CHAPTER IV
The philosopher Kant was of the opinion that it would not be possible to have science of psychology because the basic data could not be observed and measured. Modern psychologists have disagreed with Kant and ventured to define psychology as a science of behaviour which can be observed and measured quantitatively in an objective and scientific way. However, they would agree with Kant to the extent that only certain kinds of psychological phenomena are open to observation and measurement.

Intelligence is one such phenomenon. But the 'Yardsticks' are still very crude. It is true that there are serious and continuous attempts to refine them but it is doubtful whether the refinement would any day reach perfection. Cronbach remarks that we have come a long way from Wissler's trying to correlate college success with speed of cancelling 'a' and Binet's wondering whether psychologists had anything to contribute to the identification of mentally inferior children (Cronbach, p. 189). Looking to the complexity of the human individual one can be optimistic that the measurement in psychology can reach in future the precision and accuracy as in the physical sciences.
However, the expectation of a 'yard stick' is a signal to the test maker to take all possible precautions so as to minimise the crudity of the instrument. The researcher took notice of the signal and did an extensive study of related literature as reflected in the bibliography.

1. The Range of Applicability:

According to fg. Freeman, mental tests are defined as instruments for the measurement of individual abilities or types of behaviour, with maximum emphasis on differences due to original nature rather than to training or environment. Mental capacities cannot been seen, felt, heard or measured in any direct fashion. What the psychologists measure is the manifestation of capacity in action or in behaviour. This is just like electricity manifested into light, heat, sound etc. These actions or behaviours are influenced by schooling and environment i.e. experience. The problem - before the test maker is to find out how far the differences between individuals are due to difference in their native capacity rather than due to difference in the training that they have received. The test maker must find activities in which previous experience is a negligible factor. But such activities are not manifestations of complex mental abilities. The test maker solves the problem by limiting the variety of individuals to be tested and by selecting activities which are largely common to their life experience. In fixing the range of applicability of the test for primary children the
following three factors were considered: (i) age (ii) sex (iii) Parent's Social status.

Age: It is customary to fix an age range to which an intelligence test is to be made applicable. This is absolutely inevitable when the entire population of a certain age group is to be included and when the applicability is not limited to particular school grades. In the present case, the applicability of the tests was limited to standards V, VI and VII. Separate norms for each age group and grade were to be fixed and so the inclusion of all the age groups found in these standards was not at all likely to affect the norms in any way. Hence the investigator thought it proper to decide the problem experimentally by fixing the range of applicability to the standardisation group 10 to 13+ since

(a) A representative sample of the age group can be easily obtained from the school going population.

(b) Group testing does not suit younger age group than the one under the present study.

(c) School going children of this age group will have acquired the ability to write their names, grades, parent's occupation etc, by themselves as required on the answer sheets.

(d) The age group 10 to 13+ is a crucial one and it is a matured stage of child development to conduct an experiment of this type.
Sex: Although the mental and physical developments of boys and girls go simultaneously, at certain stage, speed of response seemed more with regard to girls than boys just before and after their biological maturity. The same may not hold good with boys and awareness may occur at any period of development. This is evidenced from the scholastic achievements of pupils in the public examinations in Karnataka in particular and hence instead of taking only boys or only girls, both were included in the range of applicability to fix and ascertain the significant difference, if it exists in a hypothetical sense.

Social Status of parents:

One of the components of environment is parents' occupation of pupils. The present study includes all types of home background of pupils attending the schools. Nevertheless common norms are established and it is worthwhile making analysis in the study, the variation of IQS of pupils of different professions of pupils' parents ranging from unskilled workers to skilled technicians.

Cultural Background:

The last problem to consider was the difference in the cultural background. The places in Karnataka can roughly be divided into three types of cultures - Rural - urban and semi-urbans. Had it been constructed separate tests or at least separate norms for the three types of cultures, it would have been a better measure of intelligence than the present one.
But it was beyond the scope of the present study within the limitation set for the study. In that case it would have been necessary to limit the applicability of the test to a single culture and to design a test based on the experience common to all the three cultures.

The three cultures are more similar than distinct. There is a lot of overlapping. The rural and the urban areas differ mainly in their agricultural and industrial basis. The semi-urban culture is a curious mixture of the two. The schools in the rural and the semi-urban areas are not different from or inferior to schools in the urban areas, as a whole. According to C.L. Bhatt. "It is erroneous to class all urban schools as superior. There are certain very good schools in rural areas and quite a few schools in the cities are poorly housed, staffed and equipped and good many of them are in no way superior to their counterparts in village and towns" (C.L. Bhatt, p. 41).

F.S. Freeman writes "It would be exceedingly difficult to find a method of grading social environment so as to apply norms to them. Furthermore, many gradations of environment, could be found and the same individual is subject to the influence of more than one environment due to social mobility. For example his home environment may be of one sort and his school environment another. These complications and difficulties seem to make it inadvisable to create norms for social groups" (F.D. Freeman, p. 320)
A further difficulty in the calculation of local norms is pointed out by Cronbach, who remarks that local norms change from time to time owing to population migration and changing in school policies (Cronbach, p. 123). The remark does not fully hold good for the set up Karnataka State. The school policies, if at all they change, will change everywhere, but the population factor cannot be ignored. There is a marked tendency towards social mobility and quick organisation. Communication and transportation facilities create possibilities for a greater and greater fusion of the three cultures and frequent revision of norms is not possible. Hence it was decided to establish common norms for all the three cultures, so that they could be based on a large population, representative of the three cultures which would not change in the near future. With regard to social status of parents it comprises Caste and profession, intelligence of children is supposed to vary with these two. The answer sheets to be filled up by the children provide the information required. Analysis is made in the chapter of subsequent studies.

The last difficulty realised was about the size of the sample. The census report of 1971 has classified the Karnataka state into three major groups based upon effective literacy percentage, except Bangalore city which is a cosmopolitan in nature of population and this is treated as a fourth category separately for selection of schools and drawing of population. Details are discussed in ensuing chapter. Attempt has been made
to classify the different type of tests before finalising selection of sub-tests for the test battery.

Test battery: A test battery is a group of carefully selected tests designed to operate as a team to predict a single criterion.

2. The Types of Tests: Intelligence Tests are broadly classified as shown below.

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  Intelligence Tests
     Individual Test          Group Test
       ------------------------
          Verbal  Non-Verbal  Performance  Verbal  Non-Verbal
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Individual Tests: Individual Tests are given to one individual at a time. The tests designed by Binet were individual tests. The administration of individual tests require some special training for the testers. Testers should be highly skilled in administering them, in interpreting responses and in evaluating the testee's behaviour during the course of examination. (M.A. Gangappa pp. 76-77).

Group Tests: Group Tests are those which can be given to a group of individuals at a time. Group Testing was born in America and spread later all over the World. The administration of Group Tests do not require much special training. In all situations of large-scale testing, whether in the Military, industry or in educational field, the administrators
generally prefer the Group Testing procedures. Group Tests do not consume as much time as the individual Tests and they are economical.

Verbal Tests: Verbal Tests are those which make use of language in speaking, questioning or expect the Testees to read a given question through language both written and spoken. The Verbal Tests are found to be more useful in measuring the ability for comprehending or solving abstract problems and concepts.

Non-Verbal Tests: They do not call for language either written or spoken. Non-Verbal Tests utilise pictures, diagrams, geometrical figures instead of words. These Tests are specially designed for the deaf, the speech defectives, foreign born and those who do not know the particular language and concepts.

Performance Tests: Performance Tests are those in which language is used only in the instructions or not at all when directions are given in pantomine. Such Tests involve largely on overt motor response like the manipulation of objects, form boards, block designs and pictures rather than oral or written responses. These Tests are designed for persons handicapped by language abilities. Such Tests may be employed with Preschool Children specially those who are inarticulate or shy because of emotional reasons.

There exists another type called "culture fair Tests" or cross cultural Testing. The Test items besides being -
non-Verbal, are designed so as to be relatively Universal in content and to minimise the specific influence of any one culture. Items and experiences that are common to different cultures are included in the Test.

Standardised Test: Wrightone, Justman and Robbins (1966) State that the Standardised test, as a sample of performance of an individual or group obtained under the prescribed conditions, scored according to prescribed rules, and interpreted by reference to statistical procedure.

According to Thorndike and Hegan, the word 'Standardised' in a test means only that all students answer the same questions and a large number of questions under uniform directions and uniform time limits, and that there is a uniform or standard reference group to the performance of which students' performance can be compared.

The definition of the term given by Noll (1965) quoted by D.S. Shivanand is more helpful to a test constructor. According to him "a standardised test is one that has been carefully constructed by the experts in the light of acceptable objectives or purpose; procedures for administering, scoring and interpreting scores are specified in detail so that irrespective of the person who gives the test or where it may be given, the results should be comparable, and norms or averages for different age or grade levels have been predetermined."
Ross and Stanley (1954) look upon standardisation which constitutes the following procedure

(i) Standardisation of content

Each item has to be subjected to very careful scrutiny by experts, the difficulty and discriminative power have to be determined by rigid experimental procedures; all weak items have to be eliminated; thus ensuring the standardisation of the content.

(ii) Standardisation of the method of administration

Definite directions have to be worked out, appropriate time limits have also to be decided upon. The test administration.

(iii) Standardisation of the method of scoring

Scoring keys have to be formulated for determining scores in each of the sub-tests; corrections for guessing have to be predetermined, and

(iv) Standardisation of the procedures of interpretations

Norms have to be worked out for interpreting raw scores obtained in the sub-tests and the whole test.

Test Standardisation: The usefulness of a test rests mostly on its ability to provide interpretable measures of traits/behaviour being measured. Every test is normally accompanied by a conversion table by means of which the original measures may be transformed into indices which are descriptive categories of trait/behaviour. Developing a table of norms
forms an important place of test standardisation. The procedures followed in the development of different tables of norms for the present test are described in the pages to follow.

**Interpreting raw scores:**

When a test paper has been marked according to the instructions, the score obtained by an individual on the test is his/her raw score. According to Ross and Stanley "A score on any test is simply a numerical description of an individual's performance on that test." Since the raw score has no direct meaning in and or itself, the raw scores on a standardised test are given meaning by comparing them to the performance of a standard reference group. This standard reference group is called a norm group and the measure obtained by such a comparison is called a norm. A score on a test for example, is often labelled as high, average or low. This type of labelling or interpretation is possible only when the obtained score is compared with other score in the group from which it has been drawn. It is thus customary that a test is followed by a table of norms.

The test maker has to consider the following aspects for selection of sub-tests.

(i) Testing in group or individually, verbal or non-verbal or both.

(ii) Sampling the behaviour to be tested.
(iii) Selecting the media for testing the sample behaviour.

The first aspect was already discussed while undertaking the work; the remaining two are discussed in this section.

**Sampling the behaviour to be tested:**

The mental ability to be measured is bound to manifest through various behaviours. As Anastasi puts it "A psychological test is defined as"... essentially an objective and standardised measure of a sample of behaviour (Anastasi, 2, p. 22). Psychologists cannot and need not measure all of them with regard to the sampling of traits and functions. Freeman writes, "Any given test measures a limited aspect of the person being examined, though some tests are much more restricted in scope than others. It is essential, therefore, that the test builder define the aspect or aspects he proposes to measure. It is sufficient to get an adequate sampling of responses in a particular area or range of behaviour, the assumption being that the sampling is representative of the whole" (F.S. Freeman, p. 4),

Practice has proved that a combined score of a series of tests is reliable and a better predictor than the score of each sub-test. Freeman remarks "The need for this variety is due not so much to the fact that different mental processes are measured by them as that each of them measures the mental activity only as it appears in certain concrete operations of thought, and that these different concrete operations are -
conditioned partly by their material as well as by their form (F. S. Freeman, p. 254).

Hence it can be concluded that an item pool composed of a variety of types of tests and materials would be a better sample of the universe to be tested.

**Media for testing the sample behaviour:**

Four main types of media have been made available by the veteran test makers of the West.

1. Using language and numerical symbols.
2. Using pictures, diagrams and nonlanguage symbols, with a view to avoiding the use of language.
3. Using manipulation of objects, with a view to avoiding both the language as well as the paper-and-pencil work.
4. Using motion picture file or television, with a view to achieving more accurate standardisation.

To think of using the fourth medium in India may take a little long time. The third type, the performance type, has been restricted to individual testing. The investigator has chosen the first two. Ever since Binet constructed his scale on verbal tests, the test makers and the test users have severely criticised the use of medium most widely and psychologists tolerate it as a necessary evil. Nonlanguage tests are
recommended for illiterate, foreign born, bilingual and deaf subjects, inclusion of such tests is quite legitimate when subjects are suspected of defective reading ability or inadequate schooling owing to frequent absence, child labour and illness or emotional disturbances. They are thus used to check the doubtful results of verbal tests for they correlate favourably with the verbal tests. "It may be that as performance in real life situations beyond school is studied more freely, the 'culture fair' type of tests will come into operation. (Nunnally, p. 225 quoted by C.L. Bhatt, p. 48).

Looking to the advantage of either side, the investigator has decided to include in the present battery both the verbal and non-verbal in the mixed form. On the basis of past experience, Wechsler thought that both verbal and non-verbal materials prove the most adequate and representative content rather than either one alone.

C.L. Bhatt remarks Cattell's culture fair test while selecting tests for her battery. "It was no use creating unnecessary complications by imitating Cattell's culture free test". These pupils could not be expected to think beyond their experience, and symbolic drawing which had no meaning for them." In so far as it was decided to include verbal tests, the cultural effect was included. It was thought that pictures depicting the life situation, within the experience of the normative population could be used with advantage.
as done by a number of test makers in the East and the West.
Her views cannot be wholly accepted. Culture in verbal tests
cannot be denied but in nonverbal tests it can be minimised
though not be fully freed from the tinge of culture. Pupils
of upper primary stage could be expected to think, act and
react upon the geometrical figures and symbols and such items
of the test prove a better objective measure of $g$. In this
context the investigator accepts the views of Raven's progres­
sive matrices and R.B. Cattell's revision of culture free
test into culture fair ones.

3. Selection criteria of the tests for the Battery:

Principles enlisted by C.I. Bhatt, were studied by the
investigator thought fit for his study as

1) The tests should demand mental activities within the
limits of the academic achievement and school training
of the pupils of standard V, VI and VII studying in
the higher primary schools of Karnataka State.

2) Those activities should be suitable to the intellec­
tual maturity and interest of boys and girls between
the age range 9-6 to 13-6.

3) The test material should be based on the common life
experience of the pupils, living in all the three
types of culture-rural, urban and semiurban.

4) The test should sample adequately the behaviour to
be tested.
(5) There should be a variety in the type of material of the test.

(6) The battery should include both the verbal as well as the non-verbal items.

(7) Verbal tests should not demand a high level of linguistic attainment and ability.

(8) The mental process as demanded by the non-verbal tests should as far as possible resemble those demanded by tests commonly used in school life situations.

(9) The non-verbal tests should be safeguard against oversimplification and should be made capable of complex mental processes.

(10) Each test should conform to the Spearman approach to intelligence and hence saturate with 'g'.

(11) The battery as a whole must be a good predictor of scholastic aptitude.

(12) The non-verbal tests need not use pantomine directions.

(13) The nonverbal items may be composed of pictorial material of geometrical figures and shapes on the model of culture fair tests.

(14) The battery should be suitable for group administration.

(15) The method of answering should be simple and not complicated.
4. Constructions of preliminary forms of the tests:

The task of selection was to be done in view of the above principles. Desai modelled his tests on the pattern of the Otis advanced examination and the Army Alpha tests - (K.G. Desai, p. 42). The present investigator was forced to look for a model but arrived at the conclusion that it would be more advantageous to select suitable types from various batteries rather than base them on one or two types. Hence he began the process of rejection, omission, selection or adaptation on various types of related group tests available.

5. Construction of sub-tests:

While constructing the sub-test adequate care was taken to include such items as concepts, ideas and objects that call for mental operation of children of the age group 10 to 13+ and materials which were very much common and familiar to the children.

In the arrangement of the battery, the spiral omnibus method was not followed since it was known to be unsuitable for young children of this age group although it has its own advantages. This view is supported by Desai and Bhatt. Hence the discrete arrangement was chosen with a full consciousness of its short coming. Desai found that a practice test was necessary to familiarise the testees with the test material and the method of answering as well as to work as a shock-absorber. Hence a short practice test consisting of a sample of each test item was added in the beginning itself. Instruc-
tions for testing were prepared for each of the sub-tests and for the practice test as well. Suitable modifications were made wherever necessary in consultation with experienced teachers. Separate answer sheet was felt desirable as the pupils of higher primary level are trained in such school examinations. Awareness is increased from the time when Bhatt constructed her test and felt it was difficult and confusing to children of the same age group, who were expected to mark the answer in the question booklets. The arrangement of the sub-tests is as shown in the Table-I.

**TABLE - I : A**

Arranging And Description of the Tests.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of the subtests</th>
<th>Number of items in the subtests</th>
<th>Mental functions tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Similarities</td>
<td>30+1</td>
<td>Insight into Similar words and concepts.</td>
</tr>
<tr>
<td>2</td>
<td>Analogy</td>
<td>30+1</td>
<td>Power of Reasoning</td>
</tr>
<tr>
<td>3</td>
<td>Reasoning</td>
<td>21+1</td>
<td>Logical judgment</td>
</tr>
<tr>
<td>4</td>
<td>Matching things and profession</td>
<td>30+1</td>
<td>deducing Relationships.</td>
</tr>
<tr>
<td>5</td>
<td>Story completion</td>
<td>25+1</td>
<td>Comprehension and arranging ideas.</td>
</tr>
<tr>
<td>6</td>
<td>Number Series.</td>
<td>30+1</td>
<td>Numerical Ability</td>
</tr>
</tbody>
</table>

Total.. 141+6
<table>
<thead>
<tr>
<th>Table I: B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Non-verbal Form (Vide Appendix)</strong></td>
</tr>
<tr>
<td>1. Similarities</td>
</tr>
<tr>
<td>2. Classification</td>
</tr>
<tr>
<td>3. Progressive series</td>
</tr>
<tr>
<td>4. Analogy</td>
</tr>
<tr>
<td>5. Substitution I</td>
</tr>
<tr>
<td>6. Substitution II</td>
</tr>
</tbody>
</table>

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**Total** 109+6

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