CHAPTER 4

METHOD OF INVESTIGATION

This chapter presents the description of the selected instruments and the method followed to test the hypothesis derived in the previous chapter. The following instruments were used to measure the variables under study.

1. Wechsler's Intelligence scale for children.
2. Wallach and Kogan's measure of creativity.
3. School examinations.
4. Children's Adjustment inventory.
5. Junior Eysenck personality inventory.
6. Socioeconomic status.
7. Tamil language proficiency test.
8. Hartshorne and May's test of deception.

Preliminary investigation.

Description of the instruments:

1. Wechsler's Intelligence scale for children:

The concept of intelligence has been defined divergently by several researchers. Wechsler (1949) operationally defines intelligence as the aggregate or global capacity of the individual to act purposefully, to think rationally and to deal effectively with his environment. He refers to intelligence as an aggregate capacity, emphasising the components as qualitatively undifferentiable but not entirely independent elements or abilities. The resultant intelligent behaviour is the product of the configuration or the number of elements or abilities and non-intellectual factors. The quantitative measurement and evaluation is possible only through the measure of those specific abilities and the person's rating on intelligence depends largely on the material used in
a particular test. Thus a person's achievement on an intelligence test consisting mainly of verbal items may significantly differ from his/her performance solely on a nonverbal test or scale demanding mainly psychomotor reactions and perception of spatial relationships. Wechsler, with awareness of this contention, standardised a scale for children yielding verbal, nonverbal and global scaled score that is convertible into verbal, nonverbal and composite intelligence quotients.

The validity of using a verbal intelligence test for assessing the intelligence of bilingual children has been questioned on the basis that they suffer from verbal handicap (Pintner, 1932; Jones, 1952; 1966). Darcy (1952) suggests inclusion of both verbal and nonverbal intelligence tests for valid conclusions and to avoid either verbal or nonverbal intelligence test as a sole measure of appraisal. Hence a tool that yields both verbal and nonverbal as well as a global measure was selected.

Instruments like Eimer General Ability Test, Lorge Thorndike Test are not standardised on Indian samples. Indian standardised tests such as Desai's group Test of verbal intelligence, Bhatt's groups test, Shah's nonverbal test, Fathak's adaptation of Godenough's draw-a-man test assess solely either verbal or nonverbal intelligence (Bhatt, 1970). Distinct from Binet-Kamat's Test of Intelligence and Bhattia's test of intelligence, Wechsler's Intelligence Scale for children yields verbal, nonverbal as well as global Intelligence Quotient and has been adapted to Indian cultural background on samples of Gujarati children (Bhatt, 1970). The adapted version of WISC is used in the present study (Vide: Appendix A).

Wechsler's Intelligence scale for children consists of twelve tests. The subscales of the verbal and nonverbal test are as follows.
Verbal Scale - Information, Comprehension, Arithmetic, Similarities, Vocabulary, Digit span. Performance scale - Picture completion, Picture arrangement, Block design, Object assembly, Coding or Maze.
In the interest of shortening the time required for administering the scale, generally five verbal and five performance tests are administered to the subject and the IQ tables are calculated on the basis of ten tests. Digit span and Maze (or Coding) are considered as supplementary tests to be added when time permits or used as an alternative test when some other test in the appropriate part is invalid (Wechsler, 1949). Coding was included in the performance scale in the present investigation to measure the flexibility in writing the symbols. Subscales measure various intellectual abilities (Gustavson, 1978). The subscales of this widely used instrument are described below:

**Verbal Scale:**

**General Information:**

This subtest consists of thirty questions which tap the subject's range of information and also long-term memory of factual, isolated data. This is considered as a good indication of his intellectual capacity and the fact remains that competency in this scale depends in no small degree, upon his education and cultural opportunities. The items 7, 8, 30 were changed due to unfamiliarity of words like Mogra flower to South Indian children. They were changed to a closely appropriate equivalent with caution so as not to alter the order of difficulty within the subscales: The item 7: What is the colour of Mogra flower? was changed to: What is the colour of Jasmine?
The item 8: What is a Swastika? was changed to: What are the colours in the Indian National Flag?
The item 30: How many kilometers is it from Ahmedabad to Bombay? was changed to: How many kilometers is it from Madras to Mahabalipuram?

**General Comprehension:**

The problems faced in practical life situations are enumerated and the subject is asked to respond to the fourteen well designed questions. The subject's organisation and application of practical information, general ability of children to evaluate past experience and logical
reasoning ability and social judgement are assessed. The items required no modification from the Gujarati adaptation of WISC.

**Arithmetic:**

The test of arithmetic reasoning includes sixteen problems that measure the ability to solve the orally presented mathematical problems. There is a time limit for each problem. It is one of the three R's whose knowledge is considered as an essential item in intelligence. They correlate highly with other academic subjects and tests of intelligence and the performance is likely to be affected by his education. No changes were made from the Gujarati adaptation.

**Similarities:**

This subscale consists of sixteen pairs of elements and measures the ability to perceive the underlying relation between the pairs, thereby assessing verbal concept formation and logical abstract reasoning. The correlational studies have proved its worth as one of the most reliable measures of intellectual capacity. The fifth pair in this subscale in Gujarati adaptation—Tambur—Flute has been changed into Veena—Flute in the present study. Though tambur and veena are similar in many respects, Veena is more familiar among children of South India. In the sixth pair of Gujarati adaptation—Opium and wine has been changed to brandy and wine.

**Vocabulary:**

The list of forty words included in this subscale consists of verbs, common nouns, adverbs, adjectives, etc., and the testee is required to define, explain or describe them. The importance of this subtest stems from the fact that the number of words an individual knows is the result of his learning ability and the range of ideas possessed. Furthermore, words carry concepts behind them. No changes were required from the Gujarati adaptation.
Performance Scale:

Picture Completion:

The twenty incompletely drawn pictures are presented sequentially to the subject who is asked to discover and name if possible, otherwise indicate, the essential missing part in the picture. This is an untimed test and requires analysis of the picture to perceive the missing part. The measured mental operations are perceptual and conceptualisation through visual recognition and identification of familiar objects. In order to identify the pertinent missing part of the picture, it requires recognition of what the picture represents and identification of the missing part with the awareness that it forms the essential part of that particular object. The subject is also required to discriminate essential from non-essential details.

Picture arrangement:

Picture arrangement test consists of items - A,B,C,D followed by demonstration of the arrangement of the item - EIGHT with subsequent tasks on six items. The series of pictures that are presented to the subject in a disarranged manner should be arranged sequentially with logical causal relation between the pictures within the time limit. It assesses the ability to anticipate, plan and organise his/her performance. It involves the ability to pick out the essential cues with a comprehension of social situation and requires logical reasoning.

Block Design:

The test consists of ten designs on papers which have to be designed using blocks. The first seven designs are to be formed with four blocks within a time limit and the remaining three designs are to be formed using nine blocks. The sides of the block are painted either red or white or one-half white and one-half red. The tests assess the ability to analyse and reproduce abstract designs with blocks and calls for motor integration and coordination as well as perceptual organisation.
Object Assembly:

The subscale requires the subject to assemble the parts into a familiar configuration. The test consists of four items, viz., Mankin, Horse, Face and Auto. Each one of the item is cut into many parts and the subject is required to assemble them together so as to form complete figures within the time limit. The ability to perceive and construct the design with part to whole relationships is assessed.

Coding:

The test has its origin in the well known Otis and Army Beta test. The two sections viz., Coding A is prescribed for age group 5 years and Coding B is for those eight years or older. Coding B requires the subject to associate certain symbols with certain numbers. The key is provided in the upper part of the test and the subject proceeds with the model. It is a test based on speed and accuracy and is influenced by flexibility in handling symbols.

Since the investigation involved Tamil medium school children, all the instruments were administered in Tamil language to the randomly selected subjects. 15 boys and 15 girls were selected randomly from both monolingual and bilingual groups and the reliability of the instruments used in this study were estimated. The mean age of the group was found to be 10.2 years. For the purpose of translation of the instruments, children from V standard with average proficiency in English and Tamil, as rated by the teachers were selected. The mean age of the group was found to be 9.1 years. The English version of Gujarati adaptation of Wechsler's Intelligence Scale for children (WISC) was translated in Tamil by a Tamil Scholar. The English and Tamil version were administered with an interval of one month between the administrations. The coefficient of correlation between English and Tamil versions of WISC was found to be 0.89 which is significant at 0.01 level of significance. This ensured the reliability of the Tamil version of WISC.
Reliability:

Reliability coefficient of the instrument was obtained for verbal, nonverbal and full scale by test-retest method. The test was administered with an interval of one month between the administrations of the tests. The scores obtained on both the sessions were correlated by the Product Moment method which was then correlated by the Spearman-Brown prophecy formula. The results are presented in the Table below:

Table 1.

Reliability Coefficient for WISC.

<table>
<thead>
<tr>
<th>Test</th>
<th>$r$ corrected by Spearman Brown Prophecy Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal Scale</td>
<td>0.66</td>
</tr>
<tr>
<td>Nonverbal Scale</td>
<td>0.89</td>
</tr>
<tr>
<td>Full Scale</td>
<td>0.93</td>
</tr>
</tbody>
</table>

From table 1, it may be seen that the reliability of coefficients varies from 0.69 to 0.96 which are significant at 0.01 level. Therefore the Tamil version of WISC was accepted for use in this study.

2. Wallach and Kogan's measure of Creativity:

Psychometric approaches to measure creativity has nurtured various instruments that measure different underlying principles of creativity. Creativity as an independent measure should load negligibly to intelligence accounting for a significant degree of the variance in performance. Many of the tools have drawbacks in satisfying the criteria.
Wallach and Kogan (1965) found creativity to be distinct dimension in a playful and nonevaluative context. They induced the ten year old subjects to regard the tasks to be games rather than as tests, in which, correlation between measures was 0.51, between the intelligence and creativity scores 0.09. This was akin to results of study involving different age groups (Ward, 1968; Wallach and Wing, 1969). This valid instrument of creativity based on associative conception of creativity process has been adapted to Indian background by Paramesh (1973). So Paramesh's adapted version of Wallach and Kogan's test of creativity was selected for the present study.

The Creativity measures consists of verbal and nonverbal subtests. (vide: Appendix B). Verbal subscale comprises of instances (items eliciting possible instances of a class concept), Alternate Uses (items taping possible use of specified object) and Similarities (measuring common elements between the two verbally specified objects). The two visual subscales - Pattern meaning and line meaning consists of designs and drawings eliciting possible meaning or interpretation. The group administration of the instrument has been effectively used by Cropley (1968) and Paramesh (1971). For effective administration, the measures should be presented in non-evaluative and stress free context with no time limit. Absence of teacher and avoidance of labelling the measure as test have been suggested (Kareem, 1976).

The instrument was translated in Tamil and was administered to ten years old, Tamil-English bilingual children. The nonverbal measure was administered in the fifth standard to randomly chosen thirty children and in the next day the verbal subscale was administered. After an interval of one month, the English version of the instrument was administered in a similar manner to the same subjects. The product-moment coefficient of correlation calculated between the scores of English and Tamil version was found to be 0.91. The highly significant value at 0.01 level revealed the efficacy of the translation.
Reliability of the instrument was estimated by the Split half technique. The internal consistency was studied by obtaining the scores from randomly chosen thirty subjects. The scores of the odd and even items of each of the subtest were correlated which was the corrected by Spearman Brown prophecy Formula (Guilford, 1954). The results are presented in Table 2.

Table 2.
Split – Half Reliability Coefficient for the Creativity Instrument.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Tests</th>
<th>Reliability coefficient after correction by Spearman-Brown formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Instances</td>
<td>0.69.</td>
</tr>
<tr>
<td>2.</td>
<td>Alternate uses</td>
<td>0.82.</td>
</tr>
<tr>
<td>3.</td>
<td>Similarities</td>
<td>0.76.</td>
</tr>
<tr>
<td>4.</td>
<td>Pattern Meaning</td>
<td>0.68.</td>
</tr>
<tr>
<td>5.</td>
<td>Line Meaning</td>
<td>0.73.</td>
</tr>
<tr>
<td>6.</td>
<td>Total</td>
<td>0.39.</td>
</tr>
</tbody>
</table>

All the correlation values are significant at 0.01 level which indicate the internal consistency of the measure.

3. School Examination:

Many research endeavours have utilized standardised instruments like California Achievement Test and Metropolitan Achievement Test, for assessing the academic performance of school children. The limitation of such measures is that they are laborious and time consuming. Marks obtained from examinations like quarterly, half yearly and annual examinations reflect the knowledge attained or developed in the school subjects in the regular school programme. The natural course of evaluation conducted by school teachers forms part of the curriculum.
Moreover it involves less time for researchers and has been effectively used by several researchers (Kuppuswamy, 1945; Bates, 1970). The drawback levelled against this measure, is that subjective bias of the teachers and differential rating by different teachers in different schools when large samples are involved, would creep into the scoring system. By transmuting each set of ratings separately to standard scores, differences due to different raters could be eliminated (Chiselli, 1964). The school marks of the individual group of monolingual and bilingual children with different levels of Tamil proficiency were converted into standard scores to offset the differences in the rating method adopted by different school teachers.

Academic achievement was ascertained through school marks obtained in subjects such as English, Mathematics, Science and Social Studies in the half yearly and annual examinations of the previous academic year. Average of the marks in the two examinations in each subject and the total marks obtained were taken as the index to offset good or poor performance in any particular examination.

4. Children's Adjustment Inventory:

Adjustment of children, commonly referred to as adaption to the environment has been judged and rated by parents, teachers or by any other adult in the child's environment or by self, have been employed widely in research studies. Ellis and Miller (1936) conducted a study in which mental hygienists and teachers rated the behaviour problems of children through which adaptation to the environment was assessed. The two raters rated the behaviour of the children differently but perceived cruelty, bullying, unhappiness, depression, unsocial, withdrawal and suggestibility as most serious personality traits. Ratings by teachers, psychologists and self have been analysed by Anver (1970). Teachers considered overt behaviour more serious while psychologists rated withdrawal problems to be more severe. Children ranked the problems like teachers and the differential rating has been attributed to their diversified perspectives. It is likely that parents and teachers perceive adjustment problems of children differently (Rao, 1963). It is
evident from the study that perspective of adjustment problems differ for different people. In order to know the adjustment problems at home and school, parents and teachers were requested to give the information on adjustment problems.

In standardised tests like Bell's adjustment inventory, the children rated their problems in the dimensions of home, school, social, emotions and health (Dora, 1949; Sarojini, 1971) and in sociometric technique, social acceptability of children is measured through the popularity or isolation among the peers.

Parents and teachers who intimately interact with children in daily life observe them in different environments - home and school. Parents have few children but teachers have been trained and are qualified observers and moreover they deal with large subjects in a classroom that enables them to view the behaviour of subjects with reference to their peers and from different angles of perspective. Parent's and teacher's rating of adjustment problems of children have been utilised by Rao (1963) to investigate the problems of monolingual and bilingual children and administration of the same instrument will facilitate comparison of the collected informations. Rao's scale of Adjustment Inventories rated by parents and teachers on a three point rating is utilized in the present study (Table 3).

To offset the differences between the raters like experience in teaching, education of parents, etc. the scores within each group of monolingual and bilingual children with different levels of Tamil proficiency were converted to standard scores. The information from parents was collected by sending the inventories through the children (vide: Appendix C).

Reliability:

The reliability of the parent's and teacher's inventory were established from 30 randomly chosen subjects by split-half method that was corrected by Spearman Brown Prophecy formula. The estimated reliability
coefficient was found to be 0.84 for parent's inventory and 0.79 for teacher's inventory. All the coefficient values were significant at 0.01 level and therefore they revealed the internal consistency of the tests.

Table 3.
Description of Rao's Adjustment Inventories.

<table>
<thead>
<tr>
<th>Subscales</th>
<th>Parent's Inventory</th>
<th>Teacher's Inventory</th>
</tr>
</thead>
<tbody>
<tr>
<td>in the Inventories</td>
<td>Total No. of Items</td>
<td>Total No. of Items</td>
</tr>
<tr>
<td>Aggressive tendency</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Nervous habits</td>
<td>11</td>
<td>15</td>
</tr>
<tr>
<td>Withdrawal tendency</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>Social skills</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Antisocial tendency</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>Feeling of inadequacy</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Check items</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>63</td>
<td>73</td>
</tr>
</tbody>
</table>

Check items have been introduced to validate the sincerity of the responses.

5. Junior Eysenck Personality Inventory:

Research endeavours have developed innumerable instruments like inventories, rating scales and projective techniques that have factorially analysed personality into various traits or types. Eysenck (1960) a British Psychologist, revealed through factor analysis two basic dimensions of personality, namely Introversive-Extraversive and Neuroticism. Introversive-Extraversive refers to a degree to which one's basic orientation is turned towards the self or outward into the external world. Neuroticism is a dimension of emotionality varying from calm, well adjusted, reliable individuals at the normal end to those who are moody, anxious, temperamental and unreliable indicating neuroticism.
Extraversion and neuroticism were measured through Junior Eysenck Personality Inventory (JEPI).

The JEPI consists of 60 items in which the children answer the given questions either as Yes or No. 24 items measure extraversion–introversion and 24 items quantify neuroticism. 12 items indicate lie score which judge the sincerity of the subjects in responding to the inventory (Vide: Appendix D).

Reliability:

The reliability of the instrument was estimated by split-half (odd–even) method from the scores obtained from randomly selected 30 subjects. The product-moment coefficient of correlation calculated between scores of odd and even items of the scale was corrected by Spearman Brown prophecy formula and was found to be 0.73, which is significant at 0.01 level. The instrument therefore was accepted as reliable.

6. Socioeconomic status scale:

The socioeconomic status of the subjects was assessed through the scale developed by Kao (1975). The scale elicited information regarding the number of family members, their education, occupation, income of the family and facility available in the home. This instrument has been standardised on urban population. Different educational qualifications, occupations, income levels and facilities are coded with numbers and respondents were asked to denote the applicable answer with the code number. The status of the family is fixed by considering the total score obtained by the family as a whole (Vide: Appendix D).

Reliability:

The socioeconomic status scale was administered to 30 randomly chosen subjects. The information was collected from the parents. The consistency of the instrument was established by split-half method. The correlation between odd and even items of the scale as revealed by
product-moment of correlation was estimated by Spearman Brown prophecy formula. The value 0.89 significant at 0.01 level reveal the internal consistency of the instrument.

The other tests, namely Tamil language proficiency test and Hartshorne and May's test of deception needed standardisation and the procedures adopted are as follows:

7. Tamil language proficiency test:

Different linguistic skills in learning two languages have been emphasised by different researchers. This has led to the development of several instruments to measure the proficiency in different aspects of the languages. Flexibility test has been used as a powerful measure of bilingualism. Rating scales involved self evaluation of their linguistic skills while fluency test taps the subject's speed of response to verbal stimuli in both languages. By comparing the performances in two languages with the norms of monolingual subjects, the bilingual children's linguistic flexibility is assessed. In dominance test, ambiguous verbal stimuli are presented in a mixed manner so that language in which response should be made is not indicated. Though this measure provides reliable measures on bilingualism, validity has to be established in the respective bilingual environment in which research study is carried out.

Studies relating self reports of language background by children have indicated high correlation with ratings by interviewers or teachers (Hoffman, 1934; Arsenian, 1937). Self ratings of language use and competence have been combined into a single score to indicate the degree of bilingualism assuming close association between them. However, Macnamara (1967), Fishman and Terry (1971) have reported low correlation with objective measures from designed task. Analysing the data collected on language competence and language-use, Teitelbaum (1977) found that teachers as well as children's rating of language-use and language skill have low correlation and only few of the language-use variables were found to be predicting children's performance on the task. Among
the ratings of linguistic skills, the interviewer's judgement was the best predictor. The teacher's rating had moderate correlation with the performance measures and the children's self rating, the least. Thus, ascertaining linguistic skills through various tools have reported divergent results.

The performance skills are also measured through standardised tests like the Metropolitan Achievement test which are time consuming both to administer and score. With awareness of these limitations, Swain, Lapkin and Barik (1976) utilised cloze technique on an experimental basis, in which every n-th word is deleted from the passage or prose and the students are asked to provide the missing words. The test is easy to construct and economical to administer and score (Ollier and Conrad, 1971; Stubbs and Tucker, 1974) and has been reported to be highly reliable (Ollier and Inal, 1971; Swain, Lapkin and Barik, 1976) to ascertain language proficiency. Based on these results, a Tamil proficiency test was constructed to measure proficiency in Tamil.

In the present study proficiency in skills of reading and speaking in first language, as rated by parents as average is taken as criteria of proficiency. Since the chief focus of the present study is to ascertain the effect of second language proficiency as medium of instruction in school on bilingual children, writing is chosen as the linguistic skill in Tamil and is assessed through cloze technique. Writing is an important dimension of language and educational success is measured solely through writing in Indian examinations.

Description:

The cloze technique consists of a passage, in which first few sentences are left intact to aid comprehension. Every n-th word usually randomly chosen is deleted. Usually two types of score are obtained. They are exact responses and acceptable responses. In exact response, only the word in the original passage is considered as correct while in acceptable response, words conveying equivalent meaning of the exact method yields valuable
between them to prevent copying. The test material with deletion of every fifth word was distributed to the subjects. They were asked to fill the particulars like name, class, age and name of the school. The investigator read the instructions and the passage and the pupils were asked to follow it silently. The following oral instructions were given:

"Read the given passage and fill in the blanks. You should fill only one word in each blank and it should be such that it completes the meaning of the sentences. Be sure that you fill all the blanks."

The doubts raised by the subjects were clarified before the children were given the 'start' signal. Strict supervision was maintained to prevent cheating.

**Scoring:**

Every acceptable answer conveying the equivalent meaning of the response was credited with 1 point.

**Reliability:**

The stability of the scores of the measure was ascertained through test-retest method. The test was administered with an interval of three weeks in between the two sessions of administration of the test. The product moment of coefficient of correlation between the obtained scores of the tests was corrected by Spearman Brown prophecy formula. It was found to be 0.85. The highly significant value at 0.01 level of significance indicated the internal consistency of the measure.

**Validity:**

Validity of the test was measured by collecting the judgement of five teachers of the V standard. They were asked to respond the suitability of the measure for the average children studying in V standard. The consistent approval by the teachers reflected the validity and applicability of the tool. The criteria of judgement was similar to the
criteria used for the selection of the passage. A five point scale was used to measure the rating. A insignificant ratio computed through one way analysis of variance indicated no difference between the raters (F=0.89; NS).

To test the normality of distribution of the scores, the Tamil proficiency test was administered to 200 randomly chosen children of V standard from different schools of Madras city. The obtained scores were tested by *chi* - square goodness of fit. The observed value of 12.26 was less than the expected value of 23.68 at 0.05 level indicating that the fit was good. Proficiency in Tamil language as low, average and above average was classified based on interquartile range. These scores below the first quartile, ie, below 14 was considered as low proficiency. The scores between the first and third quartile, ie, between 14 and 23 was considered as average proficiency and those above the third quartile, ie, above 23 was considered as above average.

8. Hartshorne and May's test of deception:

The venture of detecting and measuring cheating is a complex problem since it is interrelated with many psychosocial elements. The technical problem encountered in the measurement is that it should be estimated without the knowledge of the cheater with simultaneous maintenance of rapport. Association reaction (Hanke and Eddy, 1909), physiological measures like systolic blood pressure and psycho-galvanic reflex (Marston, 1917; 1925) have been employed as lie detectors which assume that emotional disturbance accompanies concealment. Cady (1923) utilised character rating and method of observation to identity delinquent behaviour in children. The difference between the expression of his knowledge on a certain ability and his actual ability was taken as a criterion for cheating in the overstatement technique (Knight and Franzen, 1922). The paper pencil test of paraffin paper technique (Voelker, 1921; 1923) and peeping-technique are also commonly used measures in research studies but they are accompanied by pitfalls. The deception measure may not be due to cheating tendency but
it; may also be due to repetition of the task. Hartshorne and May (1928) in the project of Character Education Inquiry have utilised several techniques measuring the tendency to cheat in classroom situations. Among the various techniques developed by Hartshorne and May (1928), only three tests are used in the present study due to limitation of available time. The three tests are a nonverbal test (dot test), a numerical test (arithmetic test), a verbal test (language test) (Vide; Appendix G). Standardisation was found necessary as the tests were standardised in American school situations and mainly, the normal gain in the third trial of a task due to the effect of practice, may differ, which needs to be established for the sample studied.

Description:

1. Dot test:
This test involves a simple task of placing one dot in each square. One dot is placed in each square from left to right without skipping any square within the time limit. There are thirty columns and five rows of squares and the test material consisted of three copies of the test material in a folded form. The first trial is for practice to familiarise the subject with the task. The second trial is done in a non-cheating condition with strict supervision and in the third trial, the test is carried out in a lax environment without the supervision of the examiner, though she was present in the hall. The difference between the second and third trial is calculated. In order to interpret the gain as an indication of deception, it must exceed the normal gain by three times its standard deviation. The time and the normal gain are calculated earlier in non-cheating conditions.

2. Arithmetic Test:
This is similar to dot test and includes simple addition in three trials within the time limit. The task in the first trial is for practice, the second is done in a non-cheating condition and the third performance in a lax environment. The cheating tendency was estimated when gains between the second and third trial exceeded the normal gain in non-cheating environment.
3. **Verbal Test:**

This is a duplicate technique and the testee is asked to underline the correct answer in a multiple choice questionnaire within the time limit. The test material is then collected. A duplicate of the test paper of each subject is made. Great care is taken to be certain that an exact record of the subject's response is made on a new test material. In the next session, the test papers are returned with a key or answer sheet and the subjects were asked to score his/her own papers in an environment without supervision. The self scored answer sheets are then compared with the duplicate and the changes are recorded. Deception is indicated by the illegitimate increase in score by copying answers from the key.

**Standardisation of Dot, Arithmetic and Verbal Test:**

In the standardisation of the tests, the first step was to ascertain time limit for the tests and secondly to estimate the normal gain that could be obtained on three trials in non-cheating contexts. The standardisation procedure described by Hartshore and May (1936) was followed for adapting the three tests namely dot, arithmetic and verbal test to the subjects under study.

The mean age of 200 randomly selected samples who were from middle socioeconomic status was 10.3 years. 100 boys and 100 girls were chosen from five different schools irrespective of the linguistic group. To the selected subjects, the test were administered in non-cheating and cheating environment to estimate the reliability of the instrument. The dot and arithmetic test materials required no change from the original Hartshore and May's test of deception (1928). Items for the verbal test consisted of simple sentences which were in accordance with the syllabus of V standard. The items were subjected to scrutiny by three Tamil teachers. The consistent approval of the teachers adjudged the suitability of the test. A time interval of five minutes was allowed in between the administration of three tests.

**Administration of the tests:**
The selected children were seated comfortably with optimal distance between each other so that the supervisor could maintain strict supervision. For the purpose of setting time limit among the 200 children, 25 boys and 25 girls were chosen randomly as sample. The dot test material was distributed to the children and were asked to give the enquired data in the test material. The investigator demonstrated as how only the first page of the folded form has to be opened. The children were asked to follow the same procedure and check was made to ensure the correct method of operation. Children were asked to raise their right hand with pencils and the following instruction was given: "Today you will be doing certain simple tasks to see how fast and accurately you can do them. All of you should do your best and let me see who is doing it well. Do nothing with the paper until the instruction is given. You have to put one dot in each of the square. You should start from the left to the right side. You should fill the first column and then start again from the right side of the second column. You should always work columnwise and never work from row to row. When I say 'start' begin to put one dot in each square as quickly as possible. When you complete the task raise your hand immediately ". The investigator ensured the clarity of the instructions and the raised doubts were cleared. Caution was made that they will be disqualified if they do not adher to the instructions strictly. Strict invigilation was maintained. With the simultaneous oral instruction of 'start', the stop watch was started. Time taken by each student was noted with the help of five teachers. Each teacher was allotted a group of students, although no demarcation was made in the physical arrangement of seating. The mean time taken to complete the task was taken as the criterion for setting the time limit. The test materials were collected after the completion of the task by all the subjects.

Arithmetic Test:

The following instructions were given. "Now in this task, you have to add each problem correctly and provide the answer below in the given space. You have to work columnwise and start only when you are told. Raise your hand immediately when you have completed all the problems."
Doubts were cleared before the beginning of the test. The teachers recorded the time taken by each subject allotted to them. The mean time taken by the subjects provided the time to be set for stopping the task in further investigation.

Verbal Test:

The test materials for the verbal task were distributed and the following instructions were given:
"This is a simple task. This is like fill-in-the blanks with which you are familiar. You read the first sentence and choose the correct answer from the answers given for the blank 'a'. You have to choose one answer from the words given against 'a'. You just have to underline the answer. Do not waste time in writing the answer in the blank. For blank 'b' choose the answer from the words given below for 'b' and underline it. Go ahead till you complete the last statement. But you must start only when you are told to. After completing all the statements raise your hand immediately".

All the raised doubts were clarified which ensured clarity and comprehension of the instructions. The average time taken to complete the task by the subjects was ascertained. Mean time taken to complete dot, arithmetic and verbal tests are given below:

Table 4.
Mean Time taken for Dot, Arithmetic and Verbal Tests: or Cheating (N=50).

<table>
<thead>
<tr>
<th>Tests</th>
<th>Mean Time in Seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dot</td>
<td>0.58</td>
</tr>
<tr>
<td>Arithmetic</td>
<td>1.11</td>
</tr>
<tr>
<td>Verbal test</td>
<td>0.60</td>
</tr>
</tbody>
</table>

To obtain the normal gain between the second and third trial in non-cheating conditions, dot and arithmetic tests were administered with three trials under strict supervision maintained by the invigilator. The
test was administered to the randomly chosen 200 children. Sample consisted of 100 boys and 100 girls from V standard who belonged to middle socioeconomic status and the mean age of the sample was 10.20 years.

Administration of the test in non-cheating condition:

The subjects were seated with comfort and maximum possible distance was maintained between the subjects to prevent copying. The three copies of the dot test material which were provided in the folded form were distributed to the children and were asked to fill the particulars as requested in the form. They were asked to open and fold the form in such a way as only the first page was opened to them for use. The subjects were instructed to put one dot in each square columnwise only when instruction to begin was given. They were stopped when asked to and raise their hand with pencil immediately. They were stopped after the time limit and were asked to turn to the next page and told in such a way that only that page was opened to the subject. The same procedure was followed for this as well as for the third trial under strict invigilation to ensure non-cheating condition. For all the three trials only 0.58 seconds was strictly allowed for the task.

After five minutes of interval the arithmetic test papers were distributed and children were asked to enter their personal data. Instructions to add the simple problems and to provide the answers in the given space were given. In addition, the instruction and procedure followed were similar to the dot test. The time limit for the task is 1.11 seconds.

Scoring:

The number of square in which dot was placed by the child indicated the total score for each trial for dot test and the number of problems done correctly were credited with one point each.
Mean and standard deviation of each trial were calculated to estimate the normal gain in the third trial under non-cheating conditions. They are presented below:

Table 5.
Mean and Standard Deviation of Dot and Arithmetic Tests Under non-cheating conditions.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Dot</th>
<th>Arithmetic Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Mean 1</td>
<td>75.40</td>
</tr>
<tr>
<td>2.</td>
<td>Mean 2</td>
<td>85.20</td>
</tr>
<tr>
<td>3.</td>
<td>Mean 3</td>
<td>36.52</td>
</tr>
</tbody>
</table>

Mean gain:

- $D_1$ | 10.50 | 3.72 |
- $D_2$ | 2.09  | 1.93 |
- $SD_1$ | 22.55 | 5.26 |
- $SD_2$ | 20.66 | 7.09 |
- $SD_{(2-1)}$ | 19.36 | 7.74 |
- $SD_{(3-2)}$ | 16.78 | 3.47 |
- $SD_{(3-2)}$ | 9.54  | 2.31 |

In the above table the numerals 1, 2, 3 indicate the number of the trials. $D_1$ is the first difference that is, between the mean of the first trial and second trial. $D_2$ refers to the difference between mean of the third and second trial. Similarly $SD_{(2-1)}$ is the standard deviation of the second trial minus the first and $SD_{(3-2)}$ the difference between the third and second trial.

In order to interpret a gain in third trial as normal due to the effect of practice, the above procedure was carried out under non-cheating condition with strict supervision. To interpret a gain in the third trial under unsupervised conditions, as an indication of deception, it
must exceed the normal gain by three times its standard deviation. From the table 3 it follows that in dot test, the mean normal gain is 2.09 and the standard deviation of the gain is 9.54. For a difference to have a cheating probability as great as the limit set, it should be $2.09 + (3 \times 9.54)$ which is 30.71. Thus if a subject exceeds the normal gains as much as 31 points in the third trial when he corrected his own paper over the second, it indicated cheating tendency. Similar interpretation was made for arithmetic test and the normal gain score was found to be 10.0.

Administration of Dot, Arithmetic and Verbal test to ascertain Cheating tendency:

The procedure followed in the first and second trial for dot and arithmetic test was similar as described above in the non-cheating conditions. Strict invigilation and instruction to begin and to end the task synchronised with maintenance of time limit. In the third trial in dot and arithmetic test the children were asked to self score their performance. The investigator was not supervising the children and was watching a clock till all the subjects reported completion of task. The marks had to be given by the child in the third trial only. When all the children reported completion of the task, the test materials were collected. The instruction for the administration of verbal test was similar to that given in setting the time limit for verbal test. After one minute, the subjects were immediately stopped and the test papers were collected. A duplicate of the subject's response was made and on the next day, the originals were distributed to the samples. The following instructions were given: "Look, yesterday you had answered this paper. I did not have time to correct the papers and I am ignorant of your performance. Today correct your own paper and the correct answers are given in the key that will be provided to you. If you had underlined the answer yesterday correctly give credit with one point. Likewise proceed and give credit to your yesterday's performance." The performance of the children was not supervised. When all the children informed the investigator of their completion of the task, the test papers and the
key were collected. The self scored answer sheets were then compared with duplicates and the changes were recorded.

**Scoring:**

The illegitimate increase in score by copying answers from the key indicated cheating. The sum of the cheating score obtained in dot, arithmetic and verbal test yielded the composite score.

**Reliability:**

The reliability of the test was estimated by test-retest method. Dot, arithmetic and verbal tests were administered with an interval of one month between the sessions to the randomly chosen subjects (N=30). The Product-moment correlations obtained between the scores of two administrations were 0.69, 0.72 and 0.76 for dot, arithmetic and verbal tests respectively. The values were significant at 0.01 level revealing the stability of the scores yielded by the instruments.

Intercorrelation between dot, arithmetic, verbal and composite test scores of the cheating tendency were computed. They are presented below:

**Table 6.**

<table>
<thead>
<tr>
<th>Tests</th>
<th>Dot</th>
<th>Arithmetic</th>
<th>Verbal</th>
<th>Whole</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dot</td>
<td>-</td>
<td>0.36**</td>
<td>0.49*</td>
<td>0.62**</td>
</tr>
<tr>
<td>Arithmetic</td>
<td>-</td>
<td>0.57*</td>
<td>0.61*</td>
<td></td>
</tr>
<tr>
<td>Verbal</td>
<td>-</td>
<td></td>
<td>0.56*</td>
<td></td>
</tr>
<tr>
<td>Whole</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**p < 0.05**

**p < 0.01**
From the above table it is evident that the intercorrelations are positive and significant which indicates the cohesive nature of the tool.

Validity:

Validity of the test was established by correlating teacher's judgement of the cheating tendency of the pupils and their performance on the standardised tests. Three teachers of V standard from each of the six schools were asked to give a list of pupils of their classes from middle socioeconomic status whom they rated as possessing cheating tendency and also those who are least likely to possess the cheating tendency. Cheating was conceptually defined as a behaviour in which goal is sought or the method used to reach the end was disapproved and illegitimate. It means to deceive or to fraud. This as a mode of adaptive behaviour is acquired and habituated within the individual. With such briefing the teachers were asked to list the pupils who have adopted illegitimate behavior like copying in examination and those who are least likely to adopt such a behaviour and are always honest. List of subjects who had been rated by all the three teachers of the class as cheaters and noncheaters were made. In two schools, only five subjects with cheating tendency were available. With the available noncheating samples, a group situation of thirty students was created so that exposure to cheating in natural social situation was present. 30 cheaters and 20 non-cheaters were randomly selected and the mean age of the sample in cheaters and non-cheaters group was 9.99 years and 10.2 years. But, arithmetic and verbal tests were administered to the selected samples. The first trial for dot and arithmetic test was for practice. The first and second trials were conducted in non-cheating situations and the third trial was done in a lax environment devoid of supervision and the subjects self scored their performance. Verbal test was administered twice to measure any illegitimate change. The computed critical ratio revealed significant difference between the groups at 0.01 level which disclosed the validity of the instruments. The values are presented in Table 7.
Table 7.
Critical ratio of cheating tendency in Dot, Arithmetic and Verbal task between Cheaters and Non-cheaters.

<table>
<thead>
<tr>
<th>Tests</th>
<th>Cheaters</th>
<th>Non-cheaters</th>
<th>Critical ratio</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean S.D.</td>
<td>Mean S.D.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dot</td>
<td>14.21 8.21</td>
<td>6.26 2.46</td>
<td>3.68</td>
<td>p &lt; 0.01</td>
</tr>
<tr>
<td>Arithmetic</td>
<td>17.65 6.12</td>
<td>8.11 1.32</td>
<td>9.02</td>
<td>p &lt; 0.01</td>
</tr>
<tr>
<td>Verbal</td>
<td>9.21 1.52</td>
<td>2.11 2.61</td>
<td>13.30</td>
<td>p &lt; 0.01</td>
</tr>
<tr>
<td>Total</td>
<td>13.62 2.52</td>
<td>5.62 1.33</td>
<td>10.87</td>
<td>f &lt; 0.01</td>
</tr>
</tbody>
</table>

Design of the final study:

Research designs in literature have revealed the significant importance to isolate the effect of linguality by controlling the extraneous variables influencing language development. Peal and Lambert (1962) with awareness about the influential variables such as age, sex and socioeconomic status have pointed out the pitfalls of the earlier studies that have failed to match bilingual and unilingual groups on these variables. Research studies in the west have been carried out in the manipulated programmes of bilingual curriculum. Since there is lack of such programmes in Indian educational curriculum for bilingual children, Ex-post-Facto matched group design was followed in the present investigation. The extraneous effects of age and socioeconomic status were controlled and equal number of boys and girls in monolingual and bilingual group with high, average and low level of Tamil proficiency were compared. Tamil, the second language for bilingual sample and the first language for monolingual subjects is also the medium of instruction in school for both the linguistic groups.

Sample:

The bilingual population were: Those who have average linguistic skills as related by parents in their first language, Telugu or Kannada, in
dimensions of reading and speech and was the only language spoken at home. Most of the children in linguistic population were not facile in the writing skill in their first language and due to nonavailability of adequate samples, only skills of reading and speech were included. These children learn through their second language, Tamil from first standard. First language of these children was not taught at school and was not spoken at school. Monolingual children were: Those who learn through their first language namely Tamil from first standard. The two linguistic groups had exposure to Tamil as medium of instruction for four years and at the final year of the elementary school, the children were tested to investigate the effects of bilingualism in comparison with monolingual environment.

A random sample of the subjects for the study was chosen. The children were chosen from schools of different educational districts-North, South and East. The schools were chosen in proportion to the numbers in their populations.

Table 8.
Distribution of Schools in Madras City.

<table>
<thead>
<tr>
<th>Educational Districts</th>
<th>Schools Population</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td>83</td>
<td>6</td>
</tr>
<tr>
<td>South</td>
<td>164</td>
<td>12</td>
</tr>
<tr>
<td>East</td>
<td>97</td>
<td>7</td>
</tr>
</tbody>
</table>

From the randomly selected schools, 35 boys and 35 girls in monolingual and bilingual group with low, average and above average proficiency in Tamil language from middle socioeconomic status and from fifth standard were selected. The children were identified by adopting the following procedure: The headmasters and headmistresses of the selected schools were briefed about the purpose of the project and their cooperation were sought in conducting the research study in their institutions. They were
asked to give a list of monolingual and bilingual children belonging to the age group between 9 years 6 months and 10 years 6 months and to give their demographic data in a given performa (Vide:Appendix E).
Informations regarding socioeconomic status were collected from parents through socioeconomic status scale. The scale was sent through the children and requests were made to give the required informations. From the scores obtained in the scale, children belonging to middle socioeconomic status were identified. The Adjustment Inventories were given to parents of these children to rate behaviour problems of the children exhibited at home. Along with these informations, details of the linguistic skills of the first language and informations regarding any serious illness and accidents were noted. Subjects who had suffered serious illness or accidents were eliminated as this would affect intellectual development. When the details of the linguistic proficiency were requested exclusively the response was not encouraging and parents had reservation about giving the details. So it was collected along with Adjustment Inventory. The bilingual children who maintained speech and reading skills in the first language and who were rated as average by parents were identified. With a previous appointment with teachers, bilingual and monolingual children from middle socioeconomic status were administered Tamil proficiency test. Children with low, average and above average proficiency were identified in accordance with the scores obtained. Monolingual and bilingual children were randomly selected within the schools.

Table 9.
Mean, Standard deviation and t Results comparing the age of monolingual and bilingual children with different levels of Tamil proficiency.

<table>
<thead>
<tr>
<th>Levels of Tamil Proficiency</th>
<th>Monolinguals</th>
<th>Bilinguals</th>
<th>t</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean S.D.</td>
<td>Mean S.D.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>10.61 1.23</td>
<td>10.21 1.06</td>
<td>1.46</td>
<td>N.S.</td>
</tr>
<tr>
<td>Average</td>
<td>10.06 2.96</td>
<td>9.68 2.01</td>
<td>0.63</td>
<td>N.S.</td>
</tr>
<tr>
<td>Above Average</td>
<td>9.79 3.21</td>
<td>10.01 3.08</td>
<td>0.29</td>
<td>N.S.</td>
</tr>
</tbody>
</table>
The insignificant $t$ values shown by the table 9 revealed the insignificant difference between the groups in age.

The preliminary investigation had revealed that the selected instruments were reliable and valid. Hence the main investigation was carried out to study the effect of bilingualism on various dependent variables in comparison with the children from monolingual environment.

Procedure:

Principal and class teachers of the schools were requested for the cooperation in conducting the study in their institutions. Appointments for conducting the tests were fixed and earlier to the scheduled visits for testing. These subjects were met during the games period to establish a rapport with an aim to breakdown any restraints and inhibitions with the investigator and to create an air of pleasantness. They were briefed about the simple and interesting tasks they would be doing another day. Enquiries regarding their interest were responded with positive affirmations and gestures revealing their cooperation. The subjects were informed about the scheduled day.

Sequential Administration:

All the group tests were administered in the beginning which was subsequently followed by administration of the individual test namely Wechsler's Intelligence scale for children. WISC was administered to only 30 boys and 30 girls of monolingual and bilingual group with low, average and above average proficiency in Tamil due to constrain of time. In the first day, dot, arithmetic, verbal test of cheating tendency and nonverbal creative measure were administered with an interval of 5 minutes in between the administrations. In the subsequent day, verbal test of cheating tendency and verbal creativity measure were administered. Eysenck's Personality Inventory was administered the following day. Adjustment inventory was given to parents and teachers to collect the required informations.
The procedures and methods for scoring the instruments as given in the manuals were followed.

Data Analysis:

The informations gathered through the above specified instruments from the monolingual and bilingual group with different levels of Tamil proficiency were analysed statistically to obtain reliable results and for drawing inferences.

Multivariate three way analysis of variance was computed to study the effect of independent variables namely linguality (monolingual vs bilingual group), levels of Tamil proficiency (low vs average vs above average), sex (boys vs girls) and interaction effects on the dependent measure - intelligence.

Student t test was done to investigate inter- and intra- group differences with reference to the dependent measures.

Stepwise multiple regression was computed in order to investigate the extent to which the component of intelligence contributed to the total intelligence in the linguistic groups.

Multivariate three way analysis of variance with covariance control of concomitant variable (MANOVA) was used to match statistically the different groups on the variable influencing the dependent measure and to analyse the effect of independent variables- linguality (monolingual vs bilingual), levels of Tamil proficiency (low vs average vs above average) and sex (boys vs girls) and the interaction effects on the dependent measure.