Cranial and Post Cranial Comparisons Among a Modern Bantu Population.

Preliminary results

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Initial aims of study

- To determine whether there is a relationship between
  - estimated heights and cranial volumes of this group.
  - cranial volumes obtained using different methods/ formulae of cranial volume estimation.
- To establish the existence of a correlation between segment lengths and whole long bone lengths within this population.

Relevance of study

- Demonstrating the interplay between the environment and genetics.
- Application to forensic analyses in solving criminal cases.
- Understanding secular trends occurring in human populations.
- Understanding evolutionary processes using reconstruction of heights and brain volumes of prehistoric remains.
- Understanding cranial abnormalities (pathology).

Questions arising from study

1)The near absence of Bantu/East African specific equations.

- Used an Asian specific equation for estimating cranial volume derived by Dekaban & Liberman(1964) **volume cm^3=0.5238*L*B*H**
- Derived ratio by: **volume cm^3= 0.3941 *L*B*H**

2) Errors occurring due to application of methods published in the past and not related to modern populations.

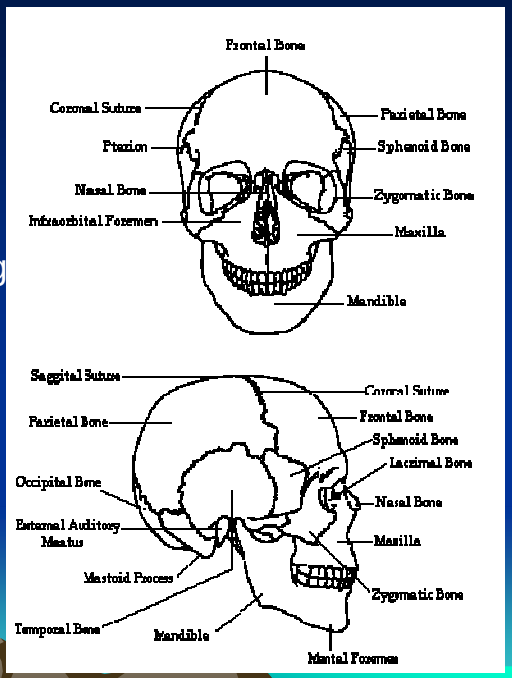
3) Differences by various authors occurring on points of measurement on the bones.

Methodology

First used manual packing method to obtain volume.

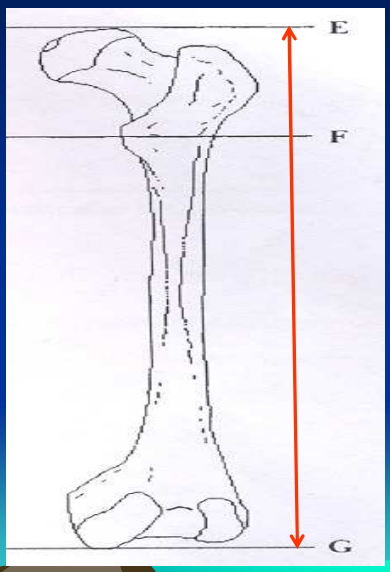
-Second method used:

- Cranial length: measuring the anterior-posterior length.
- Cranial breadth: the points between the two parietal eminences.
- Cranial height: points between the internal acoustic meatus and the bregma.



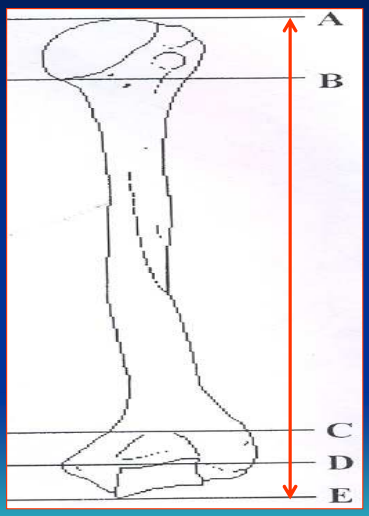
Femur

- Femur: proximal point of the head to the most distal point of both condyles.Point E-G.



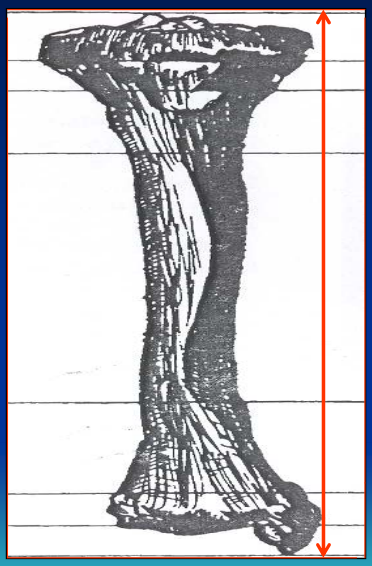
Humerus

- Humerus:the most proximal point of the head to the most distal point of the trochlea. Point A-E



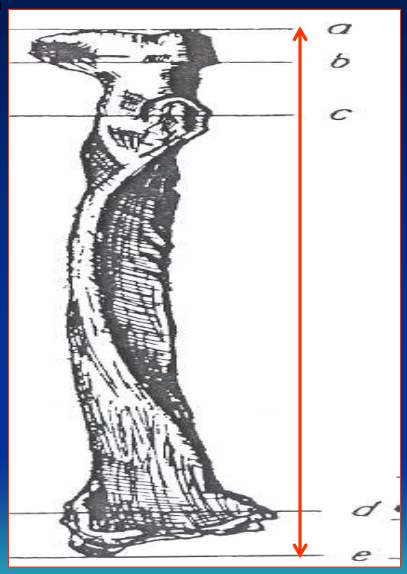
Tibia

- Tibia: proximal point of the lateral condyle to the most distal point on the medial malleoulus.



Radius

- Radius: from top of head to the tip of styloid process. Point a-e.



Equations used for heights (ES= Estimated Stature) adopted from Byers (2002)

Black females

- ES=2.28*femur+59.76
- ES=3.08*humerus+64.67
- ES=2.45*tibia+72.65
- ES=2.75*radius+94.51

Black males

- ES=2.11*femur+70.35
- ES=3.26*humerus+62.10
- ES=2.19*tibia+86.02
- ES=3.42*radius+81.56

Descriptive Statistics for whole sample indicating the estimated heights using whole Long bone lengths

Derived heights using;	N	Minimum	Maximum	Mean	Std.Deviation
Femur	75	150.730	174.800	162.505	5.474
Humerus	75	150.770	180.110	164.057	6.180
Tibia	75	154.970	180.410	167.543	5.429
Radius	75	156.800	178.860	164.190	4.996

Female crania

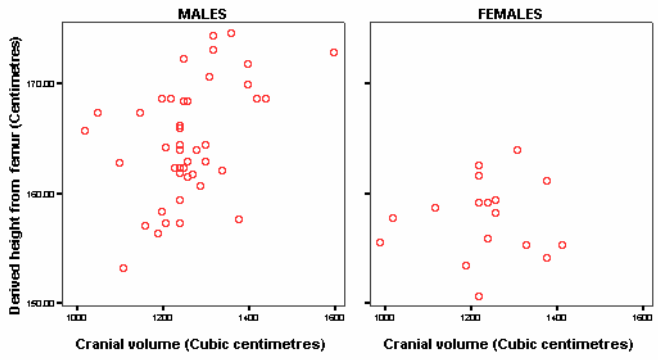
			Cranial volumes		
Head length (cm)	Head breadth (cm)	Head height (cm)	Dekaban& Liberman formula (Asian model)	Packing method	Derived ratio using Dekaban & Liberman application
17.500	12.500	13.400	1535.389	1220.000	1155.206
16.300	12.500	12.300	1312.708	1020.000	987.664
16.100	12.000	13.000	1315.576	990.000	989.822
17.400	13.300	13.700	1660.684	1220.000	1249.476
17.300	12.900	13.100	1531.343	1120.000	1152.162
17.400	13.500	13.800	1697.961	1220.000	1277.522
18.700	14.200	13.200	1835.986	1260.000	1381.371

Male crania

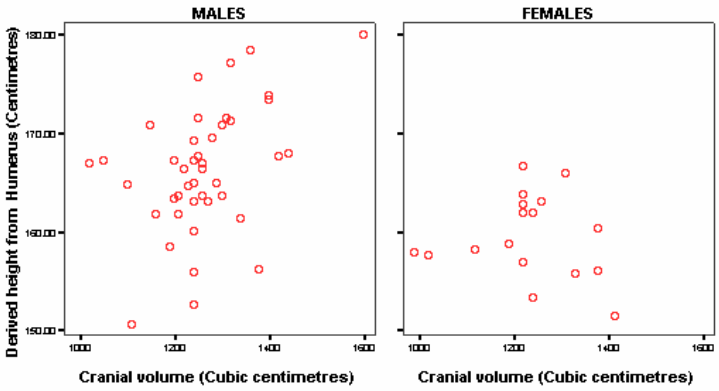
Head length (cm)	Head breadth (cm)	Head height (cm)	Dekaban &Liberman (Asian model)	Packing method	Derived ratio Dekaban& Liberman application
17.300	12.700	13.800	1588.161	1250.000	1194.910
18.500	13.500	13.000	1700.648	1250.000	1279.544
16.200	12.700	12.600	1357.859	1020.000	1021.635
17.800	12.900	13.500	1623.712	1210.000	1221.659
17.200	12.400	12.900	1441.137	1160.000	1084.292
17.500	13.000	13.050	1555.097	1290.000	1170.034
18.000	13.100	13.200	1630.359	1240.000	1226.660
17.200	12.500	12.500	1407.713	1150.000	1059.144
16.300	12.000	13.600	1393.392	1100.000	1048.369
17.800	12.800	13.950	1664.829	1200.000	1252.595
18.300	14.000	14.100	1892.186	1240.000	1423.655

Relationship between stature and cranial volume

Scatter plot of heights derived from femur lengths and cranial volume



Scatter plot of heights derived from Humerus lengths and cranial volume



- Determining presence of a relationship between stature and cranial volume using linear regression.

Height derived from ;	Coefficient of regression of correlation	Significance
Humerus (Males)	0.398	Weak positive correlation
Humerus (Females)	-0.052	Very weak negative correlation
Femurs (Males)	0.382	Weak positive correlation
Femurs (Females)	0.062	Very weak positive correlation

Possible reasons for lack of correlation

- The sample population may not have been wide enough and the ages too varied.
- Nutritional inadequacies during growth affecting adult morphology.
- Absence of an established health care system resulting into variations in growth patterns.
- Genotypic variations caused by mixing of different gene pools.

Possible future studies

- Comparative study geographically and ethnically.
- Anthropometric ageing of the group to have more precise ages.
- Establishing other sets of equations for reconstructing stature and brain volumes.

Why the absence of these measurements

- Social reasons associated with human measurements in the past.
- Lack of sufficient numbers of skeletal remains from definable populations.

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