

## A FACTOR ANALYTIC STUDY OF APTITUDE, INTEREST AND ACADEMIC ACHIEVEMENT

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(The present study attempts to find out the relation between aptitude and interest with academic achievement on a group of school going children. The sample consisted of 75 girl students reading in Class VIII in an English medium school at Calcutta. Differential Aptitude Test Battery of Mukerjee and Chatterji's Non-language Preference Record (CNPR) were administered on them and their last year's half year's as well as annual examination marks were collected later on. The results reveal that most of the aptitude tests included in the test battery have much relation to academic achievement whereas the fields of interests are not much associated with this.

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### **Introduction :**

Success in academic field depends to a great extent upon the potential abilities i. e., aptitudes and academic interests of the students. So, in choosing a particular stream of study for a student, care has to be taken to match his level of ability and pattern of interest to the requirement of the field concerned.

The purpose of the present investigation is to find out the relation between aptitudes and interest with academic achievement of a group of school-going students.

### **Method :**

**Subjects :** The subjects were 75 girl students reading in Class VIII in an English Medium school at Calcutta.

**Tests used :** The Differential Aptitude Test Battery developed by Mukerjee (1965) and Chatterji's Non-language Preference Record (1960) were administered on all the subjects to measure aptitudes and fields of interests respectively.

**(a) Differential Aptitude Test Battery :** The Differential Aptitude Test Battery is developed by Mukerjee (1965) under Indian condition and these tests are suitable for students reading in Class VIII. The battery is designed to measure those potential abilities of the students which in different combinations are necessary for success in Science, Humanities and Commerce streams. The battery includes the following tests: ( i ) English Spelling (E. K. 1), ( ii ) English Usage (E. K. 2), ( iii ) English Comprehension (E. K. 3) ( iv ) Clerical Aptitude, Matching (C. A. 1), ( v ) Clerical Aptitude, Coding (C. A. 2) ( vi ) Abstract Reasoning (A. R.), ( vii ) Verbal Reasoning

(V. R.) (viii) Mathematics Knowledge and Aptitude (M. K.), (ix) Scientific Knowledge and Aptitude (S. A.), and (x) Mechanical Comprehension (M.C.).

(b) **Chatterji's Non-language Preference Record (CNPR)**: The inventory measures interests in ten broad fields, viz. (i) Fine arts (Fine), (ii) Literary work (Lit.), (iii) Scientific (Sci.), (iv) Medical (Med.), (v) Agricultural (Agri), (vi) Technical (Tech.), (vii) Crafts (Craft), (viii) Outdoor (Out.), (ix) Sports (Sport), and (x) Household work (Hous.). It is a non-language forced-choice inventory and is used by State Bureau of Vocational Guidance in different regions of India. Each of 150 items of the inventory represents three pictures indicating three different activities. The subject is to indicate those two activities which he likes the most and likes the least. There is no time limit but usually students take 45 minutes to complete the inventory.

(c) **Academic Achievement**: The annual as well as half yearly examination marks obtained by these students were taken as index of academic achievement. The average of these two examination marks were considered for analysis. The subjects that were taken into consideration were: (i) English I (Eng. I), (ii) English II (Eng. II), (iii) Mathematics (Maths.), (iv) Language II (Lang. II), (v) Language III (Lang. III), (vi) Geography (Geog.), (vii) History (Hist.), (viii) Physics (Phy.), (ix) Chemistry (Chem.), and (x) Biology (Bio.).

#### Results and Discussion :

First of all the relationships between different aptitude test scores, interest scores and marks obtained in different subjects were obtained by computing the correlations among the variables.

The correlations between aptitudes and school examination marks and those between interest and school examination marks are presented in Tables 1 and 2, along with means and standard deviations.

It is clear from Table 1 that almost all the aptitude scores were significantly correlated with school examination marks except the Clerical Ability and English Comprehension. This shows that for high academic achievement, abstract reasoning, verbal reasoning, scientific aptitude, mathematical aptitude, mechanical comprehension, etc. are important.

Table 2 shows that Scientific, Technical, Medical and Craft interests were somewhat positively and significantly related with academic achievement. But, interests in other fields for example, Fine Arts, Outdoor Sports and Household Work were found to be negatively related with educational attainment. It indicates that those who are interested in outdoor or in sports or in household activities are not good in academic field.

TABLE-I  
 MEAN, S, D, AND SIGNIFICANT CORRELATIONS BETWEEN APTITUDE AND SCHOOL  
 EXAMINATION MARKS (N = 75)

<i>Aptitude School Exam. Marks</i>	<i>A.R</i>	<i>V.R</i>	<i>S.A</i>	<i>M.K</i>	<i>MC</i>	<i>E.K 1</i>	<i>E.K 2</i>	<i>E.K 3</i>	<i>C.A 1</i>	<i>C.A 2</i>	<i>Mean</i>	<i>S.D</i>
Eng. I	.47**	.40**	.36**	.45**	.27*	.23*	.42**	—	—	—	51.49	9.62
Eng. II	.48**	.33**	.49**	.8**	.34**	—	.36**	—	—	—	50.98	11.25
Maths.	.56**	.49**	.51**	.87**	.51**	—	—	—	—	—	41.57	17.81
Lang. II	.33**	—	.28*	.35**	.27*	—	—	—	—	—	45.97	14.81
Lang. III	.38**	.30**	.38**	.38**	.39**	—	.27*	—	—	—	48.69	17.92
Geog.	.49**	.32**	.56**	.67**	.36**	.29*	.28*	—	—	—	49.59	12.78
History	.41**	.32**	.55**	.67**	.36**	.27*	.27*	—	—	—	47.73	12.87
Physics	.54**	.41**	.55**	.71**	.40**	.23*	—	.23*	—	—	45.95	14.90
Chemistry	.44**	.38**	.52**	.56**	.32**	.27*	.27*	—	—	—	50.45	13.12
Biology	.47**	.35**	.57**	.65**	.33**	.26*	—	—	—	—	47.61	15.51
Mean	20.10	25.55	19.64	14.72	23.96	44.29	15.23	4.79	184.51	162.40		
S.D	7.49	4.43	4.40	4.92	2.98	8.23	3.45	1.51	11.01	32.69		

TABLE - 2  
 MEAN, S. D. AND SIGNIFICANT CORRELATIONS BETWEEN INTEREST AND SCHOOL EXAMINATION MARKS (N = 75)

Interest School exam. Marks	Fine Arts	Lit.	Sci.	Med.	Agri.	Tech.	Craft	Out	Sport	House Hold	Mean	S. D.
Eng. I	—	-.42**	—	—	—	—	—	—	—	—	51.49	9.62
Eng. II	—	—	—	—	—	—	—	—	—	-.32**	50.98	11.25
Math.	-.43**	-.39**	—	—	-.36**	—	-.29*	-.37**	-.42**	-.42**	41.57	17.81
Lang. II	-.26*	-.29*	—	—	-.29*	.23*	-.23*	-.32**	-.30**	-.30**	45.97	14.81
Lang. III	-.34**	—	.25*	—	-.24*	—	-.23*	-.30**	-.39**	-.39**	48.69	17.92
Geog.	-.43**	—	.33**	—	.30**	—	-.24*	-.29*	-.41**	-.41**	49.57	12.78
History	-.43**	—	.33**	—	.34**	.24*	-.22	-.31**	-.40**	-.40**	47.73	12.87
Physics	-.58**	—	.50**	.29*	.46**	—	-.33**	-.42**	-.51**	-.51**	45.95	14.90
Chemistry	-.46**	—	.32**	—	.28*	.28*	-.23*	-.30**	-.46**	-.46**	50.45	13.12
Biology	-.48**	—	.39**	.25*	.33**	.24*	-.30**	-.35**	-.16**	-.16**	47.61	15.51
Mean	30.87	34.09	36.33	42.85	22.21	20.60	16.45	24.65	27.41	27.53		
S. D	11.61	7.39	15.95	16.99	6.59	8.52	5.47	13.25	14.22	10.39		

Next, the intercorrelations among different aptitudes, interests and school examination marks were computed and were used for factor analysis. The factor analysis was done separately to identify the common factors underlying the aptitudes, interests and academic achievements. The principal component method varimax rotation was applied. Table 3 presents the sorted rotated factor loading matrix of aptitude test scores.

**TABLE-3**  
SORTED ROTATED FACTOR LOADING MATRIX OF  
APTITUDE TEST SCORES

	<i>Factor 1</i>	<i>Factor 2</i>	<i>Factor 3</i>
Mathematical Knowledge	.81	.00	.00
Mechanical Comprehension	.80	.00	.00
Verbal Reasoning	.78	.00	.00
Abstract Reasoning	.76	.39	.00
Scientific Aptitude	.62	-.28	.46
Clerical Aptitude 2	.00	.78	.00
Clerical Aptitude 1	.00	.66	.00
English Knowledge 1	.00	.52	.00
English Knowledge 3	.00	.00	.82
English Knowledge 2	.00	.34	.61

Table 3 indicates that there were three factors underlying the ten aptitude tests. Mathematical Knowledge, Mechanical Comprehension, Verbal Reasoning, Abstract Reasoning and Scientific Aptitude all had high loadings on Factor 1. These tests mainly measure reasoning power of the individual and hence Factor 1 may be termed as "Reasoning Power". Clerical Aptitude I (Matching), Clerical Aptitude II (Coding), and E. K. I spelling had high loadings for Factor 2. All these tests were speed test and require memory. So Factor 2 may be identified as factor involving "Speed with attention to detail" necessary for clerical work. There was a third factor. Mainly English Knowledge and Comprehension had high positive loadings on this factor. This factor is identified as "Language factor".

Next, the factor analysis of interest scores was done. The sorted rotated factor loading matrix is presented in Table 4

**TABLE-4**  
**SORTED ROTATED FACTOR LOADING MATRIX OF**  
**INTEREST SCORES**

	<i>Factor 1</i>	<i>Factor 2</i>	<i>Factor 3</i>
Medical	.92	.00	.00
Outdoor	-.84	.00	.28
Scientific	.84	.40	.00
Literary	.82	.00	.00
Sports	-.80	-.45	.00
Craft	.00	.91	.00
Technical	.36	.83	-.27
Fine arts	-.28	-.42	.78
Agricultural	.00	.00	.75
Household	.00	-.31	.73

From Table 4 it is observed that there were three factors underlying 10 different fields of interests. Medical, Scientific, Literary and Technical interests had positive loadings on Factor 1. But, Outdoor, Sports had been found to have significant negative loadings on this factor. It clearly indicates that those who are interested in scholastic type of activities are not much interested in outdoor & sports activities. Factor 1 can be identified as "Scholastic Interest". Craft, technical and scientific interests had significant positive loadings on Factor 2. But, sports, fine arts and household work had negative loadings on this factor. It indicates that the subjects who were interested in technical type of activities were not much interested in sports, household works or fine arts. This factor is identified as "Technical Interest". Fine arts, agricultural and household activities were found to have significant loadings on Factor 3. This factor is identified as "Aesthetic Interest".

Next, the factor analysis of school examination marks were conducted and it is presented in Table 5.

**TABLE-5**  
**SORTED ROTATED FACTOR LOADING MATRIX OF ACADEMIC**  
**ACHIEVEMENT**

	<i>Factor 1</i>	<i>Factor 2</i>
History	.88	.35
English II	.86	.00
Geography	.83	.44
English I	.83	.00
Biology	.77	.51
Physics	.72	.53
Mathematics	.71	.41
Chemistry	.63	.60
Language 3	.00	.89
Language 3	.27	.80

It is observed from Table 5 that there were only two factors underlying 10 academic achievement scores. Most of the subjects taught in school for e. g., History, English, Geography, Biology, Physics, Mathematics and Chemistry had high positive loadings on Factor 1. This factor can be clearly identified as "Scholastic achievement". There was also a second factor. Language had very high loadings on this factor. It is interesting to note that except English I and II all other subjects had positive loadings of medium magnitude on this factor. This factor may be identified as "Ability to express ideas in writing" and this ability is required for passing examinations of different subjects.

Apart from this, factor analysis was separately done for academic achievement and aptitude, and for academic achievement and interest to find out the underlying common factors. Finally, the combined factor analysis was done to identify the common factors underlying aptitudes, interests and academic achievement scores. More or less the same results were obtained from both the analyses. Eight factors were extracted from this combined analysis. The following points can be highlighted from the result.

1. It was observed that some of the aptitudes were grouped with academic achievement. This indicates that the academic achievement of an individual depends to a great extent upon his/her Mathematical aptitude, Scientific aptitude, Abstract reasoning, Verbal reasoning and English

knowledge. It was also important to note that Fine-arts and Household work had negative loadings in this factor which means that high academic achievers are usually less interested in Fine-arts or Household work.

2. The second thing which can be highlighted from this study is that, interest is not found to be much related to academic achievement. Medical, Scientific, Literary and Technical interests have high positive loadings on this Factor; whereas Outdoor, Sports and Fine-arts interests have high negative loadings. This shows that the subjects who have scholastic interests are not interested in Outdoor, Sports and Fine-arts.

3. The findings also reveal that Verbal Reasoning, Abstract Reasoning and Mechanical Comprehension can predict achievement in Mathematics and Physics to some extent as all these have significant loadings on the third Factor.

4. It is interesting to note that Clerical Aptitude is clubbed with English spelling and usage (grammar) and Abstract Reasoning. It may be due to the fact that all these involve attention to details. To achieve high marks in English spelling, English usage, Matching, Coding and Abstract Reasoning, attention to details and memory are required and that is why these tests are found to be clustered together.

5. Achievement in Bengali language and aptitude in English Knowledge were grouped under a common factor. It indicates that this involves a different factor which is not related with achievement in any other school subjects, aptitudes and interests.

#### **Conclusion :**

The factor structure obtained through analysis in the present investigation reveals that most of the aptitudes and achievement in school subjects were related with each other. But, the fields of interest were not much associated with academic success. It was observed to be a separate entity. It may also happen that these students showed their interest superficially for certain areas though were not actually much interested in those fields. But, to get a more clear picture about the contribution of interest, further study with larger number of cases on both the sexes is required.

#### **REFERENCES :**

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