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CHAPTER III
REVIEW OF RELATED LITERATURE

3.1 INTRODUCTION

Throughout the twentieth century, attempts to measure general mental ability or intelligence, have played a pre-eminent role in psychological testing. In earlier years, the idea of general intelligence held forth during the last three decades, with a few exceptions, attention has focused on intellectual abilities. However, because of practical utility of general intellectual ability, it is still widely used and in spite of their theoretical deficiencies, has shown practical utility. Like all other scientific procedures the development of intelligence tests has to pass through various stages before attaining the present scientific and statistically prefect and reliable level.

The review of theories and past literatures are very important to the investigator. It provides the investigator to understand what is necessary and to see the problems, to prepare the work design and acquire ideas to select the proper tools and samples. It also helps to solve the problem systematically and useful for guideline in the related field and adapt technique for research.

Measuring intelligence of the man has been for a long time and has been developed until the present, which has been important for testing. The intelligence tests have various forms and steps. Some tests
are complement, reliant, popular and remain as they are. This chapter presents the study of related theories and standard intelligence tests that were developed in the past time. The development of intelligence tests discussed in this chapter can be studied under two stages:

(i) The Pre-scientific stage

(ii) The scientific stage

3.2 THE PRE-SCIENTIFIC STAGE

In 1966, Dubois stated that Chinese had the test to select the civil servants for more than 3000 years ago. The ancient Greek used the test to evaluate physical and mental level of people. The interesting psychological tests were first recognized in the nineteen-century for the purpose to care the feeble-mindedness and mental disorder, properly that were brute treated and abandoned at that time. Psychologists had tried to categorize mental disorder patient from feeblemindedness. Esquirol, the French physician explained and categorized to group mentally retarded from normal to idiocy. He tried to develop the classification system and type of mental retardation and came up with several methods. He concluded the principle of person's language for the test to measure mental retardness, which was verbal test. The current tests also comprehensive are verbal test. Therefore verbal ability is important to individual's intelligence.

Other person who was also interested in this subject was the French, Dr. Seguin. He trained the mentally retarded persons on the ground that
mental retarded person can be healed. He found that there were schools for mentally retarded persons in 1837 and it was widely known. His technique to train sensory nerve and muscle is still the valid method in the today's institution for mental retardation. This method was found by Seguin have become the non-verbal intelligence test. The Seguin's Form Board is the test that required the students to put the various shape of wood bar in their proper slot as fast as possible.

Galton, the British biologist who was interested in human's heredity, believed that the similarities between parents or relatives could be determined by testing. Galton designed several simple tests for testing sensory nerve which is in the brain. He believed that sensory nerve of an individual can determined his intelligence. He stated that we perceived all information through feeling nerve. The greater different sensory nerve is scope of decision and intelligence which is more increasable. He also notes the idiots are less to differ the heat from cold, or pain. There was evidence that confirmed Galton's belief that the ability of providing all sensitive nerve is at the most among people with high intelligence.

In 1881, Galton began using of psychological test to find college students' intelligence by testing them one at a time. The test consist of the measure of muscle power, speed of movement, response to pain, the ability of watching and listening, determining of weight, memory and the like. The test emphasized on feeling of nerve and action time.
Most of the tests that European psychologists had gathered around late 19th century tended to cover the more complex variable. Kraplin used test for the base of habitual person for testing the mentally retarded patients. In that test, majority of part of the test involved numeric calculations about the result of training, memory, tiredness and confusion. Later Ebbirghaus, the German psychologist use arithmetic calculation, memorizable aid and completing the sentences for children in schools. Completing sentences were complex test but the test result apparently corresponds with academic score. In addition, Ferrari used the test with the patient. The test had various forms to cover variables such as memory, imagination, determination, comprehension and docility. These tests lead to the development of intelligence test later.

3.3 THE SCIENTIFIC STAGE

Now-a-days, intelligence tests are based on the work of French psychologists, Alfred Binet Associated with him was, first, V. Henri, and later, Theodore Simon. There was no doubt that the Binet was the shining light and genius of this most important contribution to modern psychological methods, even though many others contributed to the developments. Thus, Binet is considered as the father of the scientific approach in intelligence testing.

3.3.1 Individual Test of Intelligence
3.3.1.1 Stanford-Binet Intelligence Test

The Stanford-Binet test was developed in 1916 at Stanford University (hence, Stanford-Binet), by the American psychologist, Lewis Terman. He used the Binet test as its basis but was substantially revised; it was not a mere translation, because some items were dropped and new items were added. The result was an “Americanized” version of the test, with questions that were culturally relevant to American children.

It was Terman that joined the term I.Q. (intelligence quotient) which was calculated by dividing the mental age by the chronological age and multiplying the quotient by 100 i.e

\[ I.Q = \frac{M.A}{C.A} \times 100 \]

Where,
M.A  = Mental age
C.A  = Chronological age

However, this original definition led to potential problems of interpretation. For instance, since the original versions of the Binet-Simon test and intelligence scale which were only intended to be administered to French school children for scholastic purposes, one could be 30 years of age (Chronological age) and take the test and score a perfect maximum mental age of 15. Then according to Terman's new formula \( \frac{15}{30} \times 100 = 50 \) which would be the IQ of a person with severe mental retardation. Eventually, the IQ definition
was changed to reflect the comparison of the person’s test score with the mean score of other people his or her own age. Over the years the test becomes less favored to other tests. The last version of the Stanford-Binet test (S-B 4), had 15 sub tests and was intended for use with ages 2-23. The current standard version of the Stanford-Binet 5, has been substantially revised to 10 subtests with an applicable age range of 2-85+. This degree of reorganization and revision was likely inspired by its chief competitor and more widely used intelligence test, the Wechsler.

The Stanford-Binet Intelligence Scale is the healthiest surviving descendent of Binet's original scale. Binet developed his test to identify slow learner in Paris schools. He developed a test which was first published in 1905 and later revised in 1908 and 1911. Although the test departed from the current practices along many dimension, three aspects were of greatest importance.

a. The use of complex molar tasks as test items,

b. The use of an age, standard, (the concept of mental age was first introduced in 1908 revision), and

c. The attempt to measure general mental faculties.

The test became popular and several attempts were made to translate it and adapt it for American usage. The adaptation that caught on in the United States was Terman's version, first published in 1916, which has become known as the Stanford-Binet Test. Terman's test was
an extension and improvement of Binet's scale and in many respects uses Binet's scale only as a point of departure.

The 1916 version was important for several reasons. It was the first test to provide detailed administrative and scoring instructions, recognizing that variations from these directions could produce wide differences in scores. Second, the concept of the IQ was introduced. Third, the need for securing a representative sample of subjects for standardizing the test was recognized.

The 1937 revision did not attempt to measure anything different from the 1916 form but only to do a better job of measurement. Two forms of the test were constructed, Form L (constructed by Lewis Terman) and Form M (constructed by Maud Merrill). The test covered the age range from 1 1/2 to 18 years and was standardized on over 3000 children. Selection for items was based on three criteria:

1. The item measured considerable behavior intelligence.
2. The percentage of children passing the item increased rapidly with age, and
3. The mean mental age (M. A) of children passing and failing the item differed significantly.

The test was very heavily loaded with verbal materials to measure other types of intellectual functioning and the administrative procedure was time consuming. But compare to the earlier form of the Stanford-Binet and other available intelligence tests, the 1937 revision covered a
wider range of abilities, covered a wider age range and provide more
detailed instructions for administration and scoring.

3.3.1.2 The 1960 Revision of Stanford-Binet Test

As Brown states, "When taking a decision regarding the
desirability of revising an existing test, a test constructor must consider
the advantages of a revision e.g. elimination of obsolete materials,
utilization of new techniques of test construction etc. and then weigh
these against the disadvantages of such a revision e.g. the time and cost
of revision and rendering irrelevant much of the normative, validity and
experimental data about the test".

In this revision more effective items have been retained and
rearranged, and deviation I.Q has been introduced

In order to illustrate the content of the test, four different age levels
have been picked up. Its brief description is as follow:

(A) Age level: 2 to 4

1) Three-hole Form Board: Placing three geometric objects in
   form board.

2) Delayed Respond: Identifying placement of hidden object
   after 10- seconds delay.

3) Identifying parts of the body: Point out features on paper doll.

4) Block Building Tower: Build four-block tower by imitating
   examiner’s procedure.

5) Picture Vocabulary: Naming common objects from pictures.
(6) Word Combinations: Spontaneous combination of two words
(B) Age level: 5 to 6
(1) Vocabulary: Correctly define six words on 45 words list.
(2) Differences: Telling difference between two objects.
(3) Multilateral Pictures: Pointing out missing part of pictured objects.
(4) Number Concepts: Counting number of blocks in a pile.
(5) Opposite Analogies: Solve analogies like "summer is hot: winter is ____"

(C) Age level: 7 to 14
(1) Vocabulary: Correctly define eleven words from the list of words.
(2) Block Counting: Counting number of cubes in three dimensional pictures, some cubes is not apparent.
(3) Abstract Words: Definition of abstract words.
(4) Finding Reasons: Giving reasons for laws and preferences.
(5) Word Naming: Naming as many words as possible in one minute.
(6) Repeating six digits: Repeat six digits in order.

(D) Age level: Average Adult
(1) Vocabulary: Define 20 words correctly.
(2) Ingenuity: Algebraic word-problems involving mental manipulation.
(3) Difference between Abstract Words: Differentiate two related abstract words.
(4) Arithmetic Reasoning: Word problems involving simple computations.
(5) Proverbs: Giving meaning of proverbs.
(6) Orientation: Finding orientation after a verbal series of changes in directions.
(7) Essential Differences: Give principle difference between two related concepts.
(8) Abstract Words: Give meanings of abstract adverb.

There are two limitations of Binet's Test as follows:
1. Being verbal tests, it cannot be administered to the illiterate, deaf and mute, and
2. Being individual tests, it consumes a great deal of time.

To minimize these limitations, two types of tests have been developed. They are:
1. Performance Tests, and
2. Group Tests.

3.3.2 Performance Tests

According to Mehrens and Lehmann, "A test is called a performance test if the tasks demand a manipulation of objects e.g. making geometrical configurations with blocks, rather than an oral or written response". This type of test is most helpful in assessing the level
of intellectual functioning for people who have language disabilities, deafness, blindness etc.

Some examples of performance tests are the Wechsler Scale (1939), Pinter-Patterson Scale (1917), the Cornell-Coxe Scale, the Arthur Point Scale (1930), the Cartel Infant Intelligence Scale, the Merhll-Plamer Scale, and the Leiter Adult Intelligence Scale. The Koh's Block design (1923), Porteus Maze Tests (1914, 1924, 1950 & 1959), Alexander's Pass Along Test, Collins and Drever's Test etc are all Performance Tests.

3.3.2.1 Wechsler Scales

David wechsler devised the Wechsler-Bellevue test and intelligence scale in 1939 to facilitate the assessment of his patients for whom he thought the Stanford-Binet test was yielding unsatisfactory result. That initial test was eventually developed into multiples specialized I.Q tests for targeted subpopulations such as the Wechsler Adult Intelligence Scale (WAIS; ages 16 and above), the Wechsler Intelligence Scale for Children (WISC; for ages 6-16), and the Wechsler Preschool and Primary Scale of Intelligence (WPPSI; for ages 2.5 to 7.25 years).

The WAIS has two major scales, verbal and performance (non-verbal) with 14 subtests (7 verbal and 7 performances). The test yields a verbal I.Q, a performance I.Q and a combined I.Q score. The advantages of the Wechsler tests over the early Stanford-Binet were its
performance scale and the different test versions which were tailored to specific aged populations.

The assignment of I.Q scores, as mentioned earlier, are calculated from the comparison of an individual’s test score with the mean score of the cohort of other people his or her own age. The test performance of the cohort is graphed and calculated statistically. The group mean is labeled an I.Q of 100 as an average intelligence. One standard deviation is subdivided into 15 units so that plus one standard deviation has an I.Q of 115 and minus one standard deviation has an I.Q of 85. This range 85-115 is considered the normal range with 85-99 being low average and 101-115 being high average. Scores that are plus or minus 2 standard deviations from the mean are considered exceptional for obviously different reasons. Scores from 116 to 129 are considered superior, with scores above 130 considered gifted or "genius" in everyday language. Score from 84 to 71 are considered borderline and score 70 and below are labeled retarded.

WAIS have two scales (1) verbal scale & (2) performance scale. The verbal scale consist of six sub-tests & the performance scale consist of five sub-tests.

The eleven sub-tests of WAIS have been described in brief as follows:

(A) Verbal Scale

It consists of six sub-tests. They are as follows:
(1) Information: It has 29 items which measure the range of the examinee's knowledge, retention of learned information from school.

(2) Comprehension: It has 14 items which measure the judgment and common sense.

(3) Arithmetic: It has 14 items, testing concentration, arithmetic ability and problem solving skill.

(4) Similarity: It has 13 items, measuring logical thinking and conceptual ability a good measure of general intelligence.

(5) Digit Span: It has items which tests attention and immediate memory by items requiring examinee to repeat series of digits either forward or backward.

(6) Vocabulary: It has 40 words of varying difficulty. It is the best single index of full scale I.Q indicates range of knowledge and cultural background.

(B) Performance Scale

It consists of five sub-tests. They are as follows:

(1) Digit Symbol: It measures flexibility and ability for new learning through a task requiring the substitution of symbols for number.

(2) Picture Completion: It has 21 items that require examinee to tell what is missing in a picture of a common object which measures perceptual ability, particularly ability to differentiate essential from unessential details.
(3) Block Design: Examinee reproduces design with colored blocks. It measures ability to analyze and organize from cubes.

(4) Picture Arrangement: Require examinee to arrange a group of pictures which in total tells a coherent story. It measures ability to comprehend a total situation.

(5) Object Assembly: Task is to assemble pieces of a puzzle from a common object. It tests perceptual ability and persistence. The individual's score is based on the number of items answer correctly. For this reason, the WAIS is referred to as a point scale.

(C) Other Wechsler Scale

The Wechsler Intelligence Scale for Children (WISC) is an extension to lower age levels. The format of the WISC is similar to the adult scales; only one WISC sub-test (Mazes) does not appear in adult form. The items were constructed to test the children that find the mazes exit quickly. In 1967, Wechsler Preschool and Primary Scale of Intelligence (WPPSI) were published for the age-groups 4 to 6 1/2. The format of sub-test is quite similar to the WAIS and WISC, but certain changes have been made (e.g. inclusion of more non-verbal tasks) to make the test appropriate for pre-scholars.

3.3.3 Group Tests of Intelligence

Group tests of intelligence are typically composed of several types of items like vocabulary, general information, arithmetic and reasoning items. In particular, group tests of general intelligence are often heavily
weighted with vocabulary items, either in the traditional form or in varied form, such as selecting the correct word for use in sentences or in items of analogies. The widespread use of vocabulary items reflects the empirical finding that vocabulary is the best single index of intelligence. General information items are included to estimate the individual's range of knowledge. Arithmetic items generally involve simple computations. Reasoning items may be verbal or non-verbal analogies. By and large, group tests include the item types that have proven to be the most valid indices of intellectual ability.

Group tests share certain common features. Group administration permits more efficient testing of large number of persons. Group tests are usually paper and pencil tests with items cast in the multiple-choice format. Although group intelligence tests were originally designed to be economical for individual tests, and still are widely used in this manner, they have assumed an existence of their own. Group intelligence measures are also used for industrial and business screening. These tests are generally short, are constructed along traditional lines, and include items covering the common components of intelligence ability.

Now due to increasing popularity and demand of group tests, a need for construction and standardization of group tests of intelligence has been felt. A brief outline of the existing group tests is given below.
3.3.3.1 Group Tests of Intelligence Developed Abroad

Noteworthy group tests that developed in other countries.

(A) Verbal Group Tests

(1) American Council Psychological Examination (ACPE) (1924)
   It was developed by L.L. & T.G. Thurstone in 1924 and has passed through various revisions. It is meant for college entrance.

(2) Army Alpha Examination (1916-1939)
   It is meant for secondary school students and adults. It consists of sub tests like information, reasoning and practical judgment

(3) Army Central Classification Tests (ACCT) (1945)
   It was developed during World War II and was meant for age group 9 to 16 and adults. The items are based on vocabulary, arithmetic, reasoning & block counting and they are arranged in spiral omnibus form.

(4) Primary Mental Abilities Test (1963)
   It is meant for K.G to Grade XII. It consists of items measuring verbal meaning, spatial ability, perceptual ability, number facility, and reasoning ability.

(B) Non-Verbal Group Tests

(1) Culture-Free Intelligence Tests (1950)
   It was developed by R.B. Cattell, for age 4 to adult. It is a nonverbal test consisting of matrices and other reasoning tasks. It is
independent of language skill but is not truly free of cultural influences.

(2) Davis-Eells Games (1953)

It was developed by Davis and Eells for pupils Grades I-II & III-VI, which are full of pictorial items.

(3) Progressive Matrices (1951)

It is a non-verbal test for age-group 5 1/2 to 11 year developed by J. C. Raven & H.K. Lewis.

(4) Semantic Test of Intelligence (1952)

It is a non-verbal test for testing conceptual reasoning.

(5) Tests of General Ability (TOGA) (1960)

The test was developed by J.C. Flanagan for students of K.G. to Grade XII. It eliminates school learned skills. The tests consist of two sub-tests, viz., information and reasoning. All the test items are in pictorial form. "TOGA Part I (information) scores appear to relate more closely to Thurstone's Verbal Comprehension Factor and part II (reasoning) seems to relate to his reasoning factor". It provides a measure of general intelligence using items not dependent upon formal school learning.

(C) Verbal & Non-Verbal Group Tests

(1) California Test of Mental Maturity (CTMM)

It was developed by S.R. Sullivan, W.W. Clark, and B.W. Tiege for K.G. to Grade XII with variety of items. Separate "Language" and
"Non-language" IQs are offered; it is a widely accepted, current test.

(2) Lorge-Thorndike Intelligence Tests (1954)

The test is meant for K.G. to high school students. The test consists of verbal and non-verbal items.

(3) Otis-Lennon Mental Ability Test (OLMAT) (1967)

In 1922 A.S.Otis constructed the intelligence test was called "Otis Self-Administering Test of Mental Ability". Later, R.T.Lennon developed A.S.Otis's test which was well known as "Otis-Lennon Mental Ability Test (OLMAT)." This test has five levels to test students from K.G to Grade XII. It consists language and non-language reasoning items to measure intelligence quickly. There are four parts as follows:

(a) Verbal Comprehension: It has about 25-31% of all items which measure comprehensively i.e. antonym words, synonym words and sentences.

(b) Verbal Reasoning: It measures verbal reasoning ability that has about 31-40% of all items. It consists of word-letters matrix, verbal analogies, verbal classifications, inferences and logical selection.

(c) Figural reasoning: It measures reasoning ability by figures that it has about 19% of all items. The test consists of figural analogies and figural series.
(d) Quantitative Reasoning: It measures the number and quantities that it has about 16-19% of all items. Test consists of number series and arithmetic reasoning.

3.3.3.2 Group tests of Intelligence developed in India.

Verbal and non verbal tests have been developed in India. They are in various states and in different languages. These tests are for the age of 6th to 18th years students.

The following Table 3.1. states the information about the tests that were developed in India.

**TABLE 3.1**

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Name of the test</th>
<th>Investigator</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Group test of Intelligence</td>
<td>K.P.Bora</td>
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<td>2</td>
<td>Group test of Intelligence</td>
<td>G.C.Ahuja</td>
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<tr>
<td>3</td>
<td>Test of General mental ability</td>
<td>R.K.Tandon</td>
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<tr>
<td>4</td>
<td>Group test of Intelligence</td>
<td>P.Ahuja</td>
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<td>5</td>
<td>Group test of Intelligence</td>
<td>M.S.Yadav</td>
</tr>
<tr>
<td>6</td>
<td>Group test of Intelligence</td>
<td>Prayag Mehta</td>
</tr>
<tr>
<td>7</td>
<td>Group test of Intelligence</td>
<td>Bureau of Phychology</td>
</tr>
<tr>
<td>8</td>
<td>Group test of Intelligence</td>
<td>M.C.Joshi</td>
</tr>
<tr>
<td>9</td>
<td>General mental ability Test</td>
<td>Jalota</td>
</tr>
<tr>
<td>10</td>
<td>C.I.E. verbal test</td>
<td>Central Institute of Education</td>
</tr>
<tr>
<td>11</td>
<td>Group test of Intelligence</td>
<td>A.K.Pathak</td>
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<td>12</td>
<td>Self taking Group test of Intelligence</td>
<td>A..W.Oak</td>
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### Table 3.2

<table>
<thead>
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<th>Test Type</th>
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<td>13 Group test of Intelligence</td>
<td>P.S. Hundal</td>
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<td>14 Test of Intelligence</td>
<td>J.B. Singh</td>
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<td>15 Group test of Intelligence</td>
<td>B.L. Kaul</td>
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<td>16 Group test of Intelligence</td>
<td>R.E. Pandey</td>
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<td>17 Group test of Intelligence</td>
<td>P.G. Pallai</td>
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<td>18 Non-verbal test of Intelligence</td>
<td>G.H. Nafde</td>
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<td>19 Non-verbal test of Intelligence</td>
<td>M.G. Premlata</td>
</tr>
<tr>
<td>20 Culture-free test of Intelligence</td>
<td>O.D. Trivedi</td>
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<td>21 Non-verbal test of Intelligence</td>
<td>A.S. Nayar</td>
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<td>22 Non-verbal test of Intelligence</td>
<td>I. Jain</td>
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<tr>
<td>23 Abstract Intelligence test</td>
<td>M. Shah</td>
</tr>
<tr>
<td>24 Non-Language test of Verbal Intelligence</td>
<td>S. Chatterji and S. Mukhargi</td>
</tr>
<tr>
<td>25 Draw a Bicycle test</td>
<td>T.R. Sharma</td>
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<td>27 Colours cancellation test</td>
<td>kapur M.</td>
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<td>28 Picture completion test</td>
<td>Malin. A.J</td>
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<td>29 Block design test</td>
<td>Malin. A.J</td>
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<td>30 Test of classroom behavior</td>
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<td>31 Children’s reaction frustration test</td>
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<td>32 Bender-Gestalt test</td>
<td>Purnian. S</td>
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<td>33 Written vocabulary test</td>
<td>Pasricha. P and Das S.K.</td>
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### 3.3.3. 3 Group tests of Intelligence developed in Gujarat

The following Table 3.2 states the information about the tests that were developed in Gujarat.
TABLE 3.2
TESTS DEVELOPED IN GUJARAT

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>Name of the test</th>
<th>Investigator</th>
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<tbody>
<tr>
<td>1</td>
<td>Group test of Intelligence</td>
<td>K.G.Desai</td>
</tr>
<tr>
<td>2</td>
<td>Group test of Intelligence</td>
<td>Desai &amp; Bhatt</td>
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<td>3</td>
<td>Group test of Intelligence</td>
<td>G.L.Bhatt</td>
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<td>4</td>
<td>Non language test of Intelligence</td>
<td>D.M.Bhavsar</td>
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<tr>
<td>5</td>
<td>Non verbal group test of Intelligence</td>
<td>G.B.Shah</td>
</tr>
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<td>6</td>
<td>Group test of Intelligence</td>
<td>Lele and others</td>
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<tr>
<td>7</td>
<td>Non verbal group test of Intelligence</td>
<td>M.M.Patel</td>
</tr>
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<td>8</td>
<td>Verbal Group test of Intelligence</td>
<td>Jayaben Patel</td>
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<tr>
<td>9</td>
<td>Group test of Intelligence</td>
<td>J.M.Patel</td>
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<td>10</td>
<td>General Ability test</td>
<td>M.T.Patel</td>
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<td></td>
<td>(For secondary school students)</td>
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<td>11</td>
<td>Draw a man test</td>
<td>Pramila Phatak</td>
</tr>
<tr>
<td>12</td>
<td>General Ability test</td>
<td>J.Z.Patel</td>
</tr>
<tr>
<td></td>
<td>(for primary school students)</td>
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<td>13</td>
<td>General Ability test</td>
<td>Pallavi.P.Patel</td>
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<td>(for higher secondary school students)</td>
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The present test being verbal and non verbal in nature, the investigator has attempted to peep into the existing verbal and non verbal group test of intelligence developed in Gujarat state.
The first of this type of test is:

1. Bhatt’s Verbal and Non-verbal group test of Intelligence

In Gujarat Champaben Bhatt has done pioneering work by developing a verbal and nonverbal group test of Intelligence in 1963 for the age group of 9th to 13th years. The test consists of seven sub-tests. Different sub tests have a different time limit. The reliability by split half method is 0.86 and by KR-20 formula is 0.96. Congruent validity of the test is 0.82. Age, area, grade norms were established.

2. Jyoti Desai’s Verbal and Non-verbal group test of Intelligence

In Gujarat Jyotiben Desai has done pioneering work by developing a verbal and nonverbal group test of Intelligence. The test is for std 5th to 7th. There are 7 sub tests vizly odd-man out, following direction, verbal analogies, moronic age, sequence in picture and progressive matrices. It includes 78 test items. Test-retest reliability of the test is 0.089 and split half method reliability of the test is 0.88. Congruent validity of the test is 0.82. Age, area, grade norms were established.

3.4 RESEARCH STUDIES

3.4.1 Researches done in India

Ramalingaswami (1970) adopted the performance part of the Wechsler Adult Intelligence scale (WAIS) and collected data from 604 literate persons of Delhi belonging to both sexes between 15 to 45 years. The reliability of the total test ranged from 0.89 to 0.91 in
the four age groups. Factor analysis of the subtests for the four age groups and for both sexes was done separately. A single common factor was identified as spearman ‘g’ in each analysis.

**Trivedi** (1970) standardized a ‘culture-free’ test of mental ability for Assamese high school students. The sample consisted of 1310 students of tenth grade. The battery consists of figure arrangement, similarity location, progressive matrices, analogy-based matrices and pattern perception subtests. Both Percentile and T-score norms were prepared on the basis of data collected from the study sample.

**Chatterjee and Mukherjee** (1971) constructed and developed a non-language test of verbal intelligence. No significant difference was found between non-language test and the two parts of a verbal test containing letter reasoning and verbal reasoning items. The correlation between letter reasoning and total scores on the non-language test was found to be quite high.

**Ahuja** (1971) constructed a battery consisting of six tests, namely, analogies, classification, disarranged sentences, opposition series and best answers. The reported test-retest reliabilities as well as certain validity coefficients, appear to be satisfactory. Age norms and class norms have been worked out separately for boys and girls because of significant sex differences.
Deshpande (1971) studied the sex differences on Raven’s matrices test, the sample consisted of boys and girls enrolled in class IV of primary schools of Nagpur. He found a significant sex difference in the average scores of boys and girls.30

Sharma (1972) attempted to measure children’s intelligence through bicycle drawings. From a preliminary study of 417 drawings, a 75 point scoring scheme, with items of hierarchical difficulty levels was designed, which showed a self scoring consistency coefficient of 0.96. The test has been standardized on 2,863 children from 30 schools and age-norms have been derived. The test-retest reliability was found to be 0.82, and split-half reliabilities for different age groups ranged from 0.84 to 0.92.

Bhatt (1972) translated the different tests of WISC battery into Gujarati after eliminating or changing some items and administered the battery to 440 students from 12 schools in Ahmedabad. Both split-half and test-retest reliabilities were obtained. The coefficient was found to be high. Validity was established against criteria like scores on the Stanford-Binet Intelligence Test, Desai and Bhatt’s Group Test of Intelligence, Shah’s Non-verbal Test of Intelligence, school achievement and teacher’s ratings. Factor analysis was also carried out.

Mohan (1972) studied Raven’s Standard Progressive Matrices (PMT) and a verbal test of general mental ability. The two tests were
administered to 310 students (165 females and 145 males) of Punjab University. The correlation coefficient between PMT and a verbal test of general mental ability was 0.654, and the correlations between the two tests for males and females did not show any difference.

**Rao and Reddy** (1972) conducted a study entitled, “Can Raven’s progressive matrices test be shortened”. They administered the RPM under nine different conditions of testing to 1,260 higher secondary boys from age group of 13 to 17 years. A shortened version of RPM was also scored along with the standard one and it was found that the correlations were very high when the RPM was administered as a power test without any time limitation. On the other hand, administering the test with time limitations as a speed test yielded significantly lower correlations when compared to the above.

**Maniam and Feroze** (1973) developed a verbal reasoning test in Tamil for high school students which has two parts. The first part consists of eclectic reasoning, mathematical reasoning, syllogistic reasoning and abstract reasoning tests. The second part comprised of scientific reasoning test, indirect test, and synthetic test. The split-half reliability of the total scores was found to be 0.74 and validity coefficient was 0.60 against school achievement. Boys were found to be better in reasoning ability than girls.
Faroqi (1974) conducted a series of five studies using the progressive matrices test (PMT) and found that group testing yielded high scores than the scores under individual condition. The shortened version of PMT calling for about half the time required for the standard version, yielded almost as useful estimate of child’s intelligence level as the standard one. Sex differences on the PMT were found to increase with increasing age.

Dolke (1975) studied various psychometric properties of progressive matrices test (PMT) on the basis of data collected from 512 employees of four textile mills. The test-retest reliability after one month was found to be 0.80. The internal consistency by KR-20 formula and split-half reliabilities were 0.67 and 0.73 respectively. The concurrent validity coefficient of PMT against scores on the GATB was found to be 0.55. The correlation between PMT and the criterion of occupational success based on merit-rating turned out to be 0.62. Some age-wise norms and occupational-norms were also derived.

Dolke (1976) conducted an investigation into certain psychometric properties of Raven’s Standard Progressive Matrices Test (PMT). An attempt was made to report the work on item analysis, factor analysis, reliability and validity of PMT. The sample included employees from technical and clerical occupations and university students. Their mean score on PMT was 34.15 with a standard
deviation of 12.60. For the purpose of item analysis 370 subjects were randomly selected from the total sample of 521. The results revealed that most of the items in PMT were of medium and low difficulty. Many items had poor discrimination. On scaling the test on linear scale it was found that items were not properly spaced in terms of their difficulty.

Factor analysis of the test showed that it does not have a relatively simple structure: it measures some other factors along with ‘g’. Reliability and validity coefficients of the test are statistically significant but not very high.

**Pillai** (1978) constructed and standardized a test in Tamil to measure the intelligence of children in the age group of 10+ to 15+. The study was also designed to relate intelligence to age, sex, grade, residence and the socio-economic status of pupils. For the final administration, 5,000 pupils were selected from thirty-four schools of one of the fourteen districts of Tamil Nadu, using stratified proportionate sampling. The test included seven subtests: synonyms, antonyms, analogy, classification, mixed words, reasoning (verbal), and reasoning (numerical). The test-retest reliability was found to be 0.84 and the split-half reliability was 0.88. The content validity was considered on the basis of the various types of behaviors assessed by the subtests. Norms were determined for the total sample, grade wise and age wise.
Mishra (1978) conducted the study to assess factor-structure invariance of the Wechsler Adult Intelligence Scales (WAIS) across two developmental age groups, 18-19 and 25-34, in an ideal factor analytic condition. The WAIS, Differential Aptitude Tests, Culture Fair Intelligence Test, and Advanced Progressive Matrices were administered to 200 subjects (100 subjects in each group). Intercorrelation matrices of the twenty-four variables of both the age groups were subjected to principal component analysis and varimax rotations. Eight factors in each age group were retained following the criterion of positive generalizability. The retained factors in the 18-19 age group were identified as perceptual organization, perceptual inductive reasoning, language usage, associative thinking, conceptual verbalization, verbal reasoning, memory and speed of perceptual thinking. The factors in 25-34 age group were interpreted as language usage, associative thinking, perceptual inductive reasoning, memory, perceptual organization, speed and verbal comprehension. Identical or similar factors were matched across the age groups. Horn’s corrected version of pattern correlation was computed between the factor loadings of each matched factor pair for an invariance analysis. Seven of the eight factors could be matched and the one unmatched factors pair considered to be the most dissimilar was excluded from the invariance analysis. Marker variables helped for the emergence of
certain new factors and raised the magnitudes of WAIS communalities. The invariance analysis revealed that structural invariance could be established for a verbal factor pair (conceptual verbalization of 18-19 age group and verbal comprehension of 25-34 age groups). A complete non-invariance was evident for the memory factor; lack of structural invariance was found for the remaining six factors.

Puhan (1979) conducted a study intended to examine WAIS factor structures across 18-19 and 25-35 age groups. The WAIS sub scores of one hundred 18-19 and one hundred 25-34 year olds were taken (Puhan, 1974). The raw scores of all the WAIS scales were correlated and principal component factors were found and rotated to Varimax solutions. In the 18-19 age groups the rotated factors were identified as verbal comprehension, freedom-from-distractibility, perceptual assembly, and symbolic reasoning. In the 25-34 age group they were interpreted as perceptual organization, verbal reasoning, and concentration speed. The invariance analysis were then performed to examine the structural stabilities of the similar factors. The structure of the verbal comprehension factor showed a striking similarity across the age groups. The structure of the Freedom-from-distractibility factor was found lacking invariance requirements. The rest were found as dissimilar factors. The results were discussed in the light of past observations.
Chakraborty (1979) also did the study with the major objective of providing an instrument to measure the general mental ability of children of age groups 6 to 10 (studying in classes I to V) for solving the problems related to school admission, classification of pupils into homogeneous groups, class promotion, diagnosis, prognosis, educational guidance and research. A battery consists of six tests vizly Stringing Bead Pattern, Picture Sequence, Picture Assembly, Object Profile, Block Design and Symbol Substitution. The standardization sample consisting of 1,000 children (200 from each grade level comprising 100 boys and 100 girls) was selected from 84 percent of the total subdivisions of Manipur.

The reliability coefficients of the battery and its tests were estimated by K-R formula and test-retest method. The reliability coefficients obtained were found to range from 0.66 to 0.91. From factorial analysis it was found that the battery contained only one factor in the six tests studied. The ‘g’ factor loadings and centroid factor loadings of the test varied from 0.75 to 0.87 and 0.76 to 0.87 respectively. The coefficients of correlation between the scores on the battery and scholastic achievement in English, Mathematics and Science were found to range between 0.40 and 0.56. The coefficients of correlation between the battery scores and the scores obtained by the students on WISC and Performance Test of Intelligence were 0.78 and 0.63 respectively. The content, concurrent, factorial, cross
and predictive validities of the battery were satisfactory. Grade and age norms were established separately for boys and girls. Grade percentiles for different classes (from I to V), and age percentiles for different age levels (from six to ten) were computed for boys and girls separately.

Sheth (1979), adapted the Wechsler Adult Intelligence scale for Gujarati population by making changes in the items of WAIS, wherever necessary and standardized on the population of Ahmedabad city. Six subtests were verbal and five subtests were performance type. The various subtests were about general information, general comprehension, arithmetical reasoning, similarities, digit span, vocabulary, digit symbol, picture completion, block design, picture arrangement and object assembly. The sample comprised of 400 adults including women. The raw scores of each test were converted into scaled scores using $M = 10$ and $SD = 50$. Reliability of the test was checked by test-retest and split-half method and were found to be very high. Validity of the test was determined by comparing its IQs with IQs on Desai-Bhatt, Cattell Culture - Fair tests and Raven’s Standard Progressive Matrices and the correlations ranged from 0.37 to 0.90. The correlations of the subtests were analyzed for factor analysis by Hottelling’s principal axis method and centroid method and eight factors were extracted, the first of them being “g”.
Thakur (1979) designed the study where the major objective was to construct and standardize a test to measure the general mental ability of students studying in classes V to VIII of Assamese Medium high schools and higher secondary schools of Upper Assam. Seven subtests – logical selections, analogies, number series, synonyms-antonyms, proverbs, classifications and best answers – were included in the test. The final version of the test was administered to 3039 boys and 2243 girls, selected from classes V to VIII, by adopting the stratified random sampling technique. The reliability coefficients obtained by test-retest, split-half and rational equivalence methods for the entire sample and for different classes of boys and girls separately were found to range from 0.89 to 0.97. Content, construct and concurrent validity were established and the obtained coefficients were found to range from 0.41 to 0.88. Grade norms and percentile norms were fixed for different grades of boys and girls together as well as separately; norms were also fixed for the entire sample irrespective of grades. Coefficients of correlation between intelligence scores and academic achievement were found to range from 0.41 to 0.50 for Classes V to VIII.

Desai (1980) conducted the study with the main objective of comparing the performance of different sub-cultures of Gujarat on Raven’s Standard Progressive Matrices, Cattell’s Culture Fair
Scale, Desai-Bhatt Verbal Group Test of Intelligence and Bhavsar Non-verbal Group Test of Intelligence. The sub-cultures were big urban, small urban, semi urban, rural advanced, rural backward, rural muslim, tribal and tribal institutional. Eight schools, one from each sub-culture, were selected and one division of Standard VIII was selected from each school randomly.

The sample consisted of 338 pupils, and the four tests mentioned earlier were the tools used for this purpose. Product moment coefficient of correlation and factor analysis by the principal factor method along with varimax rotation were the statistical techniques used for data analysis. Girls’ average scores in all sub-cultures were lower than those of boys in the respective sub-cultures but on Cattell’s Culture Fair Scale 3, they were not much different. The mean scores of boys and girls showed progressive decrease from more urban to semi urban, rural and tribal sub-cultures with only one exception that the rural advanced sub-culture showed better averages than the semi-urban group. Because of low norms on the Cattell’s Culture Fair Scale 3, the scope of comparability among various samples reduced to a great extent. Thus the Cattell’s culture fair scale 3 did not prove more useful than the verbal and non verbal tests used in the investigation. The differences in the average scores of the verbal test of intelligence were found to be more pronounced than those on Raven’s and Cattell’s tests. This supports Cattell’s
finding that crystallized intelligence assessed by verbal tests shows greater cultural difference than fluid intelligence assessed by culture fair tests. Five factors were identified, “g” factor, verbal factor, deeper reasoning, perception of relationship, and manipulation of correlates.

Jehan and Ahmad (1980) evaluated the effect of advantaged and disadvantaged class on intelligence. Fifty advantaged and fifty disadvantaged children were identified on the basis of Kuppuswamy’s socio-economic status scale. They belonged to the age range of 5-9 years and grade level upto 3rd. Seguin Form Board test of intelligence was administered individually. The result revealed that the mean I.Q. of the advantaged group of children was much higher (107.1) than the disadvantaged group of children (82.7).

Parental education, occupation, income and the living condition of the child plays a significant and important role in the intellectual development of a child.

Nayar (1980) carried out the study to construct and standardize a test for assessing the social intelligence of adults. Test items were constructed in multiple choice form with four to six responses likely to be made by the central figure in the situations. The test consisted of two forms, M and N. The final forms, M and N were administered to a representative sample of 1,200 and 600 respectively, belonging to
different age groups ranging from 20-40 years and above for purposes of validation. The coefficients of reliability calculated by the split-half method and the Spearman-Brown prophecy formula for Forms M and N were 0.82 and 0.74, 0.90 and 0.85, respectively. The reliability coefficient between the forms M and N was 0.73.

**Patel (1981)** conducted the investigation with the main objective to develop a non-reading test of general mental ability for Gujarati speaking students of the higher secondary schools of Gujarat State. The standardization sample consisted of 5,725 students studying in the higher secondary schools of Gujarat State. The coefficient of reliability ranged between 0.71 and 0.87 by different methods. The test gave coefficients of validity against teachers’ ratings as 0.59, against examination marks as 0.52, against other tests of intelligence as 0.68 and 0.79. Factor loadings revealed that the test was heavily loaded with “g” factor. Age norms and grade norms were established and deviation-IQs and percentiles for the test were computed.

**Shah (1981)** constructed and standardized a spiral omnibus type group nonverbal test of intelligence for Grades VIII to XII and the test was meant for the age group of 13 to 17 years. It includes six types of nonverbal intelligence tests, namely, similarities, classification, analogies, series, conditions and matrices. The sample from the population of Gujarat was selected by including in it one
school from an urban area and one school from a semi urban area from each district of Gujarat except the Danges. From the schools 3612 pupils were selected by the method of random sampling. The reliability of the test estimated by test-retest method for different age groups ranges from 0.80 to 0.95. The test retest reliability for separate tests ranges from 0.60 to 0.80, the split-half reliability for different age groups ranges between 0.80 to 0.87. The validity of the test was obtained by correlating the test with Bhavsar Non-verbal Test, Desai-Bhatt Verbal Test, School examination marks and Teachers’ opinions which were 0.88, 0.90, 0.57 and 0.78, respectively. Factor analysis of the test was carried out by Hottelling’s principal axis method and seven factors were obtained, the first factor being common to all the six tests and hence was thought to be the “g” factor.

Banker (1981) constructed and standardized an abstract reasoning test. The final test was administered on 5,277 students of ninety-one different schools of fifty-nine different places of Saurashtra. Reliability of the test was established by test-retest method (0.81), split-half method (0.94), Rulon formula (0.94), and Kuder-Richardson formula (0.95). The three types of validity established were congruent validity (r = 0.84), concurrent validity (r = 0.63) and predictive validity ranging from 0.62 to 0.72. Separate norms were established for boys and girls of Grades VIII and IX, in the form of
percentile ranks, standard scores, T scores, Stanines and letter grades.

Joshi (1982) adapted the Wechsler Preschool and Primary Scale of Intelligence for the children of Ahmedabad city in Gujarat. The original Wechsler scale consists of six verbal subtests viz: information, vocabulary, arithmetic, similarities, comprehension and sentences. The five performance subtests viz: animal house, picture completion, mazes, geometric design and block design. In the adaptation, some changes were made to suit the tests to Gujarati children. The tests were administered to thirty-seven children of age group four to six and a half years for item analysis, fixation of time limit and development of the scoring scheme. 180 boys and 180 girls were tested with the Gujarati adaptations of WPPSI and their verbal performance and total scale IQs were calculated. Conversion tables for all these were prepared. The reliability of the scale was determined by split-half technique for all different age groups and also for individual tests which ranges from 0.28 to 0.94, by the test-retest method, the reliability ranges from 0.63 to 0.93. The validity of the scale was determined by correlating the WPPSI IQs with the Stanford-Binet IQs, Draw-a-Man Test IQs, School marks and Teachers’ ratings which ranges from 0.26 to 0.96. The scoring key and the tables of conversion of raw scores into scaled scores and then to IQs were given in the manual.
Chatterji (1983) made a study which aimed at finding the academic group differences in intelligence among intermediate college students. Jalota’s (1976) Hindi version of the Group Test of General Mental Ability (1972) was administered to a sample of 760 students of class XII belonging to four academic groups viz., Arts, Science, Commerce and Agriculture. The study revealed that students of Science group stood highest on the intelligence scale and students from Arts faculty were at the lowest end. There was no significant difference between the intelligence level of commerce and Agriculture groups, but each of them was significantly more intelligent than Arts Group.

Mohan and Bhatia (1985) conducted a study where the purpose was to study psychomotor performance in children as a function of intelligence and sex. Two simple psychomotor tasks- Backward Figure Writing (BFW) and Tapping were used on 60 children belonging to the age group of 10 to 14 years. Three levels of intelligence; gifted, normal and mentally retarded were taken, each group consisting of 20 children (10 boys and 10 girls). Each subject worked for 5 minutes in the pre-rest period, rested for 1 minute and again worked for 2 minutes in the post-rest period on both the psychomotor tasks. Results indicated that in both the pre-rest and the post-rest periods, the subjects with higher intelligence consistently showed a better performance on BFW and tapping. Sex
emerged to be a significant determiner in pre-rest BFW, pre-rest and post-rest tapping.

Chatterji (1986) developed a non-verbal intelligence test for the children from the age level 13 to 15 years of class IX and class X. The test consist of items presented through geometrical figures and were of the multiple choice type. Both the difficulty and discrimination indices of the items were calculated. Most of the items included in the test were within the satisfactory range of difficulty values and had sufficiently high discrimination. Split-half reliability after correction was 0.95. Concurrent validity with external criterion was 0.62.

Shamshada (1988) attempted to compare boys and girls with regard to intelligence, neuroticism, scholastic achievement and need achievement. The sample comprised of 1,008 students covering equal number of boys and girls who were drawn from Srinagar, Sopore, Baramullah and Anantang. The relevant data was collected using Tandon’s Group Test of General Mental Ability, Dadherjee’s Incomplete Sentences Blank and Annual Examination Marks. The collected data was treated using mean, SD and ‘t’ test. The major finding was that girls were superior to boys in intelligence and scholastic achievement.

Mahnaz (1994) studied intelligence and an academic achievement of tenth Grade students of east and west part of Pune city with
particular reference to the socio-economic background. The sample consisted of 1946 students from 39 schools, and the Kulman – Anderson intelligence test was used to measure the intellectual level of the students. The ANOVA test results indicate that there is not much difference in intellectual abilities of students of different type of schools. The result shows that there is a negligible difference in IQ mean scores of boys and girls. The correlation results show a low and insignificant correlation between academic achievement and IQ ($r = 0.26$).

The following conclusions can be made on the basis of the above review:

Indian studies can be divided into three parts.


(2) The second part deals with adaptation and standardizations of foreign tests to the Indian environment finding out reliability and validity on the Indian sample and derive norms on Indian sample as those of Ramalingaswami (1970), Trivedi (1970), Bhatt (1972), Mohan (1972), Rao and Reddy (1972), Faroqi (1974), Dolke
(1975), Dolke (1976), Mishra (1978), Puhan (1979), Sheth (1979) and Joshi (1982).

(3) The third part studied the differences in intelligence according to some variables as those of Deshpande (1971) studied the sex differences on Raven’s Matrics test. Desai (1980) compared the performance of different sub-cultures of Gujarat. Jehan and Ahmad, (1980) evaluated the effect of advantaged and disadvantaged class on intelligence, Chatterji (1983) studied the academic group differences in intelligence, Mohan and Bhatia (1985) studied psychomotor performance in children as a function of intelligence and sex, Rangari (1987) studied the intelligence of the tribal and the non-tribal students, Shamshada (1988) compared boys and girls with regard to intelligence, neuroticism, scholastic achievement, Mahanaz (1994) studied intelligence and an academic achievement of tenth Grade students of east and west part of Pune city.

The findings shows that:

1. There were significant differences in intelligence score between students in different ages according to the studies conducted by Ahuja (1971), Sharma (1972), Dolke (1975), Pillai (1987), Chakraborty (1979), and Patel (1981).

2. There were differences between boys and girls in the average of intelligence scores according to the studies conducted by
Ahuja (1971), Deshpande (1971), Faroqi (1974), Desai (1980), and Shamshada (1988). But the study of Feroze (1973) shows significant differences in reasoning ability only and Mohan (1972) shows no significant differences between boys and girls.

3. Thakur (1979) and Chatterji (1983) commented on the relationship between intelligence test and academic achievement. But Mahanaz (1994) found an insignificant correlation between academic achievement and IQ.

3.4.2 Researches done in other countries

Proger et al (1971) studied the relative predictive and construct validation of the Otis-Lennon Mental Ability Test (OL-MAT), The Lorge-Thorndike Intelligence Test (L-TIT), and The Metropolitan Readiness Test (MRT) in grades Two and Four. The sample consisted of 322 students from second grade and 316 students from fourth grade. The relative predictive and construct validities of the Oits-Lennon, Lorge-Thorndike, and Metropolitan readiness tests were investigated by several multivariate analysis: canonical correlation, factor analysis and stepwise regression. Canonical correlation and principal-components factor analysis were employed to study the factorial construct validity of the O-L MAT, L-TIT, and MRT. The results demonstrate some similarities and differences between the two analytical approaches to construct validation. Further, stepwise multiple regression was used to establish
the relative predictive validities of the three tests, in selected verbal and numerical areas. In brief, the O-LMAT appears to be at least as effective a predictor of verbal and numerical achievement, as measured by the Stanford Achievement test (SAT), and the use of teacher rating (TR) as is L-TIT and MRT. Estabrook (1984) under the title “A Canonical correlation Analysis of the Wechsler Intelligence Scale for Children-Revised and the Woodcock-Johnson Tests of Cognitive Ability in a sample referred for Suspected Learning Disabilities”. The sample consisted of 107 boys and 45 girls in grades 1 – 7. A canonical analysis was completed to examine the overlap between the two tests. Three significant canonical correlations were obtained. The redundancy index showed that approximately 28.6% WJTCA (Woodcock-Johnson Tests of Cognitive Ability) subtest variance is predictable from the linear combination of the WISC-R subtests, and approximately 32.7% of the WISC-R subtest variance is predictable from the WJTCA subtests. Analysis of the structure correlations indicates that the first canonical variants share a general intelligence factor, the second a perceptual speed factor, and the third a numerical-memory factor.

Antonak et al. (1982) is titled Otis-Lennon Mental Ability Test (OLMAT), Stanford Achievement Test (SAT) and Three Demographic Variables (sex, school attended, and year) as Predictors of Achievement in Grades 2 and 4. The sample consisted of 91
students from second grade classes in 1977-78, who were also presented as fourth grades during the 1979-80 academic year, and 103 students from the second grades in 1979-80. A series of 51 multivariate statistical analysis was used to determine the relationships that exists among these three variables.

The results revealed that the best predictor of achievement at either grade 2 or grade 4 was the I.Q. variable alone. The correlations among the OLMAT-IQ and the SAT variables were strong and positive for all pupil samples. The correlation between the OLMAT scores for the sample of 91 students when tested as second graders in 1977-78 and again as fourth graders in 1979-80 was 0.74. The correlations among the SAT subtests led to questions concerning the test’s construct validity and its use for differential diagnosis of educational problems of children. The non significant sex differences in both the mean SAT and OLMAT IQ scores were found. A detailed study of the correlations between the OLMAT and SAT did not support the continued use of the group IQ test.

Grossman et al (1983) under the title of “Validity of the Slosson and Otis- Lennon in predicting achievement of gifted students” studied the efficacy of the Slosson Intelligence Test and the Otis-Lennon Mental Ability Test to predict academic achievement as measured by selected subtests of the Stanford Achievement test (SAT). The sample consisted of 46 children of middle-class origin
(24 males and 22 females) from a Midwest, urban public elementary school district.

The results of a multivariate multiple regression analysis indicated that the Slosson and Otis-Lennon significantly predict SAT Vocabulary, Reading Comprehension, and Mathematical Concepts subtests, with the Otis-Lennon in comparison with the Slosson accounting for a significantly higher proportion of the variance with SAT scores. Regression equations are provided for determining expected SAT scores based upon observed Otis-Lennon and Slosson IQs. Implications of the findings with regard to the screening of gifted students for programmes are delineated.

Kaeser and Reynolds (1985) examined the II subtests of the Wechsler Preschool and Primary Scale of Intelligences (WPPSI) statistically for evidence of sex differences. The authors used the data gathered for the WPPSI in the early 1960s which consisted of 600 males and 599 females selected on the basis of age, geographic region, urban- rural residence, race and father’s occupation. Results provided fundamental support for previous work with older children showing better female performance on memory and psychomotor tasks and better male performance on spatial tasks although the distinctions in performance were not as clear as with older children.
Hyde and Linn (1988) conducted a study entitled “Gender Differences in Verbal Ability: A Meta-Analysis”. They located 165 studies that reported data on gender differences in verbal ability. The weighted mean effect size ($d$) was $+0.11$ indicating a slight female superiority in performance. The differences in verbal ability no longer existed. Analysis of effect sizes for different measures of verbal ability showed almost all to be small in magnitude: for vocabulary, $d = 0.02$; for analogies, $d = -0.16$ (slight male superiority in performance); for reading comprehension, $d = 0.03$; for speech production, $d = 0.33$ (the largest effect size); for essay writing, $d = 0.09$; for anagrams, $d = 0.22$; and for tests of general verbal ability, $d = 0.20$. For the 1985 administration of the Scholastic Aptitude Test-Verbal, $d = -0.11$, indicating superior male performance. Analysis of tests requiring different cognitive processes involved in verbal ability yielded no evidence of substantial gender differences in any aspect of processing. Similarly, an analysis by age indicated no striking changes in the magnitude of gender differences at different ages, countering some conclusions made by some studies that gender differences in verbal ability emerge around age 11. For studies published in 1973 or earlier, $d = 0.23$ and for studies published after 1973, $d = 0.10$, indicating a slight decline in the magnitude of the gender difference in recent years. The implications of these findings are discussed, including their implications for theories of sex
differences in brain lateralization and their relation to changing gender roles.

Anderson et al (1989) investigated the temporal stability of WISC-R IQ scores for learning-disabled students (88 boys and 25 girls) from four school systems in Louisiana. Pearson product moment correlations yielded coefficients that were considerably lower than those previously reported: \( r = 0.55, p < .001 \) for the Verbal IQ; \( r = .63, p < .001 \) for the Performance IQs; and \( r = 0.58, p < .001 \) for the full scale IQs. Results of t-test analyses indicated that only the Verbal IQ scores were significantly different when the initial evaluation \( (M = 89.4) \) was compared to the re-evaluation \( (M = 85.3) \) \( p < .001 \). The results suggest that the WISC-R may be less stable for the learning-disabled population than for other groups and that the average 3-year test-retest time lapse was an influential factor in the reduced reliability of this instrument.

Canivez (2000) investigated the predictive and construct validity of the Developing Cognitive Abilities Test (DCAT) in a heterogeneous sample of 863 sixth grade students. Level H of the DCAT was administered during the student’s sixth grade year and selected subtests of the Iowa Tests of Basic Skills (ITBS) were administered eight months later during their seventh grade year. Results showed that correlations between the DCAT and Iowa Tests of Basic Skills ranged from 0.50 to 0.74 with a median \( r = 0.635 \).
Correlations also supported the construct (convergent) validity of the DCAT when compared to the ITBS with the DCAT verbal subtest correlating significantly higher with the ITBS vocabulary reading, and language usage than either the DCAT quantitative or spatial subtests which are not as verbally oriented. The DCAT quantitative subtest was associated with the ITBS mathematics problem solving to a greater extent than either the DCAT verbal or spatial subtests.

Fabregat et al (2000) conducted a study about sex differences in general intelligence defined as ‘g’ among young adolescents. They studied two independent samples. The samples were a total of 1565 young adolescents (797) girls and (768) boys. The congruence coefficients between the ‘g’ factors extracted for each sex suggested a near identity and then the sex difference in ‘g’ was represented on each of the subtests in terms of a point-biserial correlation. These correlations were included with the full matrix of subtest intercorelations for factor analysis. The results reveal the factor loading of sex on g, which in this study suggest a null sex difference.

Diseth (2002) conducted a study, the purpose of which was to investigate the relationship between intelligence, approaches to learning and academic achievement. The sample consisted of 89 Norwegian undergraduate psychology students. Intelligence was measured by means of three different tests. The WAIS Vocabulary
test was used as a measurement of crystallized intelligence, and Monneslands Verbal Analogies Test was a measure of fluid intelligence and the Sandford/Rybakoff Spatial Test was a measure of spatial intelligence. General intelligence did not correlate significantly with any of the approaches to learning variables or with examination grade. The WAIS vocabulary test appears to be the most relevant measurement of intelligence with respect to academic achievement. In general, the present findings do not give much support to the relationship between intelligence and achievement, as would be expected.

Lynn, Fergusson and Horwood (2005) conducted a study to find the sex differences on the WISC-R in New Zealand. Sex differences on the WISC-R were examined on a sample of 897 children from 8 and 9 years who were gathered during the course of the Christchurch Health and Development Study (CHDS). The CHDS is a longitudinal study of a birth cohort of 1265 children born in the Christchurch Urban region during mid 1977. The findings revealed that boys scored significantly higher than girls on the subtests of information, vocabulary, block design and object assembly, while girls scored significantly higher on coding. Boys obtained slightly but not significantly higher scores on the verbal, performance and full scale IQs. The results were in general similar to the sex differences in
the standardization samples of the WISC-R in Scotland, the Netherlands and the United states.

**On the basis of the above review, the following conclusions can be made:**

The above studies can be divided into three parts,


(3) The third part studies the relationship between intelligence and academic achievement as of those Antonak et al (1982).

**The above findings reveal that:**

1. There are significant differences in intelligence scores between age levels as study conducted by Vigil Colet (2003).

2. There are no significant differences between boys and girls according to the studies conducted by Fabregat et al (2000).

3. There are differences in intelligence scores between boys and girls as those of Kasser and Reynolds (1985), Lynn, Feryusson and Horwood (2005).
4. Grossman et al. (1983) found a significant relationship between students' intelligence scores and academic achievement. Antonak et al. (1982) found that the best predictor of achievement was IQ variable alone. The findings of Diseth (2002) stress the idea that there is no significant relationship between intelligence and achievement.

3.5 RATIONALE FOR THE PRESENT TEST

Now a day there is great demand of different types of test by the teachers, administrators, counselors, researchers and parents. Looking to the development of tests in advanced countries, worked done in India seems to be less. Hence the present investigator has modestly ventured to develop one more test along with very few existing verbal and non-verbal test for the student studying in upper primary school of Gujarat state.

On classifying the available tests on the basis of type, age levels, grades, contents etc., it was observed that a very few verbal and non-verbal group test exist in Gujarat for upper primary school students. It was also felt from the review of the development of tests in India and abroad that it was essential for the group tests of intelligence to consider some of the factors like time limit, number of sub test and weightage to environmental factors along with heredity factors.

**Anastasi puts it:** “A practical difficulty encountered with separate sub test is that less careful examiners may make timing errors. Such errors
are more likely to occur with several short time limits with single long
time limit.”

For the role of heredity and environment in the determination of
individual’s Intelligence. **Ebill, Noll and Bauer** states: “that
Intelligence is completely dependent on genetic influences without
appreciable change by environmental factors is now seldom held. The
current tendency is to give both heredity and environment some of the
credit for performance of Intelligence tests.”

Wide popular Tests of General Ability viz. TOGA was found
unique in including all the elements discussed in foregoing
paragraphs. J.C. Flanagan advocating for this writes, “Items measuring
information and reasoning were selected for inclusion in the tests
of General Ability for two reasons, first, it appeared that these
two abilities are dominant in most of the definitions of
general intelligence. Secondly, a review of the literature indicates
that these two abilities usually provide best predictions of
school success”.

By including the information items the effect of
environment that lacks in today’s test in Gujarat, has been duly
considered. This information part is designed to test children’s
familiarity with the world around him through experiences at home,
in school and in the community. The problems relate to general
knowledge of his surroundings, gained through his deep observation
and skill. The reasoning part avoid any cultural content and test pupil's power of abstract reasoning, which is very similar to genetic differences in general ability which are inherited and affect the individuals performance throughout life. It is felt that more number of sub tests in a group tests add to the difficulty in administration and the growing generation finds it difficult to take test for a long time. The present test is pictorial, verbal and non verbal form, with two sub-tests and demanding about 70 minutes for administration might be considered unique. Hence the test is expected to serve as a good instrument to measure individual differences of students of Classes V, VI and VII in their intelligence ability.

3.6 CONCLUSION

From the review of the work done of intelligence tests, it was found that most of them were of foreign countries, very few are constructed for Indian students. Especially in Gujarat there is no intelligence test for students belonging to upper primary. Hence looking to the urgent need of intelligence test for upper primary school students, the present study was carried out. The present intelligence test would be constructed to measure intelligence of grade V to VII students of Gujarat state. The components of each part of the test were described in chapter IV
REFERENCES


