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General Mental Ability and Head Size of fifth standard Children's of Five Schools of Bhatgaon Cluster, Baloda Bazar, Chhattisgarh

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KEYWORDS

General mental ability, cephalic index, head circumference

ABSTRACT

General mental ability is a terminology that represents an individual level of learning, perceiving command, and resolve problems. Objectives of the present study are to assess the mental ability of children's belonging to different socio-economic class; to examine the sexual difference in general mental ability and head size and to find the relationship between head size and general mental ability. The study was conducted among 100 (50 boys and 50 girls) of fifth standard children's at schools of Bhatgaon cluster, Baloda Bazar, Chhattisgarh. The general mental ability is assessed by General Mental Ability Test for children (GMATC) and the mathematical analysis was carried out using Statistical Package for Social Sciences (SPSS 16.0). The maximum number of children's belongs to upper lower socio-economic class and dolichocephalic head size. Out of 100 children's 26 were outstanding, 25 were excellent, 20 were very good, 18 were good and 11 children's came in the category of scope for improvement. There is no significant sexual difference in general mental ability ($t= 0.06$; $p<0.05$)and cephalic index($t= -0.84$; $p<0.05$). Head circumference shown a significant difference ($t= 3.00$;$p<0.05$). Significant weak correlation ($r=0.255$; $p<0.05$)) was found between head size and general mental ability. Significant medium correlation ($r= 0.588$; $p<0.01$) was observed between parental socio-economic-educational status and general mental ability.

Introduction

General mental ability is a terminology that represents an individual level of learning, perceiving command, and resolve problems (Performance Group International Ltd., 2020). Kumar (2016: 36) quoted 'Stern (1914) view that the "Intelligence is usual efficiency of any individual to careful adaptation of their thought in new environment"'. Test of general mental ability is estimated by cognitive ability test that comprises verbal, non-verbal, numerical, reasoning, memory, social ability and any problem solving ability (Faremi et al., 2017).

Galton (1869) was a first who introduced the scientific concept of general mental ability (Rushton and Ankney 2009). Then the idea was reconceptualized by Spearman (1904), according to him individual who performed better in one area (e.g. science) will also faithfully express in other domain (e.g. language, mathematics). Further he summarized term general intelligence or 'g' for such basic trending better performance factor in wide and different area while difference in performance among people is due to person's specific ability (Sikdar, 2015).

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Rushton and Ankney (2009) cited Broca (1861); Darwin (1871); Morton (1849); Topinard (1878); Galton (1888) works to say that measurable correlation exist between general mental ability and brain size or head size that was universally accepted during nineteenth and early twentieth century. According to Broca skilled workers, eminent individual and mature adult has bigger brain size in comparison to unskilled; less eminent and less mature one. A similar result was found from the Galton's (1883) collected data on head size and educational and occupational information of thousands of South Kensington Natural Science Museum visitors in London (Rushton and Ankney, 2009). Later on Pearson in 1906 reexamined the Galton's data and obtained small positive relation between head size and university grade (Rushton and Ankney, 2009).

The given research problem has certain practical and theoretical implications (Fig. 1), some of them are first, assessment of general mental ability of children's who belongs to different cultural-social-economical section of society (Lesser *et al.*, 1965). Second, sex and school type differentiation in general mental ability and head size. Third, the influence of parental socio-economic-educational status on children's general mental ability because a children's primarily learn from their parents (Dekhtyar *et al.*, 2015). So family plays a key role in children's achievements. Fourth, the ill health, disease, or sickness or genetical problems may affect the mental ability of children's in scholastic achievement not only that but later-life status attainment and success also. Other than that the time spent in self-study, parents and teacher effort to teach children and gadgets and technology also impacted on cognitive development and outcomes of the children's.

Thus the present study aims; first to assess the general mental ability of studied children's belonging to different socio-economic class. Second, to examine sex difference in general mental ability and head size and finally to correlate the head size and parental socio-economic condition with general mental ability of studied children's.

Research Methodology

Study Area and Sampling

The study was conducted in five private and government schools coming under Bhatgaon cluster within Bilaigarh block of Baloda Bazar district, Chhattisgarh, India. The total 100 (50 boys and 50 girls) of fifth standard (age between 9-12 years) students were purposively selected in this cross sectional study. The all students present in the day of study were regarded as sample of the study. Table 1 shows the distribution of sample in different schools.

Table 1: Sample distribution in different schools (Source: Primary Data, 2019)

School Name	School type	Frequency	Percentage (%)
Govt. Primary School Bhatgaon "B"	Government	21	21%
Govt. Primary school Durug	Government	13	13%
Govt. primary school Rohina	Government	22	22%
Lotus Public School	Private	22	22%
Sambhavi Public School	Private	22	22%
Total		100	100

Tool and techniques

The general mental ability of students were assessed by General Mental Ability Test for children

(GMATC) prepared by Dr. R. P. Srivastava and Dr. Kiran Saxena. The test includes two forms: verbal and non-verbal, having five subtests: classification, reasoning problems, number series, analogy and absurdities and one mark was provided for each correct answer. A questionnaire schedule was provided to the students in order to assess the general mental ability containing 25 questions from each verbal and non-verbal. Student's interview was carried to gather information on parent's socio-economic status. Finally anthropometric measurements were taken to measure the head size of studied children's. The spreading calliper was used to take measurement of head length (g-op) and head breadth (eu-eu) and non-stretchable measuring tape was used to measure the horizontal head circumference (g-op-g) of subjects. The land marks used for measurements:

- Glabella (g): It is the most anterior point in the mid-sagittal plan between the eye brows when head is placed in Frankfurt horizontal plan.
- Opisthocranion (op): It is a most posterior point on the back of the head in mid-sagittal plan when head is placed in Frankfurt horizontal plan.
- Euryon (eu): It is the most laterally placed point on the parietal side of head.

Analysis of Collected Data

The accumulated data from primary source was analyzed in SPSS version 16.0. The statistical analysis (frequency analysis, student t test and pearson's bivariate correlation coefficient) were carried to explore the children's distribution in different categories, and to see the significant difference and correlation between test variables. The socio-economic status of parents was examined according to Modified Kuppuswamy scale (2019). The general mental ability of children's was interpreted according marks (calculated in per cent) obtained in the test and remarked in five categories as represented in table 2. The head size (cephalic index calculated by dividing maximum head breadth to maximum head length and multiplied by 100) of sample unit was calculated and categorized according to the classification given by Martine and Saller (1957).

Table 2: Norm for interpretation of general mental ability

Obtained Marks (%)	Remark
90-100	Outstanding
75-89	Excellent
56-74	Very Good
35-55	Good
Below 35	Scope for Improvement

Result

Table 3 shows the distribution of children's in different socio-economic class and respective head size. The maximum number of children's belongs to upper lower socio-economic class (40) and dolichocephalic head size (37) while the least, four children's belongs to the upper class and nine came in the category of brachycephalic head size. 27 children's falls within the upper middle socio-economic class and hyperdolichocephalic, mesocephalic head size. Remaining other children's belongs to lower middle (19) and lower (10) socio-economic class respectively. Out of 100 sample size 26 were outstanding, 25 were excellent, 20 were very good, 18 were good and 11 children's came in the category of scope for improvement.

Table 3: General mental ability in different socio-economic class and head size

Socio-Economic Class (n)	General Mental Ability											
	Outstanding (26)		Excellent (25)		Very Good (20)		Good (18)		Scope for Improvement (11)		Total	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Upper Class (4)	3	1	-	-	-	-	-	-	-	-	3	1
Upper Middle Class (27)	5	9	4	7	1	1	-	-	-	-	10	17
Lower Middle Class (19)	4	1	3	2	2	1	2	-	2	2	13	6
Upper lower Class (40)	3	-	2	5	5	8	6	7	3	1	19	21
Lower Class (10)	-	-	2	-	-	2	2	1	1	2	5	5
Total	15	11	11	14	8	12	10	8	6	5	50	50
Head Size (Cephalic Index)												
Hyperdolichocephalic (27)	3	3	-	5	2	4	5	2	2	1	12	15
Dolichocephalic (37)	5	3	3	5	3	4	4	5	2	3	17	20
Mesocephalic (27)	5	3	8	2	2	3	1	-	2	1	18	9
Brachycephalic (9)	2	2	-	2	1	1	-	1	-	-	3	6
Total	15	11	11	14	8	12	10	8	6	5	50	50

In table 4 an independent sample t-test confirms that there is no significant sexual difference found in cephalic index (t=-0.84;p<0.05). The mean and standard deviation of cephalic index was 74.15±4.41 and 74.98±5.10 for boys and girls respectively and the mean difference was -0.87. Again there is no significant difference found in general mental ability (t= 0.06;p<0.05) as mean and standard deviation of general mental ability test score were 69.52±24.66 for boys and 69.20±22.90 for girls with mean difference of 0.32. While significant difference exist for head circumference (t= 3.00;p<0.05). The mean and standard deviation of head circumference were 51.79±1.94 for boys and 50.68±1.73 for girls and the mean difference was 1.10.

Table 4: Sex difference in Cephalic Index, Head circumference and General Mental Ability

Test Variables		Mean	Standard Deviation	Mean Difference	t Calculated	Significance (2-tailed)
Cephalic Index	Boys (50)	74.15	4.41	-0.84	-0.87	Not significant
	Girls (50)	74.98	5.10			
Head circumference	Boys (50)	51.79	1.94	1.10	3.00	Significant
	Girls (50)	50.68	1.73			
General Mental Ability	Boys (50)	69.52	24.66	0.32	0.06	Not significant
	Girls (50)	69.20	22.90			

** 0.05 significant level*

Table 5 shows the Pearson's bivariate correlation coefficient, it shows a weak linear correlation between general mental ability and head size (cephalic index and head circumference; r=0.25, p<0.05 for both). Again Pearson's bivariate correlation coefficient shows a medium linear correlation (r=0.588,p<0.01) between parental socio-economic status and general mental ability.

Table 5: Correlation between test variables General Mental Ability with Cephalic Index, Head Circumference, and Parental

Socio-economic-educational status

Test Variables	General Mental Ability	
	Pearson's Correlation (r)	p-Value
Cephalic Index	0.25*	0.01
Head Circumference	0.25*	0.01
Parental Socio-economic-educational status	0.58**	0.00

** 0.05 Significant level; ** 0.01 Significant level*

Discussion

The present study purposes to assess the general mental ability of studied children's belonging to different socio-economic class; to examine sex difference in general mental ability and head size and to correlate the head size and parental socio-economic condition with general mental ability of studied children's. The study resulted that 26 children'swere outstanding, 25 were excellent, 20 were very good, 18 were good and 11 children's came in the category of scope for improvement belonging to different socio-economic class and head size as clearly represented in table 3. In the present study an independent sample t-test confirms that there was no significant sexual difference found in cephalic index ($t= -0.84; p<0.05$) and general mental ability ($t= 0.06; p<0.05$). While significant difference exist for head circumference ($t= 3.00; p<0.05$) among studied children's.

Similar studies were reviewed in the same line, reported varying results. There was no significant difference in mental ability found with respect to age ($F= 0.16$; $p>0.05$) and sex ($t= 0.08$; $p>0.05$) (Faremi et al., 2017). There was no significant difference in verbal absurdities with respect gender and age (Sikdar, 2015). Opposite to that again Sikdar (2015) reported that verbal analogy shown significant difference on the basis of gender ($t= 2.07$; $p<0.05$) and age ($t =2.73$; $p<0.01$). There were also significant difference in verbal classification ($t= 2.70$; $p<0.01$), verbal number series ($t= 3.57$, $p<0.01$), verbal reasoning ($t= 2.18$; $p<0.05$), non- verbal analogy ($t= 1.96$; $p<0.05$), non-verbal classification ($t= 2.13$; $p<0.05$), non-verbal number series ($t= 2.78$; $p<0.01$) and non-verbal reasoning ($t= 2.68$; $p<0.01$) on the basis of age. Low intelligence ($t= 9.18$; $p<0.01$) and achievement motivation level ($t= 3.44$; $p<0.01$) were reported among Santal against non-Santal students (Singh & Sinha). Significant difference in Mental Ability of B.Ed. Teacher Trainees was again reported as they belong to different stream ($t= 2.97$; $p<0.05$), institution types ($t= 10.11$; $p<0.05$) and parental income ($F= 8.46$; $p<0.05$) (Chiramel& Vasuki, 2019).

Again in the present study it was tried to correlates the head size with general mental ability. Table 5 shows the Pearson's bivariate correlation coefficient resulted a weak linear correlation between head size (cephalic index and head circumference; both had same ($r=0.25$, $p<0.05$ value) with general mental ability. But medium linear correlation ($r=0.588, p<0.01$) exist between parental socio-economic status and general mental ability.

Similarly Ayotola & Adedeji (2009) reported that there were low correlation of student's mathematics achievement with age ($r= -0.027$; $p< 0.05$) and general mental ability($r= 0.179$; $p<0.05$). A positive correlation ($r= 0.28$) between full scale IQ and head circumference was reported at (0.005) level of significance (Desch *et al.*, 1990). Lindley et al., (1999) also explain head circumference correlates ($r= 0.55$; $p<0.003$) with brain volume. It was illustrated that the person born with small head circumference at birth faces low early-life school performance and lifetime occupational prestige

(Dekhtyar et al., 2015). The general mental ability was significantly correlated (r = 0.83; P<0.01) with academic performance (Dev, 2016).

Conclusion

Thus present study concluded that the maximum number of children's (40) belongs to upper lower class and dolichocephalic head size (37). Least, four children's belongs to the upper socio-economic class and nine came within the brachycephalic head size. Out of 100 children's 26 were outstanding, 25 were excellent, 20 were very good, 18 were good and 11 children's came in the scope for improvement. There was no significant sexual difference found between incephalic index (t= -0.84; p<0.05) and general mental ability (t= 0.06;p<0.05). But there was significant difference exist for head circumference (t= 3.00;p<0.05). At last Pearson's bivariate correlation coefficient test result shown a weak linear correlation (r= 0.25; p<0.05)) between head size (cephalic index/head circumference) and general mental ability. But there was medium correlation (r= 0.58; p<0.01) between parental socio-economic-educational status and general mental ability found in the study. Finally it is suggested to conduct the study in large sample size or try to compare the general mental ability and head size of enrolled normal children's with physically disabled (blind, feebleminded) or genetically abberated enrolled children's to see the differences which is impactfully associated with development process of children's and it is well known fact the cognitive and mental outcomes is key influencing factors of later life success of the children's.

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Conflict of Interest *The authors declare that there is no conflict regarding publication of manuscript and authorship.*

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Images

Figure 1: Implications of General Mental Ability (Bradley and Corwyn, 2002; Dekhtyar et al., 2015).