

FAMILY SIZE, GENERAL APTITUDE AND ACADEMIC ACHIEVEMENT

Manjula Mukerjee & S. Chatterji

*Psychometric Research & Service Unit, Indian Statistical Institute
Calcutta-700 035*

(This paper aims at studying the effect of family size on the intelligence level and academic achievement of individuals. 380 fresh graduates constituted the sample. A general aptitude test was conducted on these subjects to assess their intelligence level. Graduate examination marks of these subjects were taken as the index of their academic achievement. The analysis of the data show that small family size and less number of siblings were congenial for development of intelligence and better academic achievement, though these relations were not very strong.

When the subjects were classified on the basis of aptitude scores, it was observed that the academic performance of subjects belonging to high aptitude group were more affected by family size or number of siblings than the low aptitude group.
-Editors)

Parental care and attention are of crucial importance for mental and physical development of a child. But, with the increase in the number of children in the family it is bound to get reduced. In absence of adequate parental attention and care the academic achievement of a child is likely to get hampered. In foreign countries a number of studies were conducted to investigate the effect of family size on the intellectual development of the child. A consistent negative relationship, though not very strong, is observed between these two variables in both cross-sectional and time series data.

Bhar and Leigh (1978) analysed a large number of cases belonging to the age group 14 to 24 years and observed negative correlations between family size intelligence and education though the association was negligible when relevant variables were controlled. Cicirelli (1976) observed a weak negative relationship between family size and measured intelligence. Davis, Cohan and Bashi (1977) conducted a cross cultural study with subjects whose fathers immigrated from Europe, America, South Africa and Australia to Middle Eastern and North African countries. Achievement was found to decrease as a function of birth order in small families and increase as a function of birth order in large families. Dandes (1969), Belmont and Marolla (1973), Marks and Zajonc (1975) observed that family size, order of birth and length of birth interval played an important role in influencing intellectual development of an individual.

The purpose of the present study is to investigate this problem under Indian condition and to find out whether the same trend persists in our country or not. It may be mentioned here that barring a few, most of the studies conducted in India in this context dealt with the relation between socio-economic status and academic achievement (Ahluwalia and others, 1975; Chopra, 1966; Kakar, 1970; Mathur and others, 1972; Sahu, 1979), not the family size or number of siblings etc., as done in foreign countries.

Subjects :

The sample comprised of 380 subjects. They were all graduates in different disciplines viz., Science, Humanities, Commerce. They applied for the posts of Management Trainee in a large public sector organisation. Their ages varied from 22 to 28 years.

Procedure and Results :

A General Aptitude test was administered the subjects to assess their level of intelligence. This test was specially designed for candidates at the graduate level and consisted of 200 items in areas like Verbal Reasoning, Quantitative Reasoning, Comprehension and so on.

The University examination mark at the Graduate level was available for each subject in terms of percentage. A short biographical questionnaire was administered on the subjects to collect information about their "family size", "number of brothers & sisters" etc.

To start with the correlations between "number of brothers and sisters", "family size", General Aptitude score and University examination marks were calculated and these values are presented in Table 1.

TABLE-1
CORRELATIONS BETWEEN GENERAL APTITUDE SCORE, UNIVERSITY EXAMINATION MARKS, NUMBER OF SIBLINGS AND FAMILY SIZE
(N = 380)

<i>Variable</i>	<i>GA</i>	<i>UM</i>	<i>NS</i>	<i>FS</i>
General Aptitude score (GA)	—	·50	·20	·24
University Examination marks (UM)	·50	—	·19	·07
Number of siblings (NS)	·20	·19	—	·40
Family size (FS)	·24	·07	·40	—

All the correlations were significant at the 1% level except one i e ·07.

TABLE-2
 MEANS, STANDARD DEVIATIONS OF GENERAL APTITUDE SCORES AND UNIVERSITY EXAMINATION MARKS

Number of siblings	N	Aptitude score		University marks		Number of family members	N	Aptitude score		University marks	
		Mean	s. d.	Mean	s. d.			Mean	s. d.	Mean	s. d.
1	7	120.00	33.09	62.28	11.74	1	8	121.00	28.88	58.98	9.27
2	42	132.59	24.62	60.99	6.69	2	6	119.00	33.14	57.90	6.24
3	76	125.78	25.27	60.82	9.89	3	29	122.79	28.41	59.80	9.08
4	73	118.49	26.02	59.33	10.17	4	64	131.55	22.62	60.51	9.85
5	73	115.77	28.51	57.95	8.91	5	74	125.09	23.26	60.52	11.75
6	54	111.11	23.37	56.48	9.38	6	86	116.42	24.49	56.03	8.18
7	19	111.11	25.30	51.15	14.07	7	57	116.16	25.28	57.27	12.05
8	19	115.95	21.11	54.44	8.13	8	34	111.73	24.06	58.54	7.43
9	9	117.56	28.10	60.71	7.49	9	9	99.44	16.17	55.12	1.85
10 and above	8	113.75	27.90	56.72	5.30	10	11	109.64	32.78	54.89	6.47
						11	6	100.00	25.10	56.39	10.89
						12	6	101.17	28.65	55.71	5.96
						13 and above	10	109.90	26.10	60.72	11.66

The correlation between number of sibling and family size was .40 and this was not so high that the two variates could be treated as identical. Hence, it was decided to use them separately in course of further analysis of the data.

Low negative correlations between "number of siblings", "family size", and general aptitude score and university examination marks corroborated the results obtained in studies already conducted. Hence, it may be said that the effect of family size, etc., upon the intellectual development of individuals in our country follows the same pattern as observed in other countries. The correlation between general aptitude score and university examination marks was as high as .50.

Next, the subjects were divided into different subgroups once on the basis of "number of siblings" and then on the basis of "family size". The subgroup means and standard deviations of the general aptitude score and university examination marks are presented in Table 2.

It is apparent from the results that the average of general aptitude scores decreased as the number of siblings or the family size increased. It attained the maximum in subgroups having only two siblings and in subgroups having family size equal to four. Similar results were obtained with the university examinations marks.

To test whether the subgroups formed on the basis of "number of siblings", and "family size", differed significantly so far as the average of the general aptitude score and the university examination marks were concerned, the technique of analysis of variance was applied. The results are presented in Table 3.

The results show that there were significant difference between the subgroups so far as general aptitude score was concerned whereas this difference was not significant with respect to university examination marks in subgroups formed on the basis of "family size".

In order to identify the subgroups which differed from others significantly, t-test was applied and the significant t-values are presented in Tables 4 and 5.

TABLE-3
ANALYSIS OF VARIANCE

Source	d. f.	General	F-ratio	University	F-ratio
		Aptitude score M. S.		Examination marks M. S.	
Number of siblings	9	1863-39		267-94	
			2-78**		2-80**
Within Group	369	669-35		103-15	
Total	378				
Family size	12	2096-60		122-38	
			3-42**		1-24
Within Group	367	613-68		98-54	
Total	379				

**Significant at the 1% level.

TABLE-4
SIGNIFICANT T-VALUES - GENERAL APTITUDE TEST SCORE

Number of siblings	Number of siblings				
	4	5	6	7	8
2	2.88*	3.30**	4.30**	3.09**	2.69**
3	—	2.26*	3.41**	2.26*	—

Number of family members	Number of family members							
	6	7	8	9	10	11	12	13
3	—	—	—	3.10**	—	1.98*	—	—
4	3.66**	3.51**	3.96**	5.27**	2.13*	2.97**	2.78**	2.62**
5	2.14*	2.08*	2.71**	4.25**	—	2.37*	2.13*	—
6	—	—	—	2.76**	—	—	—	—
7	—	—	—	2.63**	—	—	—	—

* Significant at the 5% level

** Significant at the 1% level

TABLE-5
SIGNIFICANT T-VALUES — UNIVERSITY EXAMINATION MARKS

Number of siblings	Number of siblings			
	6	7	8	9
1	—	2.03*	—	—
2	2.28*	2.76**	2.73**	—
3	2.54**	2.83**	2.93**	—
4	—	2.13*	—	—
5	—	2.01*	—	—
7	—	—	—	2.34*

Number of family members	Number of family members		
	6	9	10
3	—	2.61**	—
4	2.82**	3.91**	2.43*
5	2.64**	3.60**	2.37*
8	—	2.43*	—

* Significant at the 5% level

** Significant at the 1% level

It may be seen that the average aptitude scores of subgroups having 2 or 3 siblings were significantly higher than those of the subgroups with 4 or 5 or 6 or more number of siblings. But, the effect was not uniform. For example, the average aptitude score of subgroup with 3 siblings was found to be significantly higher than that of the subgroup with 7 siblings but this was not significant for subsequent subgroups i. e., subgroups with 8 siblings or 9 siblings and so on. Similar results were also obtained with the university marks. Hence, one cannot conclude that with the increase in the number of siblings the level of performance of the subjects will uniformly decreases. After a certain point the effect may not be as strong as it is at the beginning. As the family size increased the average aptitude score decreased but not steadily; it fluctuated in between.

In order to analyse the effect of family size and the number of siblings on university examination marks, the subjects were divided into two halves, High Aptitude group and Low Aptitude group, on the basis of their aptitude score. The averages of the university marks for subjects having varying number of siblings and family members were calculated for these two subgroups and are presented in Table 6.

TABLE-4
 MEANS, STANDARD DEVIATIONS OF UNIVERSITY EXAMINATION MARKS IN
 HIGH AND LOW APTITUDE GROUPS

Number of siblings	High Aptitude		Low Aptitude		Number of family members	High Aptitude		Low Aptitude	
	Mean	s. d.	Mean	s. d.		Mean	s. d.	Mean	s. d.
1	70.99	3.89	50.67	6.03	1	60.02	8.88	57.24	11.16
2	62.35	8.94	56.76	11.13	2	60.14	1.43	55.67	8.96
3	64.38	8.62	55.36	9.30	3	63.77	9.75	54.91	5.15
4	65.15	9.87	53.66	6.72	4	64.75	7.87	51.82	7.80
5	64.10	7.91	53.14	6.37	5	64.43	11.02	54.44	10.30
6	62.49	9.55	53.71	8.00	6	60.65	7.72	52.41	6.62
7	56.79	8.21	48.55	15.66	7	64.89	8.19	51.73	11.44
8	56.80	7.33	52.32	8.59	8	60.68	7.05	57.05	7.49
9	64.48	8.16	56.00	2.71	9	-	-	55.12	1.85
10 and above	58.15	5.89	55.29	5.84	10	58.80	2.49	51.63	7.13
					11	-	-	53.98	11.60
					12	-	-	54.80	6.18
					13 and above	72.84	11.99	55.53	7.15

The averages varied more in high aptitude groups than in the low aptitude groups. *t*-test was applied to identify the subgroups which differed significantly from others with respect to average university marks and the significant *t*-values are presented in Table 7.

TABLE-7
SIGNIFICANT T-VALUES - UNIVERSITY EXAMINATION MARKS
(High Aptitude group)

Number of family members	Number of family members				
	4	5	6	7	10
2	3.16*	2.33*	—	2.55**	—
4	—	—	2.19*	—	3.63**
5	—	—	—	—	2.84**
7	—	—	—	—	3.04**

Number of siblings	Number of siblings							
	2	3	4	5	6	7	8	10 and above
1	3.43**	2.85**	2.29*	2.87**	2.81**	3.67**	4.55**	3.64**
3	—	—	—	—	—	2.12*	2.75**	—
4	—	—	—	—	—	2.24*	2.83**	2.08*
5	—	—	—	—	—	2.01*	2.60**	—

* Significant at the 5% level

** Significant at the 1% level

The performance of subjects with high aptitude group was most affected by "family size" and "number of brothers and sisters". Intelligent subjects did better in the university examination when they had small family and less number of brothers and sisters than otherwise. But, the low intelligent group remained more or less invariant. In this case out of 90 comparisons only two were significant. Subgroups with 6 and 7 family members differed significantly from the subgroup with 8 family members.

Finally, regression analysis was conducted to predict university examination marks on the basis of general aptitude score, Family size and number of brothers and sisters. The regression equation obtained is as follows :

$$\hat{y} = 36.15 + 0.19 X_1 - 0.66 X_2 + 0.35 X_3$$

where \hat{y} = Predicted university examination marks

X_1 = General aptitude score

X_2 = Number of brother and sisters

X_3 = Family size

The corresponding multiple correlation was .52, which was slightly higher than the observed correlation between university marks and aptitude score (.50). It indicates that the academic achievement mainly depends upon the intelligence level of the subjects and the efficiency of prediction can not be much increased by adding the two biographical factors along with the aptitude score. It may be noted that this increase in correlation, however small it might be, was significant. Hence, the effect of family size and number of siblings upon academic achievement though not very strong, should not be totally ignored.

Conclusion :

The results of the present investigation more or less corroborate those of the studies conducted earlier, i. e. small family, less number of children, create a congenial atmosphere for better academic achievement and intellectual development of an individual. It was observed that the effect was more significant so far as the performance in aptitude test was concerned than that of the university examination. But, this effect was not uniform. It was further observed that the performance of the subjects having high aptitude score in university examination was more affected by family size or number of brothers and sisters than that of the subjects with low aptitude score.

The prediction of university marks could be slightly improved when factors like family size and number of siblings were taken into account along with the general aptitude score. It is acknowledged that other factors like parent's educational level, economic condition of the family, interest and motivation of the individual, which may have significant positive contribution towards academic achievement of the subjects, are not taken in this study. It is felt that, detailed investigation considering all these factors simultaneously is worth doing.

REFERENCES :

- Abulwalis, S. P. & Deo, S. A. - Study of relationship between socio-economic status and academic achievement of high school students. *Journal of Educational Research & Extension*, 1975, 12, 1-5.
- Bahr, Stephen J. & Leigh, Geoffrey K. (Bringham Young K) - Family size, Intelligence & expected education. *Journal of Marriage & the Family*, 1978, 40, 331-335.
- Chopra, S. L. - Socio-economic background and failure in the high school examination. *Educational & Psychological Measurement*, 1966, 26, 495-497.

- Cierelli, Victor G. - Sibling structure & Intellectual ability. *Developmental Psychology*, 1976, 12, 369-370.
- Dandes, H. M. and Dow, D. - Relation of Intelligence to family size and density. *Child Development*, 1969, 40, 641-645.
- Davis, D. J.; Cohan, S. and Basbi, J. - Birth order and intellectual development : The confluence model in the light of crosscultural evidence. *Science* 1977, 196, 1470-1472.
- Kakar, S. B. - Popularity, Intelligence, economic status and academic achievement. *Indian Journal of Psychology*, 1970, 45, 233-237.
- Mathur, S. S. and Hundal, B. S. - School achievement and intelligence in relation to some SES background factors. *Journal of Educational Psychology*, 1972, 30, 42-47.
- Sahu, S. - Effect of social disadvantage on verbal competence and language achievement. *Psychological Studies*, 1979, 24, 66-72.
- Zajonc, R. B. and Marcus, G. B. - Birth order and intellectual development. *Psychological Review*, 1975, 82, 74-88.
-