THE PRESENT investigation is a search into the intellectual and social development, the temperament or the behavioural profile and the achievement of tribal pre-school children to get the necessary information regarding their psycho-social development so that it could be compared with that of their rural and urban peers to find out the difference.

The Intelligence Quotient or IQ score has lasting imprint on the psycho-social development of children. Assessment of intelligence is effective in evaluating the academic readiness of children coming from the unusual backgrounds. In order to assess the intellectual development the present study used the Binet-Kamath Intelligence test since it was a standardised IQ test for the Indian population.

The Indian Adaptation of the Vineland Social Maturity Scale is commonly used to assess the social development of children. But it deals only with some physical skills and was found unsuitable for the present study. So a closed type observation schedule was prepared by the investigator. Closed type schedule was easy to fill up and convenient for scoring (Good and Hatt 1962, Bhandarkar and Wilkinson 1983). An observation schedule enables an investigator to gather correct information
about the area of study. Moreover it provides certain extra tips of knowledge to the investigator about some grey aspects of the study. Further, the information gathered by direct observation is more valid than those from the secondary sources. In the present study the investigator observed the children in the school informally using the observation schedule and elicited more genuine behaviour of the children.

In the measurement of temperament or behavioural profile of the pre-school children, the ‘parent questionnaire’ by Thomas et al. (1963) was found to be suitable. It is a 72 item scale designed to assess the temperament of three to seven year old children. To avoid the difficulty of the tribal, rural and urban mothers in filling the questionnaire, the investigator interviewed the mothers using the questionnaire to get the relevant information about their children’s behaviour. Interviewing the mothers (principal caretakers) was the most feasible approach to collect the information about their children because of their constant observational contact and continuous interactions with their children. In the New York Longitudinal study of temperament (Thomas et al. 1971) has reported an agreement at 0.01 level of confidence between the direct observation of the child and the parental interview.

Though a lot of standardised achievement tests were available many of them were found unsuitable to assess the achievement of tribal pre-school children. Hence an achievement test suited for the present study was prepared by the investigator herself. She decided to teach the children a particular topic and to test how far they gained from it.

In order to make the test more objective the investigator had to select a topic which was completely unknown to the Anganwadi attending pre-school children. Therefore, topics based on the Montessori system of
Education were selected to teach the children. Moreover the investigator designed all the test items as performance tests as she found it difficult to understand the language of some tribal groups.

3.1 Research design

The design of the study thus formulated is as follows.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Aspects of measurement</th>
<th>Criteria of measurement</th>
<th>Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intellectual development</td>
<td>The child’s ability to remember, comprehend, analyse, interpret, repeat and to solve problems was assessed</td>
<td>Oral and simple manipulative tasks</td>
<td>Binet-Kamath intelligence test</td>
</tr>
<tr>
<td>Social development</td>
<td>Five aspects—sociability, autonomy, initiative, adjustability and responsibility were assessed</td>
<td>Informal observation by the investigator of the children’s day to day activities, reactions and behaviours in the Anganwadi centre</td>
<td>Structured observation schedule.</td>
</tr>
<tr>
<td>Temperament or behavioural profile</td>
<td>Nine aspects of child’s temperamental pattern were assessed</td>
<td>‘Positive’ or ‘Negative’ and ‘Mild’ or ‘Intense’ responses of the child were assessed through interviews with the mother</td>
<td>Parent questionnaire (Thomas et al., 1963).</td>
</tr>
<tr>
<td>Achievement</td>
<td>Psycho-motor skills like practical life skills, sensory skills, language skills and arithmetic skills were assessed</td>
<td>The time taken by the child in performing the 12 test items on Montessori materials were noted.</td>
<td>Self made achievement test</td>
</tr>
</tbody>
</table>
The above research design clearly spells out the various aspects and the criteria of measurement and the tools for the measurement of each variable.

3.2 Type of the study

Cross-sectional method was used in the present study in order to make it as extensive as possible. Large sample size, individual research work and time factor restrict the scope of longitudinal study. The cross-sectional method was proved suitable to study a large sample in a short period of time. The availability of pre-school children and the co-operation of the mothers were also considered while deciding on the type of study. Again, cross-sectional research helps to avoid familiarisation of the mothers and children with the tests which may affect the clarity of results.

3.3 Sample

The tribal, rural and urban pre-school children from Wayanad, Idukki and Thiruvananthapuram districts formed the universe of the study.

The sample of the study comprises four year old Anganwadi attending boys and girls from the tribal, rural and urban sectors of the selected regions.

Children from the different tribes like ‘Mannan’, ‘palliyan’, (Idukki district), ‘Kurichiyans’, ‘Paniyar’ (Wayanad district) and ‘Kanikar’ (Thiruvananthapuram district) were included in the tribal sample.
3.4 Sampling procedure

Though three to six year old children were considered as pre-school children, the investigator decided to fix the age at four to make the analysis uniform and easy.

In order to get the sample from the same socio economic status the investigator was so strict in selecting the four year old children attending the Anganwadi centres only. The Anganwadi centres are the pre-school centres run by the social welfare department under the ICDS project. All the Anganwadi teachers are given the same training by the government and same syllabus is followed in all the Anganwadi centres irrespective of the tribal, rural and urban settings. So the pre-school children selected from these centres have the same economic, educational and social backgrounds and are getting the same exposure.

Wayanad, Idukki and Thiruvananthapuram districts were selected for the study because they represented the northern, central and southern regions of Kerala and would give a perfect representation of the state. Due importance was given to the tribal, rural and urban pre-school children in all these districts.

The pre-school children were selected from Kalpetta, Gudalaikunnu, Myladi, Karackamala, Thattamala, Perikkalloor, Nadavayal, Thirunelli (Wayanad District), Attappalam, Anakara, Rosapukandom, Chakupallom, Palliyakudy, Mannakuddy, Thodupuzha, Edavetty (Idukki district), Valiyathura, Velly, Shanghumugham, Pachamala, Kalayapuram, Bhimapally and Pallode (Thiruvananthapuram District).

A list of Anganwadi centres in the tribal, rural and urban sectors of each district was collected from the respective ICDS project officers. From
the total Anganwadi centres in each sector, five schools were selected at random. A list of four year old children was made from each of these five schools. From that list fifteen children of both sex were selected by lot. The investigator assessed the developments and achievements of these children. Then from the children who completed all the test items, ten children (five boys and five girls) were selected again by lot.

Thus eventually 25 boys and 25 girls were selected from each sector in each district. This amounted to 150 children from each district which meant a total of 450 children. The investigator tried her best to keep the selection very objective. The sampling pattern is shown in Table 3.1.

<table>
<thead>
<tr>
<th>Districts</th>
<th>Tribal</th>
<th>Rural</th>
<th>Urban</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idukki</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td>Thiruvananthapuram</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td>Wayanad</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td>Total</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>450</td>
</tr>
</tbody>
</table>

The above table shows an equal distribution of samples from each district and also from each sector.

3.5 Tools used in the study

The data concerning the various areas of psycho-social development was collected using different tools. General information about the children was elicited first. Standardised tests were used to assess the IQ and
temperament of the children. An observation schedule for assessing social
development and an achievement test were constructed by the investigator.

3.5.1 General information

The general information sheet consists of thirteen questions concerning
the name, place name, date of birth, age, sex, birth order of the child,
number of children in the family, name and occupation of the parents,
monthly income of the family, SES, location of the family and the name of
the Anganwadi where the child is studying (Appendix I).

3.5.2 Binet-Kamath intelligence scale

Binet-Kamath Intelligence scale was used to assess the intellectual
development of pre-school children. It is the most widely used intelligence
scale.

(a) Description

This scale which has its basis on the Stansford-Binet scale, has been
standardised on the Indian population and has Indian norms. It concentrates
on verbal and simple manipulative tasks to test and assess complex
intellectual processes such as judgement, reasoning, memory, comprehension,
word definition and problem solving. It covers a span of three years to
adult hood. Six test items are presented in each age. The investigator has
to start with the tests for three year olds and proceed to the items of the
next levels till the child does none. Three to seven year old test items
were used in this study (Appendix II).
(b) **Scoring**

Each test item carries a score of 2 months. The age at which the child completes all the 6 items will be considered as the basal age. The mental age will be calculated by adding 2 scores each for the total number of completed items along with the basal age. Then the intelligence Quotient (IQ) can be calculated using the formula,

\[ IQ = \frac{MA}{CA} \times 100 \]

where MA is the mental age and CA is the chronological age.

3.5.3 **Observation schedule to measure social development**

An observation schedule was prepared by the investigator for assessing the social development. The constructed schedule is described in the following headings. (1) Selection of the test items, (2) Preliminary test, (3) Description of the final schedule, (4) Scoring.

(a) **Selection of the test items**

A scanning of the available literature and the direct observation of the pre-school children by the investigator provided the necessary materials for the observation schedule.

The guidelines given by Erikson (1963), Hurlock (1972), Santz (1975), Romanello (1987), Reddy, (1988), Singh (1988), Craig (1989), Milon (1990), Hendrick (1990) and Wentzel (1991) about the various aspects of social behaviour of the pre-school children and the relevant social behaviours recognised by the investigator through the direct and frequent observation of the pre-school children in the nearby nursery schools helped
Reshaping of the schedule was done by eliminating 15 questions which provided the same information and a second schedule was formulated with 60 questions. In that schedule 14 questions dealt with social contacts of the child, 15 questions assessed the child’s responses, reactions and adjustments to various situations, things and to other people, 10 questions denoted the play behaviour of the child, another 10 questions exposed the self-help skills of the child and the remaining 11 questions expressed the social qualities of the child.

(b) **Preliminary test**

The social development of 20 pre-school children was assessed as a preliminary test to finalise the second schedule. The items that proved irrelevant and repetitive were deleted again and the schedule was finalised with 50 items.

(c) **Description of the final schedule**

The 50 items indicating different social behaviours are grouped under five aspects of social development carrying 10 questions each. The areas covered and the number of questions coming under each area are as follows.

1. Sociability - 10 questions (Question numbers 1, 3, 4, 5, 8, 12, 20, 21, 23 and 49)

2. Autonomy - 10 questions (Question numbers 7, 9, 14, 19, 28, 31, 36, 37, 42 and 43)
3. Initiative - 10 questions (Question numbers 2, 6, 10, 15, 16, 24, 30, 39, 40 and 44)

4. Adjustability - 10 questions (Question numbers 11, 13, 25, 26, 27, 32, 33, 34, 35 and 50)

5. Responsibility - 10 questions (Question numbers 17, 18, 21, 29, 38, 41, 45, 46, 47 and 48)

The questions on sociability deal with the social contacts of the child and gather information about the child’s interest to be in the group, to enjoy the presence of others, to have special friends, to be contacted, to share things with others, to communicate with others and to be friendly with others.

Questions on Autonomy reveal how independent and free the child is by noting the child’s confidence in social contacts, his interest in seeking other’s help, his independence from parents and teachers in taking decisions and also tried to find out if the child is attention seeking, comfortable with unfamiliar persons, and easily timid.

Information regarding Initiative deals with the ability of the child in taking the first step in various performances. The child’s ability to initiate contacts, to give suggestions and ideas to others, to contribute to adult conversations, to lead the group, skills in greeting elders and the confidence shown by the child in performances are assessed in this area.

Questions concerning Adjustability indicate how the child gets along with others. The frequency of aggressiveness, quarrelling, acceptance and tolerance of others, complaints about others, obedience to rules and regulations, reactions to new and stressful situations, participation in the school activities etc. are assessed here.
Questions on Responsibility reveal whether the child is aware of himself and others. The child’s ability to remember names and places, interest in others, awareness of social norms, ability to understand others feelings, willingness in giving and asking assistance in difficulty, eagerness in completing the tasks assigned to him are evaluated.

‘Always’, ‘sometimes’ and ‘rarely’ are the three choices given to all the questions except the last two. ‘Co-operatively’, ‘parallel’ and ‘alone’ are the three choices for the last but one question which deals with the child’s engagement in play. ‘Older children’, ‘younger children’ and ‘age mates’ are the three choices for the last question regarding the child’s friends in play. After observing the child’s behaviour the investigator has to encircle or tick the suitable choice (Appendix III).

(d) Scoring

Each item of the schedule is to be scored on a three point scale. A score of ‘3’ is to be given to the choice ‘always’ in the case of positive behaviour and to ‘rarely’ for the negative behaviour. The choice ‘sometimes’ and other wordings indicating the middle path is to be given a score of ‘2’. The last choice which denotes the least expression of positive behaviour and frequent expression of negative behaviour is to be given a score of ‘1’ (Appendix IV).

The choices for the last two questions (Question No. 49 and 50) are to be scored as follows.
Thus the maximum score for the individual child will be 150 and the minimum score will be 50. The higher the score, the higher will be the child’s social skills.

### 3.5.4 Parent questionnaire to measure the temperament or behavioural profile

The present study used the ‘Parent Questionnaire’ to assess the temperament or behavioural profile (Reaction pattern and Intensity of reaction) of the pre-school children. Thomas et al. (1963) personality inventory was the source for the parent questionnaire to assess the temperament of children.

(a) **Description of the tool**

Thomas et al. (1963) classified the different temperamental patterns under nine dimensions of personality. Parent questionnaire is a 72 item temperament scale designed to assess the same. The nine dimensions of temperament and the number of questions under each section are as follows.

<table>
<thead>
<tr>
<th>Question No.</th>
<th>Choices</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>49</td>
<td>Co-operatively</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Parallel</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Alone</td>
<td>1</td>
</tr>
<tr>
<td>50</td>
<td>Older children</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Younger children</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Age mates</td>
<td>1</td>
</tr>
</tbody>
</table>
1. **Activity level** (7 questions—question numbers 1, 18, 24, 34, 45, 60 and 64) means the amount of typical movement by the child and the amount of active time spent by the child each day.

2. **Rhythmicity** (7 questions—question numbers 6, 13, 20, 31, 38, 47 and 55) denotes the predictability or unpredictability of the child’s daily activities.

3. **Approach-withdrawal** (7 questions—question numbers 4, 10, 21, 30, 46, 62 and 66) notes the child’s initial responses to a new stimulus.

4. **Adaptability** (9 questions—question numbers 7, 12, 15, 33, 40, 42, 51, 59 and 68) points out how easily the child’s initial response to a new stimulus can be changed.

5. **Threshold of Responsiveness** (10 questions—question numbers 3, 11, 23, 32, 39, 49, 56, 57, 65 and 67) notes the intensity of some stimulus required to trigger a response.

6. **Intensity of reaction** (9 questions—question numbers 8, 16, 27, 35, 43, 50, 54, 61 and 69) assesses the level of energy of the child’s response regardless of whether it is positive or negative.

7. **Quality of mood** (7 questions—question numbers 2, 14, 19, 29, 41, 58 and 70) notes the pleasant, joyful and friendly behaviour in contrast to unpleasant or unfriendly behaviour.

8. **Distractability** (7 questions—question numbers 9, 17, 22, 36, 48, 52 and 71) points out the degree to which the child’s behaviour can be interfered with or altered by an outside event.
9. **Persistence and Attention span** (9 questions—question numbers 5, 25, 26, 28, 37, 44, 53, 63, and 72) denotes how the child pursues any one activity even in the face of obstacles.

Seven choices namely, ‘hardly ever’, ‘infrequently’, ‘once in a while’, ‘sometimes’, ‘often’, ‘very often’, and ‘almost always’ are given to each question the researcher has to tick the choice which is best suited for the child (Appendix V).

The already mentioned nine dimensions were grouped in to two categories by Indulekha (1977). The three dimensions—the intensity of reaction, activity level and threshold of responsiveness were grouped as ‘Intensity of reaction’ category which describes the child’s behaviour as ‘mild’ and ‘intense’. The remaining dimensions namely, quality of mood, rhythmicity, approach withdrawal, adaptability, destructibility and persistence and attention span which describe the child’s behaviour as ‘positive’ and ‘negative’ were grouped under ‘Reaction pattern’. The present study also assessed the behavioural profile of the children in terms of ‘Intensity of reaction’ and ‘Reaction pattern’.

**(b) Scoring**

Each item of the questionnaire is to be scored on seven point scale. The items under the ‘Intensity of reaction’ and those under the ‘Reaction pattern’ are to be scored differently. The items which come under the ‘Intensity of reaction’ is to be scored without considering whether the behaviour is positive or not. So a person who encircles ‘hardly ever’ (1) will get the lowest score ‘1’ and who encircles ‘almost always’ (7) will get the highest score ‘7’. The items which come under the ‘Reaction pattern’ are to be scored by considering the
positive and negative behaviour. Thus a person who encircles ‘almost always’ (7) for a positive behaviour will get the highest score ‘7’ and who encircles ‘hardly ever’ (1) for a positive behaviour will get the lowest score ‘1’. In the case of negative behaviour, the person who encircles ‘almost always’ (7) will get the lowest score ‘1’ (Appendix VI).

The maximum score a subject could get is 504 and minimum is 72. The maximum score for the ‘Intensity of Reaction’ is 182 and the lowest score is 26. Higher score for the Intensity of reaction indicates ‘Intensity’ and lower score indicates ‘mildness’ in the child’s characteristics. The maximum score for the Reaction Pattern is 322 and the minimum score is 46. The higher score in the reaction pattern denotes ‘positive’ behaviour pattern and lower score denotes ‘negative’ behaviour pattern in the child.

### 3.5.5 Achievement test

The present study defines Achievement as the ability to grasp and to reproduce what is being taught to the child in the class. In order to assess the academic achievement, the investigator had to teach the children a particular topic first and then the test had to be administered to assess their ability to reproduce it. She decided to teach the selected psycho-motor skills using Montessori materials. The achievement test is described in the following steps. (1) Selection of the test items, (2) Preliminary test, (3) Final test, (4) Description of the test materials, (5) Teaching procedure, (6) Testing procedure and (7) scoring.

#### (a) Selection of the test items

The first hand experiences from the direct observation, frequent face to face discussion and the information gathered from the available literature
helped the investigator in formulating twelve items of psycho-motor skills for the achievement test. She grouped those twelve items under four subheadings consisting of three items each. The four areas and their subtests are as follows.

(i) **Practical life skills**

(a) Napkin folding, (b) Buckling, (3) Mat folding.

(ii) **Sensory skills**

(a) Block identification, (b) Sound identification, (c) Texture identification.

(iii) **Language skills**

(a) Letter recognition, (b) Reading, (c) Writing.

(iv) **Arithmetic skills**

(a) Number recognition, (b) Pairing, (c) Addition.

*Practical life skills* consider the child’s abilities in self-help skills like napkin folding, buckling and mat folding which are very much needed for their day to day life.

*Sensory skills* concern with the ability of the child in identifying different blocks, sounds and textures.

*Language skills* deal with the child’s ability in recognising simple Malayalam letters (ο, μ, ν, ω) and in reading and writing three words μο, ωο and μω using Montessori materials.

*Arithmetic skills* denote the child’s ability to recognise the numbers 1, 2, 3, 4 and 5, to pair the picture with the corresponding number and to do simple additions like $1 + 1 = 2$, $1 + 2 = 3$, $1 + 3 = 4$, and $1 + 4 = 5$. 
(b) Preliminary test

In order to test the feasibility of the test items, a preliminary test was conducted among ten pre-school children in an urban Anganwadi centre. The investigator took two days to teach all the skills individually. Then two more days were given to the children to practise the skills under the supervision of the researcher. Then the test was conducted on the fifth day. The child had to perform all the skills according to the instructions given. Meanwhile the time taken by the child in performing each task was recorded as the score for that particular item. Then the total time was calculated and was considered as the total score for the child’s achievement.

After the preliminary test, the napkin folding and mat folding were found inadequate and were replaced by Button and Hook frames. Since the children did the texture identification by noting the colour of the fabric and not by touching and feeling, same coloured sand papers with different tactile sensations were introduced instead of the fabric material.

(c) Final test

In order to find the suitability of the added items the test was repeated in the same manner on another sample of ten children. After teaching and practising the skills, the test was conducted on the fifth day. All the items were systematically completed by all the children. Thus the test items for the Achievement test were finalised.

The four areas, the test items and the materials needed for each item of the finalised Achievement test are as follows.
<table>
<thead>
<tr>
<th>Area</th>
<th>Test items</th>
<th>Materials needed</th>
</tr>
</thead>
</table>
| I  Practical life skills | a) Putting on buttons  
  b) Putting on hooks  
  c) Buckling         | a) Buttons frame  
  b) Hook frame  
  c) Buckle frame    |
| II  Sensory skills | a) Block identification  
  b) Sound identification  
  c) Texture identification | a) Cylinder block  
  b) 2 sets of sound boxes  
  c) 2 sets of tactile blocks |
| III  Language skills | a) Letter recognition  
  b) Reading  
  c) Writing       | a) Letter blocks and sand paper letters of σ, τ, ω and α  
                    b) Pictures and word blocks of μο, νο and ομ.  
                    c) Sand paper letters, word blocks and pictures of ομ,  
                        νο and ομ.                                    |
| IV  Arithmetic skills | a) Number recognition  
  b) Pairing  
  c) Addition     | a) Number blocks and sand paper numbers of 1, 2, 3,  
                     4 and 5.  
                     b) Sand paper numbers and pictures—  
                        (Picture of a shirt,  
                        picture of two hats,  
                        picture of three umbrellas,  
                        picture of four frocks, and  
                        picture of five shirts)  
                     c) Sand paper numbers and  
                        and picture  
                        (2 pictures of a shirt,  
                        picture of two shirts,  
                        picture of three shirts,  
                        picture of four shirts, and  
                        picture of five shirts) |

(d) **Description of the test materials**

All the materials for the Achievement test were prepared by the investigator and the description of each material is as follows.
(i) **Materials for the practical life skills—button, hook and buckle frames**

These are three 10 square inch sized wooden frames holding two piece of cloths. The button frame has three buttons on one piece of cloth and three button holes on the other piece. Three hooks and eyes are fixed on the hook frame. Three buckles and locks are fixed on the buckle frame. Figure 3.1 shows the materials used for practical life skills.

![Image of buttons and frames](image)

**Figure 3.1.** Materials for practical life skills.

(ii) **Materials for sensory skills**

‘Cylinder block’: This is a wooden block (18 inches in length) with ten holes of different circumferences in gradation and with respective cylinders to fix in it.
‘Sound boxes’: These are six cylinders made of PVC pipes with 6 inches length. Based on the contents each box produces a sound totally different from that of the other. The contents in each box are as follows.

Box I - 10 pieces of stones
Box II - A spoonful of rice
Box III - A spoonful of cumin seeds
Box IV - A spoonful of mustard seeds
Box V - A spoonful of fine sand
Box VI - A spoonful of tea powder.

The boxes are yellow in colour with the caps painted blue. A duplicate set is also made with the caps painted red in colour.

‘Tactile blocks’: This is a set of six four square inch sized sandpapers of different textures fixed on card boards. This is also made in duplicate. Figure 3.2 presents the materials used for sensory skills.

Figure 3.2. Materials for sensory skills.
(iii) **Materials for language and Arithmetic skills**

'Letter and number blocks': These are sand paper cut outs of four Malayalam letters 𑄦, 𑄦, 𑄧 and 𑄧 and five numbers 1, 2, 3, 4 and 5 pasted on four square inch sized card boards.

'Sand paper letters and numbers': These are sand paper cut outs of four Malayalam letters, 𑄦, 𑄦, 𑄧 and 𑄧 and five numbers, 1, 2, 3, 4 and 5.

'Word blocks': These include three sand paper cut out words, 𑄨𑄤, 𑄨𑄡 and 𑄨𑄣 pasted on 6 x 4" sized card boards.

'Pictures': There are three pictures for writing, five pictures for pairing and six pictures for addition. The selected pictures are the following.

**For writing:** Pictures of 𑄨𑄤, 𑄨𑄡 and 𑄨𑄣

**For pairing:** Picture of a tea shirt, picture of two hats, picture of three umbrellas, picture of four frocks and picture of five shirts.

**For addition:** Two pictures of a shirt, picture of two shirts, picture of three shirts, picture of four shirts and picture of five shirts. Figures 3.3 and 3.4 show the materials used for language and arithmetic skills respectively.
Figure 3.3. Materials for language skills.

Figure 3.4. Materials for arithmetic skills.
(e) **Description of the test**

All the psycho-motor skills should be taught to the child individually as a first step and then the child’s ability in doing all those skills should be assessed.

(i) **Teaching procedure**

First teach the child to put on the buttons, hooks and buckles using the respective frames (Figure 3.5a).

To teach block identification, tell the child to take away the cylinders from the holes and then to replace them by showing the hole one by one in the ascending or descending order. Then instruct the child to put the correct cylinder in the hole shown by the investigator at random that is not in the order. Then by keeping all the cylinders four meters away from the block, tell the child to collect the correct cylinder for the hole shown by the researcher. After seeing the hole, the child has to reach the place where the cylinders are kept, has to choose the correct one, come back and has to replace the cylinder in the correct hole.

Sound identification can be inculcated using the sound boxes. First, allow the child to hear all the six sounds of the original set by shaking the boxes one by one. Then allow the child to pair boxes from the original and duplicate sets having the same sounds by listening the sounds produced. Then tell the child to pair the sounds by keeping the duplicate set four meters away from the original one (Figure 3.5b).

To teach texture identification, allow the child to touch and feel the six tactile blocks one by one and to understand their different textures. Then tell the child to find out the duplicate of all the textures by touching
and feeling the blocks one by one. Finally tell the child to pair the blocks having the same texture by keeping the duplicates four meters away from the originals.

Letter and number recognition can be taught by making the child to write over the respective letter and number blocks using their own hands. Meanwhile teach the child to pronounce the letters and numbers. Then, by showing the letters and numbers one by one, allow the child to collect the same sand paper letters and numbers kept four meters away from him and to pronounce it. Teach the child the letters о, м, ч and я and the numbers 1 to 5 in this manner.

Reading and writing exercises can be introduced by showing the pictures and the respective word blocks in pair. Teach the child to pronounce the word оо by pairing the picture of оо with the word block оо. Then allow the child to write the same word (word оо) using the sand paper letters о and о (Figure 3.5c). Teach the other words оо и оо in the same manner. Finally, after showing all the pictures one by one, tell the child to collect the correct word block and to write the word with sand paper letters which are kept four meters away from him.

To teach the skill of pairing, help the child to do the picture-number pairing using the pictures and respective sand paper numbers as in the reading and writing exercises and to pronounce the number (Figure 3.5d). Lastly, by showing the pictures one by one, tell the child to pair it with the respective sand paper number kept four meters away from him. Thus teach the child to pair the numbers 1 to 5 with the respective pictures.
Figure 3.5. Learning of prescribed psycho-motor skills by the pre-school children: (a) Practical life skills, (b) sensory skills, (c) language skills, and (d) arithmetic skills.
In order to teach the skill of addition, first train the child to number the birds in a picture by showing the pictures with different number of birds and pairing the pictures with the respective sand paper numbers. Then by putting two pictures together, tell the child to count the birds in each, to add them and to come out with the total number and to pair it with the respective sand paper number. Thus teach the child simple additions like $1 + 1 = 2$, $1 + 2 = 3$, $1 + 3 = 4$ and $1 + 4 = 5$.

Train all the psycho-motor skills in the first two days. Then allow the child to take two more days to practise the same. Then the achievement of the child can be assessed on the fifth day.

(ii) Testing procedure

The achievement of each child can be assessed individually. Keep all the test materials ready on two tables kept four meters apart. Arrange a stop watch to note the time (in seconds) taken by the child to perform each task. The investigator has to start the stop watch when the child begins the task and stop when he finishes it. The procedure of the achievement test is as follows.

Practical life skills

Ask the child to put on the Buttons, Hooks and Buckles on the respective frames and note the time taken by the child in performing each.

Sensory skills

Block identification: By showing the fourth hole on the block, ask the child to select the correct cylinder for the hole from the cylinders kept on the table four meters away and note the time taken by the child.
Sound identification: By allowing the child to listen to the loudest sound, ask the child to identify its pair from the duplicate set kept four meters away from it and note the time taken by the child.

Tactile identification: By allowing the child to touch and feel the fine tactile block, ask the child to find out its pair from the duplicate set kept four meters away and note the time taken by the child.

Language skills

Letter recognition: By showing the Malayalam letter block ഞ ask the child to select the same letter from the sand paper letters kept four meters away.

Reading: Showing the picture of സ ask the child to collect the corresponding name block from the set kept four meters away.

Writing: Ask the child to write the name of the picture with the sand paper letters after showing him the picture of സ.

Arithmetic skills

Number recognition: Showing the number block '2' ask the child to identify the same number from the sand paper numbers kept four meters away.

Pairing: After showing the picture of four frocks ask the child to pair it with the appropriate sand paper number from the set kept four meters apart.

Addition: First, by showing the picture of a shirt ask the child to collect the corresponding sand paper number. Then do the same with the picture of three shirts. Thirdly by keeping the two pictures side by side ask the child to collect the sand paper number which denote the total number of shirts.

The investigator has to note the time taken by the child to finish each task in the prescribed achievement test scoring form (Appendix VII).
(f) **Scoring**

The time (in seconds) taken by the child to finish each task is considered as the score for each test. A score of two minutes (120 seconds) is to be given to those tasks which were left unfinished or unattempted. The total score for each child can be calculated by adding the time taken by the child for all the tasks.

A child who finishes all the tasks in a short period of time will have a lower score and is considered as a high achiever. Thus in this achievement test, the lower the score, the higher the achievement will be.

Thus the investigator finalised the tools to measure the intellectual development, social development, temperament and the achievement of the pre-school children.

3.6 **Pilot study**

The Binet-Kamath intelligence scale was already standardised on the Indian population. The reliability of the temperament scale (Parent questionnaire) on the pre-school children of Kerala was also found by Thomas (1991). The reliability coefficient obtained ($r = 0.91$) was found to be highly significant. So the reliability of these two tests were not attempted again.

A pilot study was conducted on 50 pre-school children selected at random from a total of 150 children from Idukki district to find out the reliability and validity of the observation schedule to assess the social development and of the achievement test. Tribal, Rural and urban pre-school children of both sexes formed the sample for the pilot study.
The split-half method was applied to find out the reliability of the observation schedule for assessing social development and test-retest method was used to find out the reliability of the Achievement test.

The Reliability coefficient obtained for the observation schedule was corrected using the Spearman-Brown Prophecy Formula.

$$ r = \frac{2r}{1+r} $$

The results obtained are presented in Table 3.2.

<table>
<thead>
<tr>
<th>Test</th>
<th>Method</th>
<th>Coefficient obtained</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation schedule for assessing social development</td>
<td>Split-half</td>
<td>0.97**</td>
</tr>
<tr>
<td>Achievement test</td>
<td>Test retest</td>
<td>0.95**</td>
</tr>
</tbody>
</table>

** P < 0.01.

The highly significant reliability coefficients (P < 0.01) shown in Table 3.2 predicted that the tests are highly reliable. The face validity of the two tests were also considered.

3.7 Main study

The main study was conducted after establishing the reliability and validity of the tools. The intellectual development, the social development, the temperament and achievement of 450 pre-school children from the 45 Anganwadi centres belonging to the Wayanad, Idukki and Thiruvananthapuram districts of Kerala were assessed using the respective tools.
Permission to carry out these studies in the Anganwadi centres was sought beforehand from the Directorate of Social Welfare and the respective child Development Project officers of each district. Each centre was visited and a list of the four year old pre-school children in that centre was made one week before the study.

The investigator was in each Anganwadi centre for six days to conduct the various assessments. After establishing a rapport with the children she started collecting the information.

The general informations about the children were drawn by the investigator on the first day itself. The intellectual development of the children were assessed individually on the second day morning using the Binet-Kamath scale which took 15 minutes for each child. Then in the afternoon she started teaching the selected psycho-motor skills.

First, each child was taught to put on the buttons, hooks and buckles using the respective frames. To teach block identification, each child was told to take away the cylinders from the holes and to replace them by showing the hole one by one in the ascending or descending order. Then the child was instructed to put the correct cylinder in the hole shown by the investigator at random. Then by keeping all the cylinders four meters apart, the child was told to collect the correct cylinder for the hole shown by the researcher.

Sound identification was inculcated using the sound boxes. Each child was allowed to hear all the sounds by shaking the original sound boxes one by one. Then each child was trained to pair the boxes from the original and duplicate sets by listening to the sounds produced. Finally each
child was instructed to identify the pair from the duplicate set kept four meters away from the originals.

In order to teach texture identification, each child was allowed to touch and feel the six tactile blocks one by one to understand their different textures. Then each child was trained to touch and feel each block from the original set and to select its identical forms from the duplicate set. Each child was also made to pair identical blocks by keeping them at a distance of four meters.

To teach letter and number recognition, each child was helped to write over the respective letter and number blocks using their own hands and to pronounce the letter. Then each child was trained to identify and pronounce the same sand paper letters and numbers kept four meters away from him. The letters o, m, w and d and the numbers 1, 2, 3, 4 and 5 were taught to each child. In reading and writing exercises each child was taught to pair the picture of mo with the word block mo and to pronounce the word. Then each child was asked to write the word mo using the sand paper letters m and o and to read it. The same procedure was repeated to teach the words wo and wmo.

To teach the skill of pairing each child was trained to do the picture-number pairing. Each child paired the sand paper numbers 1 to 5 with their respective pictures.

In order to teach addition each child was shown pictures of shirts with different numbers, asked to count the shirts in each and to pair it with the respective sand paper number. Then two pictures were put together and the child was trained to count the number of shirts in each, to add them and to pair it with the sand paper number which denote the total number. Thus simple
additions like $1 + 1 = 2$, $1 + 2 = 3$, $1 + 3 = 4$ and $1 + 4 = 5$ were taught.

The investigator finished the teaching of psycho-motor skills by the third day evening. On the fourth and fifth days she revised the classes in the morning and then the children were left free for the rest of the day to practise the skills. Meanwhile the researcher keenly observed the performances of the children and made the necessary corrections.

On those days she also assessed the social development of children. For that she informally observed the child’s day to day behaviours in the school using the observation schedule. On the fifth day evening she herself filled in the schedule of each child. Those behaviours left unnoticed were observed on the sixth day.

The temperament of children were assessed by interviewing their mothers. The mothers were informed beforehand to come to the Anganwadi centre on any of those days according to their convenience. The investigator conducted a face to face interview with each mother using the parent questionnaire. She asked the questions one by one in Malayalam (Appendix Vb) and the mother’s responses were recorded at once by encircling the appropriate choice provided in the questionnaire. She took half an hour to interview each mother. The interview was conducted without disturbing the children’s activities.

The achievement test was conducted on the sixth day. All the children were allowed to play outside along with the Anganwadi teacher. All the test materials were kept ready on two tables of 20 inches height kept four meters apart.
The button, hook and buckle frames, the cylinder block, the original set of sound boxes, tactile blocks, letter and number blocks and the pictures were arranged on one table. The cylinders, the duplicate set of sound boxes and tactile blocks, name blocks and sand paper letters and numbers were arranged on another table kept four meters away from the first one. A stopwatch was arranged to note the time taken by the children to perform the tasks. Then the children were called one by one to do the achievement test. The investigator herself conducted the test and noted the time taken by the child to perform each task.

To test the practical life skills each child was asked to put on the buttons, hooks and buckles on the respective frames. For assessing the sensory skills each child was asked to select the cylinder that would fit in to the fourth hole of the cylinder block from the cylinders kept four meters away. Then the child was allowed to listen to the loudest sound box and told to identify its pair from the duplicate set kept four meters away. Next the child was made to feel the fine tactile block and asked to find out the pair from the duplicate set.

To test the language skills, by showing the letter block the child was asked to identify the same letter from the sand paper letters kept four meters apart. Next the child was asked to collect the correct word block by showing the picture of cm. Then by showing the picture of dm the child was told to write its name using the sand paper letters.

For assessing the Arithmetic skills, each child was shown the number block ‘2’ and was asked to identify the same number from the sand paper numbers kept four meters away. Then showing the picture of four frocks the child was asked to pair it with the appropriate sand paper number kept four meters apart. Then introducing the picture of a shirt, the child was
instructed to pair it with the correct sand paper number. The same was done with a picture of three shirts. Then by keeping the two pictures together, the child was told to pair it with the sand paper number which denote the total number of shirts.

The child was alone in the room with the investigator while doing the test. No other person was allowed to enter the room during the test. When the child performed all the tasks one by one according to the instructions, the investigator noted the time (in seconds) taken by the child to perform each task. No child was allowed to speak in between the tests. If the child asked anything while performing a task the child was told to repeat the task after some time. No child was given the test when he or she was hungry or in an irritable mood. The total time taken by the child to finish the test varied from subject to subject. The various areas of psychosocial development of 450 pre-school children were assessed by the investigator herself. She took one full week (6 days) to finish all the assessments in an Anganwadi centre. In total she took 45 weeks (270 days) to complete the data collection.

3.8 Treatment of the data

After completing the data collection, scoring was done. First, IQ was calculated using the formula.

\[ IQ = \frac{MA}{CA} \times 100 \]

where MA is the mental age measured by the IQ test and CA is the chronological age collected from the admission register.

Scoring of the observation schedule was done on the 3 point scale (Refer Appendix IV) and that of the parent questionnaire was done on the 7
point scale (Refer Appendix VI). Then the area wise scores and the total scores of social development and temperament for each child was calculated. The time (in seconds) taken by the child in the achievement test was his score for achievement.

Then the numerical data was analysed statistically using the "Two way analysis of Variance.

By applying the two-way ANOVA, the differences shown by the tribal pre-school children from their rural and urban peers and the gender difference were assessed in the following areas and subareas.

(a) Intellectual development

(b) Social development

(c) Temperament (Intensity of reaction and Reaction pattern)

(d) Achievement
  (1) Practical life skills, (2) Sensory skills, (3) Language skills and (4) Arithmetic skills.

The 'F' values were calculated in the following manner.

First the sum of squares of the columns, rows, within cells and their interaction were calculated using the following formula.

Sum of squares of the columns = \( \frac{1}{nR} \sum T \cdot c^2 - \frac{T^2}{N} \)

Sum of squares of the rows = \( \frac{1}{nC} \sum \Tr^2 - \frac{T^2}{N} \)

Sum of squares of within cells = \( \sum \sum \sum n X^2 \rici - \frac{1}{n} \sum \sum \Tr^2 \)
Interaction = \frac{1}{n} \sum_{r=1}^{R} \sum_{c=1}^{C} trc^2 - \frac{1}{nC} \sum_{r=1}^{R} Tr^2 - \frac{1}{nR} \sum_{c=1}^{C} Tc^2 + \frac{T^2}{N} \\
Total = \sum_{r=1}^{R} \sum_{c=1}^{C} \sum_{n=1}^{n} x^2rci - \frac{T^2}{N}

Then the sum of squares were multiplied by their respective degrees of freedom (df) to find out the Variance Estimate. The degrees of freedom (df) for the columns, rows, within cells, and for interaction were calculated using the formulas (C-1), (R-1), RC(n-1) and (R-1)(C-1) respectively. The calculated variance estimate for the columns, rows, within cells and interaction were denoted as Se^2, Sr^2, Sw^2 and Src^2 respectively.

Then the 'F' values were calculated from the variance estimate using the following formulas.

F value for Interaction (Frc) = \frac{Src^2}{Sw^2}

F value for Columns (Fc) = \frac{Sc^2}{Sw^2}

F value for Rows (Fr) = \frac{Sr^2}{Sw^2}

The areas which showed significant 'F' values were again analysed by computing critical ratio to find out the intergroup differences in the various areas and subareas. The critical ratio was calculated using the formula.
Standard deviation was found out using the formula

\[ CR = \frac{M_1 - M_2}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}} \]

The areas which show significant gender difference in two-way analysis were also analysed to find out the group-wise gender difference by applying critical ratio.

The analysed data along with the illustrations and interpretations are given in the following chapter.