The Relationship of Cephalic to Cranial Measurements in an Unmixed Group of American Negroes

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When a physical anthropologist measures an individual his thoughts often turn to the bone structure that underlies the flesh. The anatomist, the surgeon, and the artist may have similar thoughts, however, there is little statistical data available to substantiate or reject any projection they might make as to the correlation of the living measurements with those of the skeleton. Only rarely are standardized measurements available in both the living and skeletal conditions for the same series of individuals. For this reason the present preliminary study was made using the cranial and cephalic measurements obtained from a group of American Negroes.

The present study is the outgrowth of an investigation being conducted by the author. Anthropometric and somatological data obtained by T. Wingate Todd from Negro cadavers at Western Reserve University in the early 1920's and measurements obtained by Dr. G. K. Neumann at a later date on the same Negro crania are used in this study. In addition the statistical data for these cranial measurements as compiled by Dr. H. W. Neumann (3) is used. The statistical data for the cephalic measurements was calculated by the author. For purposes of this paper the cephalic statistics of 33 adjudged "full" Negroes is compared to the cranial statistics of a series of 81 adjudged "full" Negroes of which the series of 33 form a part. These specimens were adjudged "full" Negro on the basis of the cadaveral observations of Todd and classified visually on a varietal basis into Sudanid, Paleonegrid (Forest Negro) and Ethiopid groups. These observations were to be later substantiated by the work of Dr. H. W. Neumann. (3) The vast majority of the two series presented here belong to the Sudanid variety.

The purpose of this study is to present some data that may form a foundation for a more accurate estimation of either cephalic or cranial measurements when one of the two is not available. In surveying the standard Rudolf Martin (2) anthropometric blanks used for the cephalic measurements and the revised Harvard form for cranial observations and indices used as a basis for the cranial data, only 11 direct measurements and nine indices were found to correspond. Correspondence meaning that the measuring points are located essentially on top of each other in both the living and skeletal conditions. The comparison data indicates that even though these measurements were not compared specimen for specimen the amount of skewedness resulting from the larger cranial series is nil. Certain criteria which are questionable from the scientific point of view were overlooked only in this case because of the relative unavailability of published data of this type. Two of the most obvious inferences made here are that the cadaveral measurements coincide accurately with measurements obtained on the living and that there

is a lack of direct individual for individual comparison. The latter is to form a more complete and detailed study in the future. In addition a certain amount of latitude was allowed in the positioning of corresponding measuring points due to a lack of published evidence to the contrary.

The stated age of 27 of the 33 individuals of the cephalic series averages 28.5 years and ranges from 19 to 41 years. From this evidence we may assume that the sample represents a group of fully grown and developed individuals. It should be mentioned, however, that these individuals were by and large a socially unsettled type of migratory worker of low means, not typical necessarily of the more permanent Cleveland Negro population. They have been shown by anthropometric and photographic data to be rather ectomorphic somatologically, but the influence

TABLE 1

Corresponding Cranial and Cephalic Measurements With Difference in Millimeters and the Resulting Percent this Difference Represents of each Series Measurement

Cor. Measurements	Cranial Series Mean (81)	S.D.	Cephalic Series Mean (33)	S.D.	Correlation Factors Diff. in mm.	Percent of Difference
Length L	186.45	5.49	192.21	6.24	5.76	Ce. 2.99 Cr. 3.09
Breadth B	138.22	5.09	149.39	5.97	11.17	Ce. 7.48 Cr. 8.08
Min. Frontal MF	98.13	4.73	105.90	6.01	7.77	Ce. 7.33 Cr. 7.91
Porion-Apex Ht. PAH	112.73	3.89	123.30*	5.38	10.57	Ce. 8.57 Cr. 9.37
Total Facial Ht. TFH	124.45	5.82	129.33	6.45	4.88	Ce. 3.77 Cr. 3.92
Upper Facial Ht. UFH	74.22	4.06	73.45	6.25	Directly Comparable	
Total Facial Br. TFB	133.33	5.10	139.63	5.53	6.30	Ce. 4.51 Cr. 4.72
Dacryal Chord DC	23.07	2.05	34.98**	2.64	11.91	Ce. 34.05 Cr. 51.62
Nasal Br. BR	27.13	2.17	42.33	2.92	15.20	Ce. 35.93 Cr. 56.03
Nasal Ht. NH	52.57	3.07	54.36	4.03	1.79	Ce. 3.27 Cr. 3.40
Biangular Br. BA	99.38	6.03	112.36***	11.57	12.98	Ce. 11.55 Cr. 13.06

* Porion-apex height is used here as being equivalent to porion-tragus.

** Interorbital distance is used here as the nearest comparable measurement in living.

*** Bigonial breadth is used here as the nearest and only comparable measurement in the living.

this fact has on the comparative data presented here should be minimal since we are only dealing with the head and skull.

The eleven corresponding measurements selected are listed in Table No. 1. The mean dimensions for each measurement in both series are given in millimeters. The accompaning standard deviations are also given to demonstrate the dispersion of the two series. The standard letter symbols for each measurement are given to aid the reader in determining the derivation of the indices listed in Table No. 2. The precise location of each of the measuring points can be obtained by referring to the text of Comas' manual (1). For purposes of correlation the differences of the means in the two series were calculated. In order to further demonstrate the degree of correlation the percentage of the original mean as represented by the difference was calculated for each series mean measurement.

A survey of these results will show that the greatest percent difference found was 56.03%. This tremendous variation was obtained for the nasal breadth measurements and can be explained by the flaring ala nasi typical of the Negro. In all cases the variation in percentage differences can be explained by obvious anatomical features found in the living but absent in the skeletal condition. Another feature such as the nasal wings mentioned above might be the masseter muscle which covers the lateral surface of the ramus of the mandible and is largely responsible for the 12.98 mm. difference in the biangular (bigonial) measurements. Similar allowances for tissue depth could be made for all measurements listed. It should be noted, however, that it is not these obvious changes which occur in the living to skeletal transition but, rather, the degree of change that is important. The derivation of a mean nasal breadth of 27.13 mm. for a Negro cranial series is not unusual. However, being able to state with some accuracy that this measurement represents only 56.03% of the breadth of some Negro's nose is unique. This type of maneuver could be performed for each corresponding measuring point in order to suggest a correlation factor for tissue depth. Of the eleven corresponding measurements only the "upper facial height" is seen to be directly comparable. It can be said to be directly comparable in that being a single plane vertical measurement there is no correction necessary for tissue depth.

In Table No. 2 a list of indices obtained using only corresponding measuring points is given as well as their means and standard deviations. No correlation factors or percentage differences are given because in actual practice the corrections would be made on the direct measurement involved. The larger variation in indices occurs where metrical comparisons are most disturbed by tissue depth and form. In the directly comparable measurements and indices the variation is assumed to be due to the difference in the two series.

Considering the data presented here one could not propose a standard correlation factor for American Negro cranial and cephalic measurements. Perhaps the data does lay the groundwork for a later more complete and detailed study which might result in producing such a factor. As data is accumulated for other racial groups a series of factors could

TABLE 2

Corresponding Cranial and Cephalic Indices

Index	Cranial Series Mean in mm.	S.D.	Cephalic Series Mean in mm.	S.D.	Comment
Cranial B/L	74.06	3.05	77.75	3.08	Correction for greater neck muscle thickness
Transv. Fronto-Parietal MF/B	71.03	3.21	70.96	4.28	Directly comparable
Total Facial TFH/TFB	93.44	5.02	92.68	4.45	Directly comparable
Upper-Facial UFH/TFB	55.72	3.27	56.60	4.13	Directly comparable
Zygo-Frontal MF/TFB	73.65	3.51	75.71	5.77	Directly comparable
Cranio-facial TFB/B	96.52	3.51	93.96	5.75	Directly comparable
Nasal NB/NH	51.72	4.45	78.18	3.48	Correction for wings and height
Fronto-Mandibular BA/MF	101.48	7.47	105.66	8.76	Correction for masseter muscle
Zygo-Mandibular BA/TFB	74.56	4.09	80.00	8.52	Correction for masseter muscle

be made available. The value of such a correlation factor for the anthropologist is obvious, however, its possible applications in Anatomy, Art, Criminology and Medicine would extend the value.

Literature Cited

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