri: $44.0 \leq HI \leq 46.9$
- Brachycheri: $47.0 \leq HI \leq 49.9$
- Hyperbrachycheri: $HI \geq 50.0$

The statistical analysis of the work was done to get the mean, minimum, maximum, standard deviation and the hand indices for the data.

3.0 Results and discussion

Table 1 gives the summary of the hand length of both the right hand (19.96±0.76) and the left hand (19.98±0.76). The larger of the values in parenthesis is the mean while the smaller is the standard deviation. The analysis revealed that the mean value for the left hand was higher than that of the right hand. This observation agrees with that of Ibeachu *et. al* (2011). However, McFadden and Shubel (2002) reported a contradictory observation, with the right hand generally larger than the left hand. Table 2 also presents the summary of the handbreadth for both the right hand (8.03±0.31) and left hand (7.93±0.3) and it was observed that the mean value of the width of the right hand is greater than that of the left hand. This also agrees with the observations of Ibeachu *et. al* (2011) and Mcfadden and Shubel (2002). Table 3 indicates the average hand index for combination of both the right hand and left hand for the hand length and hand breadth was estimated to be 39.96±0.4. The average hand index for the male local weavers was found to be lower to what was obtained by Ibeachu *et. al* (2011). This might be due to the different ethnicity and geographical location of the participants. The male population used in our work are from the North Central of Nigeria whereas those of the Ibeachu *et. al* (2011) were from the South-South region of Nigeria. The people of the North Central region are generally slimmer than their counterpart from the South-South region. McFadden and Shubel's work in 2002 was not based on data from the Nigerian population.

Table 1: Summary of hand length value of both right and left hand

	Min. (cm)	Max. (cm)	Mean (cm)
Right	18	22	19.96 + 0.76
Left	19	21	19.98 + 0.76

Table 2: Summary of hand breadth value of both right and left hand

	Min. (cm)	Max. (cm)	Mean (cm)
Right	7.2	8.7	8.03 + 0.31
Left	7.1	8.4	7.93 + 0.30

Table 3: Summary of hand dimension [length, breadth and indices]

Average hand length	Average handbreadth	Average hand index
19.97 + 0.76	7.98 + 0.31	39.96 + 0.40

Table 4 shows the right hand and left hand mean value for the hand length, handbreadth and hand index for different age groups. Based on the groupings, the largest age group involved in the study are youths in the range 23 to 28 years of age. Following the standard classification of length-breadth index, it was discovered that the hand index for each age group and all participants irrespective of their age fall in the Hyperdolichocheri (hdch) category. This contradicts that of the Ibeachu *et al* (2011) who reported Dolichocheri (dch) and Mesocheri (mch) categories for the population he considered.

Table 4: Age group distribution of hand dimensions in the male population at Ilorin

Age group (years)	No in each group	Mean Hand Length		Mean Handbreadth		Mean Hand Index	
		Right	*Left*	*Right*	*Left*	*Right*	*Left*
16 - 19	11	19.83 $\pm$ 0.59	19.96 $\pm$ 0.76	7.98 $\pm$ 0.35	7.88 $\pm$ 0.56	40.26 $\pm$ 1.39	40.12 $\pm$ 1.24
20 - 22	14	20.11 $\pm$ 0.82	20.96 $\pm$ 0.86	7.99 $\pm$ 0.05	7.78 $\pm$ 0.08	39.8 $\pm$ 1.6	40.55 $\pm$ 1.13
23 - 28	28	19.98 $\pm$ 0.76	19.96 $\pm$ 0.76	8.06 $\pm$ 0.36	7.99 $\pm$ 0.79	40.37 $\pm$ 1.97	40.22 $\pm$ 1.56
29 - 32	20	20.01 $\pm$ 0.6	20.14 $\pm$ 0.57	8.03 $\pm$ 0.36	7.83 $\pm$ 0.56	40.12 $\pm$ 1.64	40.12 $\pm$ 1.23
33-35	7	19.53 $\pm$ 1.27	19.69 $\pm$ 0.96	7.9 $\pm$ 0.22	7.79 $\pm$ 0.64	40.59 $\pm$ 2.74	40.34 $\pm$ 1.81

Table 5: Comparison of the average of the hand dimension of the sample of Ilorin, Nigeria's male population with dimensions from other part of Nigeria and other part of the world. (where HL, RHL, LHL, HB, RHB, and LHB represent the hand length, right hand length, left hand length, handbreadth, right handbreadth, and left handbreadth)

Hand dimension	Ilorin(Nigeria) (Present study)	Port-Harcourt(Nigeria) (Ibeachu *et al.* 2005)	Mauritius (Agnihotri *et al.* 2005)	France (Dean, 2006)	Bangledesh (Imrhan *et al.* 2006)	Northern Nigeria (Barnabas *et al.* 2008)
Mean(HL)	19.97 $\pm$ 0.76	19.05 $\pm$ 0.95	18.90	19.08	17.40	-
RHL	19.96 $\pm$ 0.76	19.02 $\pm$ 0.08	-	-	-	19.85 $\pm$ 0.86
LHL	19.98 $\pm$ 0.76	19.09 $\pm$ 0.07	-	-	-	19.93 $\pm$ 0.93
Mean(HB)	7.98 $\pm$ 0.31	8.50 $\pm$ 0.42	8.40	8.73	-	-
RHB	8.03 $\pm$ 0.31	8.58 $\pm$ 0.03	-	-	-	8.90 $\pm$ 0.95
LHB	7.93 $\pm$ 0.30	8.43 $\pm$ 0.03	-	-	-	8.68 $\pm$ 0.92

Table 5 shows the comparison of the hand dimensions of the male population at some part of with those reported for other populations by previous works. The mean hand length for this study was observed to be of higher value than that of the study of Agnihotri *et. al* (2005) in which the value 18.9 cm was obtained for the Mauritius population but the mean handbreadth for this study when compared was found to be lower than that of their study. The dimension obtained by Dean (2006) in France was discovered to be slightly lower to that of this study for the mean hand length but higher for the mean handbreadth. Likewise Imrhan *et al.* (2006) analysed the hand dimension of Bangladesh population and discovered the value 17.40 cm for the mean hand length, which was appreciably lower than that of this study. Comparing the result of Barnabas *et. al* (2008) with this work, there are only slight differences in the result obtained for both the right hand length and left hand length due to the fact that the two researches were conducted on the northern Nigeria population but there was a pronounced difference in the hand breadth dimension for both the right and the left hand. Finally from the table 5, the mean hand length, right hand length and left hand length for the present study was found to be higher to that of the Port-Harcourt students (Ibeachu *et. al*, 2011) and the mean hand breadth, right hand breadth and left hand breadth for the present study was found to be lower to that of the Port- Harcourt students.

4.0 Conclusion

The average hand index of the population under consideration fell in the hyperdolichocheri hand index group. This study has established a standard value for hand dimension for both the right hand and left hand of the local population in Ilorin, North Central Nigeria which will be relevance in ergo-design applications of hand tools such as the shuttle, scissors, and so on. It may also be useful in forensic

investigation and in the medical field. This study will also be useful in selecting appropriate sized tools to be used by the local population.

Acknowledgement

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