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Performance Based Estimation of Cranial Capacity,Cephalic index,BMI etc. in 1st MBBS students.

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ABSTRACT

CC is a measure of Cranial volume and in turn it is related to brain size .Earlier reports state there is a positive correlation between brain size, cranial capacity and one's intelligence and general mental ability(GMA).,which means if cranial capacity is more, their intelligence will be higher.in view of controversial data regarding the relation between cranial capacity and intelligence an attempt has been made to study it in detail the above parameters were taken in a group of 50 1st MBBS students and they were compared with their academic performance. It was found that even though larger CC is correlated to larger brain size, it is not linked to one's mental ability and academic performance, as evidenced by our data.

Keywords: cranial capacity, cephalic index, performance, intelligence

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INTRODUCTION

Cranial capacity serves as the most important factor for racialdetermination.It was determined by some authors for some races [1]. In north Indian skulls the cranial capacity(CC) was done by Chaturvedi and Harenja(1962)[2].Manjunath (2002) determined the CC using various formulae ,eg-Lee-Peersonformula,Sheroid formula etc (2002)[3].He estimated the CC of dissection room cadavers ,using linear measurements of skulls like occipito-frontal circumference.CC was also calculated using William et al formula with linear measurements like cranial vault thickness and by Sheroid formula by Dekaben(1977) [4]. The skulls were divided into 4 morphological types byShukla(1966) [5].He also calculated that it is not formed by homogenous element but by heterogenous element(1966).CC of crania from Karnataka were done by Thomas et al (1980) [6].Correlation between Cephalic index(CI),CC and cranial measurements in Indian cadavers were calculated by Ravindranath and Manjunath(1975)[7].Pal et al did a study on sutural bones in Gujarath population (1986) [8].Estabrooks studied the correlation between cranial capacity and intelligence (1928) [9]IN view of all the listed works it was proved cranial capacity was reported to have relation with intelligence and mental ability.CC is proved to be a measure of cranial volume and brain size (Phillippe Rushton and Davison.C) [10].Brain size and body size were found to be related and the correlation was v—0.20—0.25(Lawlor et al,2005) [11].Rushton and Jensen suggested that increase in brain size was associated with more sophisticated cognitive functioning(2005) [12].Leigh Van valen expressed estimates of brain are useless in prediction of intelligence in man and the real correlation may be 0.3(1974) [13].

Dueto all these controversial data this analysis was done to see correlation between various parameters like cranial capacity(CC),Cephalic index(CI), BMI , Body fat percentageetc and one's intelligence,performanceand mental ability are assessed in this paper.

MATERIAL AND METHODS

A total of 50 students were chosenfor the study based on their academic performance and were classified into 2 groups ,groupA included students who are above average academically and group B belonging to below average category,were selected for the study to see whether any relation exists between their intellectual capacity ,mental ability of the chosen group of students and their skull parameters and the other values like CI,CC,BMI,Body fat ratio etc. . In skulls the cephalic index(CI),cranial capacity(CC) etc were all calculated using the following linear measurements

- Linear dimensions were taken using an inch tape and vernier calipers
- Radiological-using x-rays
- Max length - Inion to glabella-L–figure-1
- Max breadth- inter Parietal eminence-B-figure-3
- Max height- External acoustic meatus to vertex—H (Fig.1)-figure-2

The following formulae were used for each item

1. **Cranial Capacity –**

   Males – 0.0000337 (L-11) (B-11) (H-11) + 406.01cc
   Females – 0.000400 (L-11) (B-11) (H-11) + 206.60cc

2. **Cephalic index** – Breadth/Length x 100-figure.
3. **BMI –** Weight (kgs)/ Height^2 (meters)
4. **Body fat %-** using Omron body fat analyzer

All linear measurements were taken twice to eliminate errors while recording the above data.

RESULTS

The total 50 students of the study group were divided into 5 groups with 10 per group and mean for each group for each parameter were calculated and tabulated.

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Cranial capacity

The cranial capacity in Group A students (best performers) was showing lesser value and the average of 25 students was 1639.but in group B category all 25 students(below average)displayed higher values(Table.1, 2,3) and mean value of it was 1818 which is much higher than group A.Table.4

Cephalic index

It was also little higher in group B than ingroup A.Its mean value in group A was 78 and 81 in group B.(Table.2,3,4)

BMI

The mean value of BMI in group A was lower (19) than group B(21)
Body fat%:(table.5)
This in both the groups was much different and surprisingly it was less in group B (table.6)

DISCUSSION

CC is a measure of Cranial volume and in turn it is related to brain size .Earlier reports state there is a positive correlation between brain size,cranial capacity and one's intelligence and general mental ability(GMA).,which means if cranial capacity is more, their intelligence will be higher.J.Phillippe Rushton and Davison.C(2009)[10],Paul Broca(18710),Rushton and Jensen (2005)[12]suggest that increase in brain size was associated with more sophisticated cognitive functioning . As per the some older reports the following data were recorded in lower mammals. Largest brain size was found in sperm whale and it was 8kg,in elephants it was 5 kg,dolphins had 1.5kg and human brain weighed around 1.5.to 1.7 kg.Broca reported the brain size was larger in skilled workers and eminent persons.But Leigh Van Valen (1974)[13] says brain weight is not an indicator of intelligence and they are not correlated.

Like this we saw so many reports some for and some against this concept. Till late 19^{th} and 20^{th} centuries brain size and mental ability were believed to have relation.In this work in living persons,(1^{st} MBBS students) we found no relation between cranial capacity and intelligence(performance).Low achievers had larger cranial capacity(mean-1818) than the best performers(CC mean-1639).One more parameter analysed was of thecorrelation between cranial capacity and cephalic index where we saw when CI was more, CC also showed proportionate increase and positive correlation(in group A ,mean CI—81 and meanCC --1818 and in group B mean CI—78and CC mean was 1639,which coincides with an earlier work stating CC and CI had significant correlation(Ravindranath and Manjunath,1975).But values of CI doesn't indicate therelation with performance When BMI and CC were compared in our work they showed positive correlation ie.group A students had low BMI and low CC and in Group B both had proportionate increase and this also had similar result like an reported data where body size and brain size seem to be related [11] and it was 0.20-0.25). Hence we prove when brain size is not related to intelligence or performance bur it had relation with body size only as observed by us we can state the increased brain size is for controlling movements of larger body volume. The body fat% measured was not showing any relation with CC. So in our work we found out of the 4 parameters studied (CC,CI,BMI,BF%) only 2 were correlated ,CI to CC,BMI to CC.

CONCLUSION

From the above datawe conclude that even though larger CC is correlated to larger brain size but not linked to one's mental ability and acaedemicperormance, as evidenced by our data.Secondly CI and CC had positive correlation and higher CI was seen in best performers asper our study, but CC doesn't reflect one's mental ability and so we conclude that CIis related to CC alone but since CC is related to brain size only and not to intelligence,a hypothesis not reported elsewhere.CC and BMI also hadrelation in our work and from this we derive this larger BMI and CC may be to control thelarger body volume, movements and activities of big built persons only.

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Table 1: Correlation between Cranial capacity and Body mass index

	CC	BMI
Group A	1396cc	19
Group B	1481cc	20.9

Table 2: CC and CI of Group –A

s.no	Maximum length in cms	Maximum breadth in cms	Maximum height in cms	CI	CC
1.	20	15	13	75	1448
2.	19	17	14	89	1306
3.	22.5	18	13	80	1544
4.	20.5	15	13	73	1260
5.	22.5	16	13	71	1396

Table 3: CC and CI of Group –B

S.no	Maximum length in cms	Maximum breadth in cms	Maximum height in cms	CI	CC
1.	20	16.5	11.5	83	1417
2.	24	17.5	14	73	1540
3.	23	18.5	14	80	1570
4.	24	18	14.5	75	1643
5.	21	17	14	81	1781

Table 4: BMI and BODY FAT %

	BMI		Body fat %	
s.no	Group A	Group B	Group A	Group B
1.	18.7	16.6	17.1	14.7
2.	19.5	20.2	25	25.4
3.	18.9	29.9	22.2	27.3
4.	17.9	20	25	6.3
5.	20.6	18.4	18.6	9.3

Table5: Mean values of CC and CI

Method	CC		CI	
Linear measurement	GroupA	Group B	Group A	Group B
	1639	1818	78	81
Radiological	1391	1491		

Table6: Mean values of BMI and BF%

Group	BMI	BF%
A	19	22.6
B	20.7	16

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Figure1: Maximum length—inion to nasion

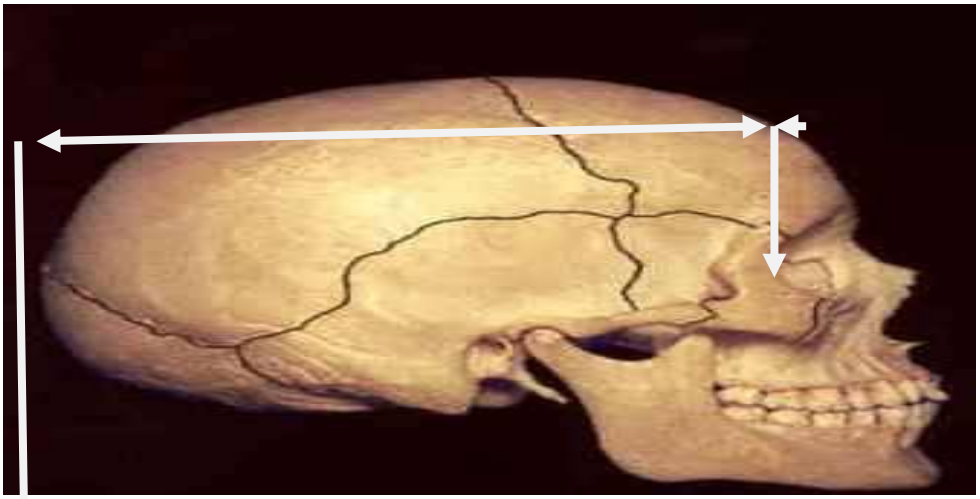


Figure 2: Maximum Height– Vertex to External Acoustic meatus

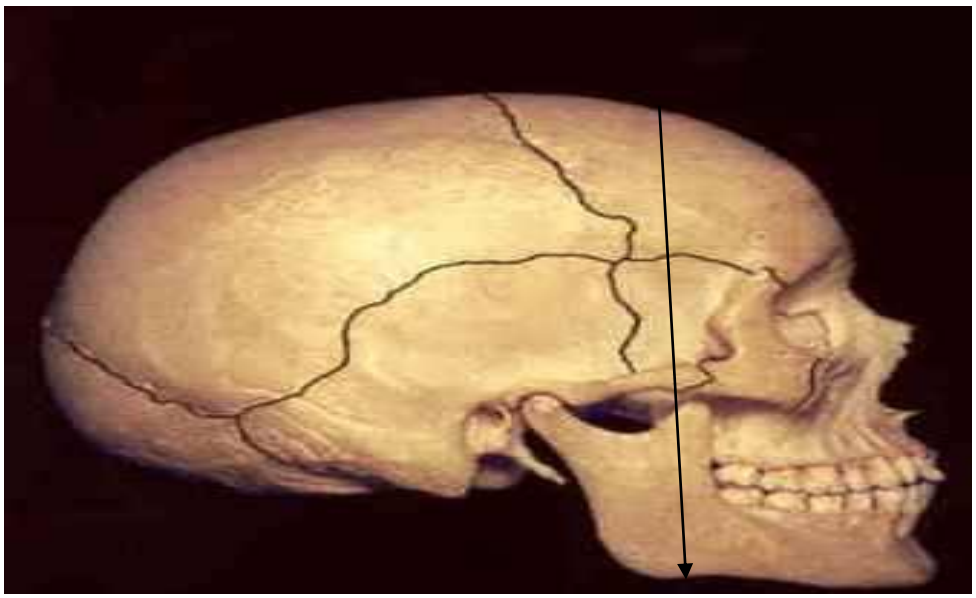
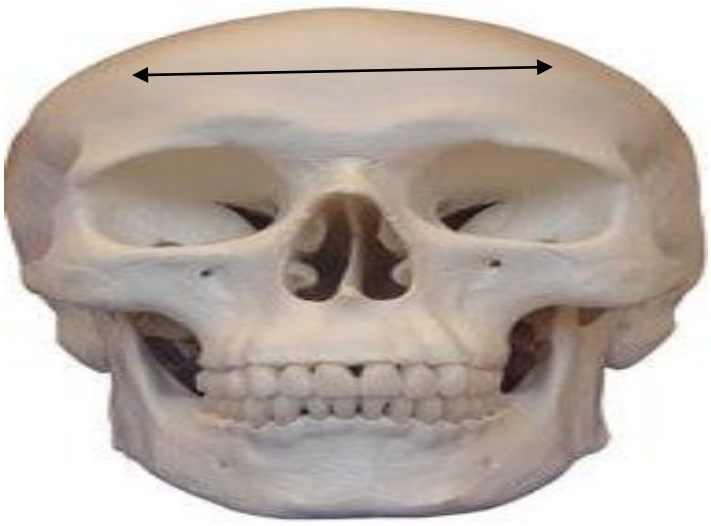


Figure 3: Maximum Breadth—interparietal eminence



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