CHAPTER - III

SELECTION OF THE TEST.
SELECTION OF THE TEST:

The purpose of this enquiry was to make a comparative study of the levels of intelligence among different professional groups. The professional groups included in the study were, students of Engineering, Medicine, Law Teacher's Training Colleges and students of Diploma in Engineering.

This required, in the first instance, the selection of an appropriate intelligence test. Since the testing programme in our country is itself a recent undertaking, tests for use at the adult level are not easily available. Moreover, no attempts seem to have yet been made to develop a suitable index of intelligence for the university going population.

Some tests in the Hindi language are available but they do not seem to be suited for the purpose of this study. This is because the medium of instruction for higher education, and particularly for professional courses is English in some places, while in some other places it is Hindi. The student community in almost all the universities comprises students from different parts of the country, where they have their own regional languages or English as the medium of instruction. As such, their proficiency in Hindi is at best uneven and
cannot be taken for granted. Besides, English is a language of compulsory study in all Indian universities up to the graduate level and may be assumed to be equally difficult or equally easy for the population of university students.

REVIEW OF AVAILABLE ADULT INTELLIGENCE TESTS:

There are several foreign tests of general intelligence which could be used at the college level, such as the College Qualification Test by George. I. Bennett, M.G. Bennett W.L. Wallace and A.G. Wesman; The School College Ability Test (S.C.A.T.) by the Cooperative Test Division, Educational Testing Service, Princeton, New Jersey; The Miller-Analogies Test by W.S. Miller; The S.R.A. College Classification Test by T.C. Thurstone, and L.L. Thurstone; The Ohio State University Psychological Test by Herbert, A.Toops, and several other tests.

Among the available tests the American Council on Education (A.C.E.) Psychological Examination (a test of general intelligence) was considered a more suitable instrument for the present study. It has the following attributes.

1. The test samples a comprehensive range of intellectual abilities - Verbal, Numerical and Spatial.

It has two broad dimensions, i.e.,

(a) L (Linguistic) and

(b) Q (Quantitative).
Each of the broader scales comprises three sub-tests, as given in table 3.1 below.

Table 3.1

<table>
<thead>
<tr>
<th>(Linguistic)</th>
<th>No. of Items</th>
<th>(Quantitative)</th>
<th>No. of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completion</td>
<td>30</td>
<td>Arithmetic</td>
<td>20</td>
</tr>
<tr>
<td>Same-Opposite</td>
<td>50</td>
<td>Figure-Analogies</td>
<td>30</td>
</tr>
<tr>
<td>Verbal-Analogies</td>
<td>40</td>
<td>Number-Series</td>
<td>30</td>
</tr>
<tr>
<td>Total</td>
<td>120</td>
<td>80</td>
<td></td>
</tr>
</tbody>
</table>

2. It is widely used in the United States as an instrument of research and for purposes of selection for admission to various courses of studies and for placement and guidance.

3. The test was prepared by the Educational Testing Service, Cooperative Test Division, from material developed by L.L. Thurstone and T.G. Thurstone, who are renowned for their contribution in the field of psychometrics and factorial analysis theory.
4. Other good features of the test are the relative ease of administration, simplicity of scoring, and the availability of practice items at the beginning of each sub-test.

According to the manual\textsuperscript{1}, the test should be found useful in handling those problems in which it is advisable to distinguish a student's mental abilities from his high school preparation and his industry.

**VALIDATION STUDIES OF THE A.C.E. PSYCHOLOGICAL EXAMINATION:**

The A.C.E. test is of wide applicability and has frequently been validated against several important tests of intelligence. Traxler\textsuperscript{2}, reported coefficients of .78 and .82 between The Otis Self-Administering Test (Higher Form) and the A.C.E. Psychological Examination.

Anastasi\textsuperscript{3}, has reported coefficients of correlations between School College Ability Test (S.C.A.T.) and A.C.E. The total score on the two tests correlated .88 and .87 in High School and College samples respectively. Verbal-linguistic scores correlated .89 and .85 and Q scores correlated .75 and .76 respectively.

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Quartini et al.\(^1\), reported a correlation of .61 between Wechsler-Bellevue and A.C.E. test scores. Super\(^2\), shows that the total scores on the A.C.E. test correlate .65 with the Cooperative Survey Test of Mathematics, but Q (Quantitative) and L (Linguistic) scores correlate .56 with the same test. He further obtained a correlation of .66 with the Nelson-Denney Reading Test.

Shanner and Kuder\(^3\), correlated the A.C.E. Psychological Examination with grades on a Comprehensive Examination given to 501 students of the University of Chicago. He obtained the following correlations between grades on the Comprehensive Examination and the A.C.E. total scores.

Table 3.2

<table>
<thead>
<tr>
<th>Biological Sciences</th>
<th>Humanities</th>
<th>Physical Sciences</th>
<th>Social Sciences</th>
<th>Average Exam. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.C.E. Psychological Exam.</td>
<td>.48</td>
<td>.48</td>
<td>.48</td>
<td>.57</td>
</tr>
</tbody>
</table>

The correlations between the A.C.E. test and some other tests of intelligence quoted above show a consistent relationship of fairly high degree. The range of correlations is from .66 to .88 and indicates that the A.C.E. test may reasonably be considered to be measuring intellectual capacity.

**Intercorrelations Between Sub-tests.**

Freeman¹, has reported intercorrelations among the six A.C.E. sub-tests. These are given in table 3.3.

Table 3.3

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>Q</th>
<th>L Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Figure-Analogies</td>
<td>.448</td>
<td></td>
<td>.349</td>
<td>.285</td>
<td>.529</td>
<td>.836</td>
<td>.442</td>
<td>.690</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Number Series</td>
<td></td>
<td>.323</td>
<td>.283</td>
<td>.498</td>
<td>.847</td>
<td>.421</td>
<td>.682</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Completion</td>
<td></td>
<td></td>
<td>.658</td>
<td>.574</td>
<td>.436</td>
<td>.829</td>
<td>.757</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Same Opposite</td>
<td></td>
<td></td>
<td></td>
<td>.563</td>
<td>.351</td>
<td>.904</td>
<td>.766</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Verbal Analogies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.611</td>
<td>.822</td>
<td>.836</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Q Scores</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.530</td>
<td>.827</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. L Scores</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.915</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Q + L</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Correlation of L and Q with their respective sub-tests are markedly high. The correlation between Q scores with scores on the language sub-tests and correlation between Q and L are not high. The two parts L and Q correlate high with the total test scores. The intercorrelations generally support the view that Q and L sub-tests of the A.C.E. Psychological Examination are measures of two different constellations of abilities and the scores on the whole test are the measure of an ability which includes several, possibly distinct intellectual functions.

The A.C.E. Psychological Examination is one of the older, well known and reputable psychological instrument on the market and its continued use by workers and institutions in the U.S.A. and in other countries lends it considerable weight, value, and authenticity. Evidence of research in the A.C.E. may be seen from the large number of references to it in research literature.

Reliability and validity have been checked on earlier forms but have not been reported for the new forms. (No data on reliability and validity are available in the manual of this rest.) An odd-even reliability coefficients of .95 is reported for the total scores and reliabilities of .87 and .95 for Q and L scores respectively by Thurstones.

Taking into considerations, the overall soundness of the A.C.E. Psychological Examination it was decided to select and adapt it for the purpose of this study.

Adaptation of the A.C.E. Psychological Examination.

To adapt this test for use in India, it was found necessary to make certain linguistic changes in some of the items of the test. Such changes were made only in the 'Arithmetic-Reasoning' Test and Test of 'Completion'. English names, measures of weight, and dimensions were substituted by Indian names, measures of weight, and dimensions. Some uncommon and unfamiliar words in the test of 'Arithmetic' and 'Completion' were also substituted by more commonly understood or simpler words.

Changes made in the 'Arithmetic' and 'Completion' tests are described below.

1. 'Arithmetic Reasoning Test'

This test comprises 20 simple problems in arithmetic. Below each problem there are five alternate answers, only one of which is correct. Testees are required to solve each problem mentally and make their responses on the test booklet. Changes were made in the following seven items.

Item 1. Sam had 12 marbles. He found 3 more and then gave 6 to George. How many did Sam have left?

(a) 3  (b) 6  (c) 9  (d) 12  (e) 15
Habib had 12 chalks. He found 3 more and then gave 6 to Ghulam. How many did Habib have left?

The word 'marbles' was substituted by 'chalks' as it is more commonly understood than the word 'marbles.'

If it takes 8 barrels of oil at $1.35 per barrel to sprinkle 1/2 mile of road, how much will oil cost for 5 miles?

If it takes 8 drums of coal-tar at Rs. 1.35 np. per drum to spread over 1/2 mile road, how much will coal-tar cost for 5 miles?

This item was changed because 'barrels' used for sprinkling oil on roads is a practice in U.S.A. but is not known in our country.

Mary and Helen receive $2.00 for making buttonholes. Mary makes 42, Helen 28. How much should Mary receive?

Madho and Haneef receive Rs. 20. in all for making umbrellas. Madho mends 42 umbrellas, Haneef 28. How much should Madho receive?

'Button-holes' were replaced by 'Umbrellas' because 'Umbrellas' are more familiar than 'Button-holes.'
Item 9. Original

A grocer bought 160 boxes of berries. From the first 8 boxes examined he had to throw away 1 box. At this rate, how many boxes will he be able to sell?

A grocer bought 160 boxes of fruits. From the first 8 boxes examined he had to throw away 1 box. At this rate, how many boxes will he be able to sell?

'Berries' is the name of some specific fruit which appear to be unfamiliar in India. This was substituted by the word 'fruits'.

Item 10. Original

If coffee loses 20% of its weight in roasting, how many pounds of green coffee must be bought to produce 8 pounds when roasted?

If groundnuts lose 20% of their weight in roasting how many pounds of green groundnuts must be bought to produce 8 pounds, when roasted?

'Green coffee' is not as commonly understood as 'green groundnuts'.

Item 11. Original

A man owns 2/3 of a boat and sells 3/4 of his share for £ 750. At this rate find the value of the boat.
A man owns $\frac{2}{3}$ of a piece of land and sells $\frac{3}{4}$ of his share for Rs. 750. At this rate find the value of the piece of land.

A deal for the sale of a 'boat' particularly of its parts was likely to be misunderstood in comparison with a deal for a 'piece of land'.

Item 13. Original

One third of an estate went to charity and one half of the remainder went to each of two children. If each child received Rs. 5,000, what was the value of the estate?

Changed into

One third of a man's property went to charity and one half of the remainder went to each of his children. If each child received Rs. 5,000, what was the value of the property?

The word 'estate' is not as easily understood as the word 'property', hence the word 'estate' was substituted by the word 'property'.

2. Completion Test.

In this test definitions of some common objects or concept are provided. Testees are required to read each definition and think of the word that fits the definition and then mark the first letter of the word which fits the definition. The following problem is an example:

A contest of speed.

B F M P 'Race'
There are five alternate answers below the definition out of which one is correct. The word which seems to fit the definition is 'Race'. Accordingly, the correct response would be 'R' which is the first letter of the word 'Race'.

In this test some linguistic changes were made in order to make items more easily understandable. These are as below:

**Item 21.**

**Original**

A substance composed of two or more metals or a metal and a non-metal.

F L N T 'Alloy'

**Changed into**

A substance composed of two or more metals.

The phrase a 'metal' and a 'non-metal' was deleted, because it made no difference to the concept of an 'alloy' as it is generally understood.

**Item 24.**

**Original**

She rules of decorum.

F G K N 'Etiquette'

**Changed into**

The rules of decorum and polite behaviour.

In this definition a sentence 'and polite behaviour' was added in order to make the definition easier to understand.

**Item 25.**

**Original**

An exorbitant rate of interest.

E G K R 'Usury'

**Changed into**

A very high rate of interest.

In this definition the word 'exorbitant' was substituted by 'very high'.
No changes were made in the remaining sub-tests and the original number of items as given in table 3.1 on page 31 were retained. Subsequent steps in preparing the final draft namely timing the sub-tests, writing instructions try out and item selection and giving final shape to the test are detailed in the next chapter.