CHAPTER-III
RESEARCH DESIGN AND METHODS

This chapter details the thinking that has led to the framing of the hypotheses regarding the motivational correlates of pupils who have been classified on the basis of their academic achievement scores as group of high academic achievers (HA), moderate academic achievers (MA) and low academic achievers (LA), designing the instruments and tests and selecting the sample of subjects, besides explaining the research procedure followed in this investigation.

As an extension of the findings of research investigations already carried out in similar areas, the following hypotheses have been formulated with respect to the influence of the four independent variables - choice behavior in equi-probable situations, level of aspiration, persistence in the face of threat of failure and risk preference in a goal task - on academic achievement of pupils, which has been quantified as a composite score of average percentage of marks obtained in examinations and the ratings of the class teacher.
HYPOTHESIS-I

Academic achievement and Choice behaviour:

Studying choice situations offering equal probabilities of success as those involved in lotteries, John Cohen established the two basic choice behavior dispositions - (i) the tendency to maximise success (Ms) and (ii) the tendency to minimise failure (Mf), which are very similar to the motives to 'achieve success' and 'avoid failure' respectively of Atkinson's theory. In the present study the choice dilemma Test offers choice situations which are almost identical as those found in John Cohen's study. The relationship between choice behavior tendencies and the levels of academic achievement would then mean the relationship between the achievement oriented motives and the levels of academic achievement.

Investigating the relationship between achievement motivation and academic achievement while Atkinson (1966) reported negligible correlation, Jones and Grieneeks(1970) found no significant relationship. But a feeble correlation between
academic performance and achievement motivation was obtained by Enwistle and Enwistle (1974) in their studies.

However Lowell (1952) found that subjects with high achievement motivation have high scholastic aptitude as compared to those with low achievement motivation. Similarly studies of Gokulanathan (1979), Coleman (1966), Rosen (1955), Lingren (1976) etc., have shown a weak but significant relationship between achievement motivation and level of academic performance.

In the light of these studies the following hypotheses have been framed:

I. The three groups of pupils classified as 'High', 'Moderate' and 'Low' academic achievers will exhibit significant differences in their choice behavior tendencies in the following manner:

(a) High academic achievers will display choice behavior characterising the tendency to "maximise the possibilities of success (Ms)" at a high level.

(b) Low academic achievers will exhibit choice behavior characterising the tendency "to minimise the possibilities of failure (Mf)". 
(c) Moderate academic achievers will exhibit choice behavior which characterises both the tendencies of "maximising the possibilities of success" and "minimising the possibilities of failure" but at a low level.

HYPOTHESES-II

The most typical result of early studies of level of aspiration as summarised by Lewin et al. (1944, p.337) reveal that nearly all normal individuals when first exposed to a level of aspiration situation, give initially a level of aspiration which is above the previous performance score and under most conditions tend to keep the goal discrepancy positive. To raise aspiration following success and to lower it following failure has been observed by many investigators like Juckant (1937) Festinger (1942), Rotter (1943) etc.. Sears (1940) found that children with a past history of success showed very little variability in aspiration. Most of them maintained the 'typical' small mean positive goal discrepancy. Children with past histories of failure, however, showed a much higher average goal discrepancy and variability within this group of subjects was very substantial.

Rotter (1943,1954) has found that atypical patterns of changes following success and failure tend to be associated with
atypical goal discrepancies.

The above quoted studies and also those of Hellmann (1976), Daniel Bar-Tal (1980) and Govind Tiwari et.al (1980), probing the role of level of aspiration W.r.t. academic achievement, suggest that aspirational behaviour pattern is related characteristically to the levels of achievement of the subjects. As the experimental situations of the present study are similar to those of Rotter, Juckant, and Festinger, the following hypothesis, stating the relationship between the measures of level of aspiration and the levels of academic achievement is put forth:

II "The three different academic achievement groups will show significantly different patterns of level of aspiration in goal tasks assessed in terms of 'goal discrepancy' (G.D), and 'attainment discrepancy' (A.D) scores.

The aspirational behaviour of the three achievement groups stated more specifically will be as under:
(a) Compared to the moderate and low groups of academic achievers, the group of high academic achievers, will maintain the typical small mean positive goal discrepancy and small mean negative attainment discrepancy scores.
(b) Low academic achievers will show either very high positive or negative mean G.D. and A.D., scores.

(c) Moderate academic achievers will not show any distinct pattern in their mean G.D. and A.D scores, like the high and low groups of academic achievers.

HYPOTHESIS-III

The relationship between levels of achievement and the levels of expected performances fulfilling maximum and minimum satisfaction were studied by Daniel Bar-Tal and his associates, Govind Tiwari et.al etc.,. The study of the former revealed that the range of expected performance of maximum satisfaction for both high and low achievement groups remained more or less same, and the range of expected performance of minimum satisfaction was longer for the low academic achievers as compared to the high achievers. However the study of Govind Tiwari suggested that the ranges of expected performance of maximum and minimum satisfaction of both high and low achievement groups differed insignificantly. In the light of these findings, the following hypotheses, regarding the characteristic patterns of "expected performances" of the three achievement groups have been formulated:

III) The three different academic achievement groups will
show distinctly different patterns of expected performance that may fulfill their maximum and minimum satisfaction."

HYPOTHESES – IV

Earlier studies by French and Thomas (1958) and Atkinson and Litwin (1960) observed that people with high achievement motive spent more time in an achievement activity than those with low achievement motive.

Norman Feather (1960, 1961, 1962) sophisticated the experiment of "persistence - behavior" and studied it in relation to expectation of success and the strength of achievement related motives. He found that

(i) When the initial task difficulty was low (Probability of success \(P_s\) = .70 or more) subjects in whom \(M_s > M_f\) persisted longer than the subjects in whom \(M_f > M_s\).

(ii) When the initial task difficulty was high (\(P_s = .50\) and less) subjects in whom \(M_f > M_s\) persisted longer than subjects in whom \(M_s > M_f\).
In the present experimental situation, which resembles that of Norman Feather, the following hypotheses have been formulated:

IV. The high, moderate and low academic achievement groups will show different levels of persistence in the critical task, presented with the same degree of probability of success. Stated more explicitly,

a. As compared to the moderate and low academic achievers, high academic achievers will persist more in the critical task by taking more trials and time, if the quoted norm of performance of that task is high (Ps=80%). Their persistence will be low if the performance norm quoted is low (Ps=20%).

b. The low achievement group, in comparison with the high and moderate academic achievement groups will persist less in the critical task, by taking fewer trials and less time if the quoted norm of performance of the task is high (Ps=80%). Their persistence will be more if the performance norm quoted for that task is low (Ps=20%).

c. The moderate academic achievers will not show any significant difference in their persistence-behavior of the
critical task, when presented with the performance norms of Ps=80% as well as Ps=20%.

HYPOTHESIS-V

As the level of achievement in any task implies efficiency of accomplishment of the same, the following hypothesis has been proposed.

V. "The three different academic achievement groups will display a significant pattern of efficiency in completing the non-critical tasks, in terms of time spent and number of trials taken i.e. efficiency level decreasing gradually from the 'high achievement group' to the 'low achievement group'.

HYPOTHESES - VI

The relationship between achievement oriented tendency and the risk behavior has been explained by the theoretical model of Atkinson(1957) according to which people high in the motive to achieve success prefer intermediate risk i.e. risks with .5 probability. This findings was supported by Litwin (1966) who used different measures for the analysis of risk-behavior
(i) Risk Aversion Index (the probability of success of a selected task - .5/) and (ii) Geographic Index (G.I).

Tapen Banerjee's (1967) study also lent support to the above findings on risk preference.

Rim (1964) related need achievement scores and the initial levels of risk and found that subjects high in need achievement were riskier than subjects low in it.

In line with the above research findings and also keeping in mind the fact that the level of achievement is determined by the motivational dispositions of 'achievement of success' and 'avoidance of failure', the following hypotheses regarding the risk-taking behavior stated in terms of risk preference, risk aversion and level of successful performance in a goal risk task of the high, moderate and low academic achievement groups have been formulated:

VI.(A) In a risk task, the high, moderate and low academic achievement groups will exhibit different levels of risk preference i.e.
(a) High academic achievers will prefer intermediate risk
(b) Low academic achievers will tend to seek extreme values of risk
(c) Moderate academic achievers will not show any significant pattern of risk preference.

VI. (B) In a risk task, the high, moderate and low academic achievement groups will exhibit different levels of risk aversion with reference to intermediate risk value of .5 (i.e. probability of getting success (Ps) is .50) in the following manner:
(a) High academic achievers will show the least risk aversion with reference to intermediate risk
(b) Risk aversion scores with reference to intermediate risk will be maximum for low academic achievers.
(c) Moderate academic achievers will show middle level of risk-aversion, as compared to the high and low achievement groups.

VI. (C) The level of successful performance in a risk task, measured in terms of 'average distance preferred', 'number of winning shots' and their 'weighted score', will be different for the three different academic achievement groups i.e. the high achievers will show significantly superior level of efficiency in
the goal risk task and this efficiency level will decrease gradually in the moderate and low achievement groups respectively.

HYPOTHESIS-VII

Various theories have been proposed to explain the phenomenon of 'risky-shift-effect'. According to 'information flow theory', as individuals become more familiar in a task, they tend to seek increased risk. The risk-taking behaviour of individuals in a familiar task would stand distinguished from that in an unfamiliar situation. This line of thinking resulted in the formulation of the following hypotheses:

VII. If the subjects are allowed to know all about the risk task and their own ability in it, there will be significant change in the risk-taking behavior as compared to their behavior in a risk task in which they lack the knowledge about their own abilities. i.e.

(a) High academic achievers will display significant increase in risk and hence decrease in risk-aversion in familiar tasks as compared to the unfamiliar ones.
(b) Low academic achievers will show significant decrease in risk and hence increase in risk-aversion in familiar tasks as
compared to the unfamiliar ones.

(c) Moderate academic achievers will display no significant difference either in risk preference or in risk-aversion between familiar and unfamiliar tasks.

HYPOTHESIS - VIII

In most individuals under normal conditions, practice leads to gain in performance but the amount of gain depends on the nature of the task, achievement-oriented tendencies of individuals, feed-back conditions etc. Hence the following hypotheses have been framed:

VIII. The three different academic achievement groups will show different amount of gain in performance measured in terms of 'average preferred distance', 'number of winning shots', and the 'weighted score for the winning shots', due to practice received in a goal risk task i.e.

(a) High academic achievers will record the maximum gain in performance

(b) Low achievers will show the minimum gain in performance

(c) Moderate achievers will show the middle level gain in
performance as compared to the high and low academic achievement groups.

HYPOTHESIS: IX

Kemph (1955) emphasized the importance of intelligence in the determination of the level of academic attainment. Moilenkopf (1956) found consistent positive correlation between socio-economic status of pupils and attainment. In India, Pillai (1965) concluded that when majority of pupils were from poor home environment, even with good teaching and proper facilities in the school, the results could not be improved.

In the light of these and many other such similar studies, emphasizing the importance of intelligence and socio-economic status of pupils, it has been decided in the present study to find the relative importance of socio-economic status, intelligence and the motivational variables like choice behavior, level of aspiration, persistence and risk preference in determining students' academic achievement. Accordingly the following hypothesis has been framed:

IX. "The variables - socio-economic status, intelligence, choice behavior, level of aspiration, persistence and risk preference—
will have significant but of different amount of bearing on academic achievement."

DESIGN OF THE STUDY:

To verify the hypotheses, suitable tools have been selected and developed for the present study, a brief resume of which has been given under:

1) Academic achievement:

To determine the academic performance of the students, the school records were used and the average percentage of aggregate marks scored by each student, in all the subjects, in the quarterly and half-yearly examination was taken to represent the academic achievement of that student.

To include the participation of the students in the day-to-day curricular activities of the class, as part of their academic achievement, class-teacher's rating of each student on the following five point scale was also obtained and the achievement scores were thus made more reliable.

E - Excellent - 75% and above
AA - Above Average - 60% to 74%
A - Average - 46% to 59%
BA - Below Average - 35% to 45%
P - Poor - Below 35%

The grade point average for each grade was computed. Giving a weightage of 3 for the examination scores and 2 for teacher's rating score, the weighted score was computed. To avoid inter-schools and intra-school variations, these raw weighted scores were converted to standard normal scores (Z). To avoid fractions, the normal scores have been converted into 'T' scores (Mc Call, 1939) using the relation $T = 50 + 10Z$.

Using the quartile points $Q3$ and $Q1$ of the 'T' scores, academic achievement of the pupils was categorised as under:

<table>
<thead>
<tr>
<th>Range of 'T' scores</th>
<th>Category of Achievement</th>
</tr>
</thead>
<tbody>
<tr>
<td>57 and above</td>
<td>High achievement</td>
</tr>
<tr>
<td>43 to 56</td>
<td>Moderate achievement</td>
</tr>
<tr>
<td>Less than 43</td>
<td>Low achievement</td>
</tr>
</tbody>
</table>

The different aspects of motivational behaviour of these
three academic achievement groups have been studied and compared.

(2) Choice Dilemma Test:

Following the model found in John Cohen's study on 'making a choice' a Choice Dilemma Test (Appendix-11) was constructed with eleven lottery type items each having two alternatives as choices.

In this test for first seven items, the probability of winning is very small. Of these seven items, first three items assess the choice between single source Vs multiple sources of winning tickets and both the alternatives in each or these items have equal probability of winning.

Items 4 and 5 assess the choice between small lottery Vs big lottery, both the alternatives in each of these two items, have equal probability of winning.

Item No.6 assesses the choice between large chance and small prize Vs small chance and big prize, but both the alternatives have equal 'expected utility'.

Item No.7 assesses choice between shorter odds and fewer draws Vs longer odds and proportionately more draws. Items 8 to 11 are similar to items 1 to 4 except the fact that here the probability of losing is very small.

For the subjects to exercise their choices in the eleven
items of the Choice Dilemma Test, 14 identical non-transparent plastic jars were taken and numbered as 1, 2, 2, 3, 3, 3, 3, 3, 4, 5, 6, 7, 8 and 9. For easy identification these numbers, one for each jar were painted on the inside lid as well the exterior bottom surface of the jar. In these jars were put round shaped green and red tokens which are similar in all respects in the following pattern:[See Appendix - II]

<table>
<thead>
<tr>
<th>Jar number</th>
<th>No. of Tokens put</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Green</td>
<td>Red</td>
</tr>
<tr>
<td>1</td>
<td>10</td>
<td>90</td>
</tr>
<tr>
<td>2,2</td>
<td>5</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>(in each of the 2 jars)</td>
<td></td>
</tr>
<tr>
<td>3,3,3,3,3</td>
<td>2</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>(in each of the 5 jars)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>Empty box</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>8</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>99</td>
</tr>
</tbody>
</table>

For the first six items of the test, picking out a green token constitutes 'success' and red 'failure' and from item seven onwards it is the other way about i.e. picking of a red token constitutes 'success'.
Administration of the Choice behaviour test

The eleven items in the choice Dilemma test have to be administered in the same sequence as found in Appendix-II. The wooden blocks indicating 'Choice A' and Choice B' have been placed on the table. Against these wooden blocks were arranged the appropriately numbered plastic jars containing the green and red tokens. The subject has been seated comfortably in a chair so that his arms could reach the jars easily but he could not look in to the jar while picking out a token from it (Appendix II). The following instructions had been given while administering the first item of the test:

"In this lottery type of game, you will be observed how you plan to get success. In 'Choice A' you have a jar containing 10 green and 90 red tokens. In 'Choice B' there are two similar jars, each one containing 5 green and 45 red tokens. If you could draw a green token from either of choice 'A' or 'B', you deemed to have success. In both the choices, you have the same probability of success i.e. 1/10. The choices differ in that in 'choice A' all the tokens are in one jar and in 'choice B' the tokens are equally divided between two jars. If you prefer
'Choice A' you will have 10 draws; on the other hand, if you choose 'Choice B' you will have 5 draws from each of the two jars. Remember that whichever alternative you choose, whether it is 'A' or 'B', you will have exactly the same number of total draws, that a token drawn is always replaced and the tokens are resuffled before the next draw and finally that the prize is the same. It is enough if you get success only once within the allowed number of draws. Now you can exercise your preference between the alternatives 'A' and 'B' and try to get success by picking out a green token'.

The investigator noted in the scoring sheet, which choice has been preferred and the obtained condition of success or failure within the allowed number of draws.

In a similar way, appropriate jars were placed against choices 'A' and 'B' and the instructions regarding the number of draws and the amount of prize were varied, as appropriate from one dilemma situation to another as indicated in Appendix-II. From the eighth item of the test onwards, red token is to represent success' and green 'failure'.

Scoring:
A score value of 1 has been assigned if the choice is made by focussing the attention on the maximum possibilities of success and -1 for focussing attention on the minimum possibilities of failure, when the chance of winning in a task is small. If the chance of winning in a task is very large then score values are reversed, for the above stated choice tendencies. Thus the possible score ranges from 11 to -11 (Appendix IIa). People with scores 11, 9 and 7 were termed as 'Ms high', scores 5, 3, 1 as 'Ms low', scores -1, -3, -5 as 'Mf low' and scores -7, -9 and -11 as Mf high'.

5. Level of Aspiration Test:

Rotter's level of aspiration board (Appendix-III) was used to study the aspirational behaviour of pupils of the three categories of academic achievement. It is a wooden board of 38 inches long with a groove running down the center. There are 19 numbered units increasing from 1 to 10 and then decreasing to one. The maximum score is the middle number 10.

The numbered units are painted on the sides of the groove.
The number '10' is painted in a different colour. In the centre of the groove, by the side of the numbered units there are small circular indentations to slow down the ball as it moves along the groove and to provide resting place for it.

The task consists of placing the ball always at the starting point and hitting it along the groove with a stick. The number on the board opposite to which the ball stops is the score for that hit. If the ball stops before reaching the number 1 or bounces out of the groove the score is taken as zero.

Administration of the level of aspiration test

The following instructions were given to the subject with intermittent demonstrations.

"You have to hit the ball with this stick, so that the ball moves along the groove to reach the goal of 10. The ball should always be placed at the starting point before you hit it. The number on the board opposite to which the ball stops is your score for that hit. If there is no number or if the ball bounces out of the groove, your score for that hit is zero. Look at the way the numbers are marked, increasing from 1 to 10 and then decreasing to 1".
After the experimenter demonstrated two trials, the subject was given 5 practice hits. Following practice hits, the subject was told, "You will be provided with 5 trials, and each trial consists of 5 hits. The maximum possible score for each trial is 50 and the minimum is '0'. After each trial, you will be informed of your performance score in that trial. You are provided with a scoring sheet (Appendix-IIla) which consists of 5 columns of score ranges expressed in class intervals of 5. (The experimenter actually shows and explains the score sheet). Before starting on each trial, you will mark the following against the score ranges of appropriate trial column:

- mark against the score range, you expect to score in the trial
- 'v' mark against the score range, above which you will feel very happy
- 'x' mark against the score range, below which you will feel most unhappy.

Start the first trial now

Scoring:

- In the scoring sheet four scores could be marked performance score, for each of the 5 hits in a trial.
the aspiration level; third is the upper satisfactory level and
the fourth is the lower satisfactory level. The aspiration score
is the aspired score for the succeeding trial. The upper
satisfactory level is the point higher than the aspirational
level above which the subject feels happy for the attainment.
The lower satisfactory level is the point lower than the
aspiration level below which the subject feels unhappy for
attainment. Performance score for each trail was computed and
the subject was informed of the same at the end of each trial.
Total performance score and the mean performance score for all
the 5 trials were computed. Keeping in mind the fact that the
median of a class interval gives the score value of that class,
Mean G.D and A.D. scores, satisfactory interval, lower
satisfactory interval, upper satisfactory interval, L/U-ratio and
the difference between the upper and lower satisfactory intervals
were computed for every individual using the following
operational definitions.

a) Goal Discrepancy Score (G.D. score):

This score is the difference between the present aspiration
and previous attainment. When the present aspiration is greater
than previous attainment, the G.D. score is positive and when it
is less than the previous attainment, G.D. score is negative.
b) Attainment Discrepancy Score (A.D. score):

    This score is the difference between the present attainment and previous aspiration. The A.D. score is positive when the attainment is greater than the previous aspiration and negative when the present attainment is less than the previous aspiration.

c) Satisfactory Interval (S.I.):

    This is the difference between the upper and lower satisfactory levels or it could be considered also as L.S.I+U.S.I.

d) Upper Satisfactory Interval (U.S.I.):

    This is the difference between the upper satisfactory level and the aspiration level.

e) Lower Satisfactory Interval (L.S.I.):

    This is the difference between the aspiration level and the lower satisfactory level.

f) Difference in satisfactory intervals (D.S.I.).
4) **Persistence test**

In line with Feather's experimental design, a persistence test (Appendix-IV) has been developed for the study. It consists of four items A, B, C and D. Items A, C and D have different task-difficulty and item 'B' is insolvable. Each item is a puzzle resembling Portuez Mazes. The puzzles are printed on white papers and there is a pile of papers for each puzzle so that the subject could simply take another paper of the same kind if he felt he had made a mistake and wanted to start over on the same item. In each item the subject has to start, from the starting point marked in it and trace his way out to the 'exit' without cutting the lines or lifting the pencil.

Item 'B' is insoluble and this fact is not made known to the subject. Item 'A' is easy and hence all the subjects have the experience of trying the first item 'A' successfully and get familiarised with the task and proceed to the critical item 'B' not getting the solution, picking up another identical paper to start over on it and so on. Since the printed papers in the pile of each item are identical, each new sheet represents
another trial. The number of trials taken, total time spent, whether the subject completed the item successfully or not, were to be noted for each of the items.

The subjects have to approach the items A, B, C and D in that order. When the subject successfully completed the item 'A' or decided to give it up once for all he was allowed to go to item 'B'. When the subject revealed the wish to skip the item 'B' after repeated failures, he was allowed to move on to item 'C'. Either on successfully completing the item 'C' or when the subject wishes to give it up, he was allowed to move on to item 'D'. After proceeding to a particular item, he was not allowed to revert back to the previous items attempted but failed. Subjects were not allowed to spend more than 30 seconds on any single sheet of paper (trial), but they could have as many identical sheets, as they desired, before moving on to the next item of the test.

Administration of the persistence test

The following instructions were given to the subjects: "This is a game to test your 'perceptual - reasoning' ability. The game consists of 4 items A, B, C and D, which vary in difficulty.
Some are harder than others. For example, the first item A is solved by almost all students of your age group, 'B' is solved by 80% of students of your age group (one half of the students, chosen randomly were informed that the performance norm of task 'B' is 80% and the other half was informed that the performance norm of the task 'B' is 20%). You are not expected to solve all the items, but do the best as you can. A maximum score of 100 is possible for solving all the four items. If you solve 3 items or less than that correspondingly lower score will be awarded. To solve any item, put your ball pen at the 'start' and you have to trace your path to the 'exit' without retracing your path or lifting your pen or cutting the printed lines of the maze. If you think you have made a false start, or gone wrong, simply take another sheet of the same kind and proceed. You can spend not more than 30 seconds on any single sheet but you can have as many identical sheets (trials) as you desire. Once you complete the item correctly or decide to give it up altogether you move on to the next item of the game. You have to take the items A, B, C and D in that order only. After proceeding to a particular item, you are not allowed to revert back to the previous items attempted but failed. Total time allowed for solving all the four items A, B, C and D is 10 minutes."
Scoring:

The investigator noted the following in the score-sheet (Appendix-IVa) for every individual.

(i) Performance-norm quoted for the critical task 'B'
(ii) Time taken for each of the 4 items - A, B, C and D.
(iii) Number of trials attempted for each of the 4 items
(iv) Information regarding solving or otherwise of the items A, C, & D.

5. Goal Risk Test:

A risk task has been designed and developed (Appendix-V) by the investigator for the purpose of this study following the ring toss game of Atkinson. It is a rectangular wooden board, 43" long and 15" wide. On the three edges of the board runs a groove of 1.25" width, so as to prevent the steel ball from jumping off the board. Thus the effective length and breadth of the board for the movement of the ball is 41.75" and 12.5" respectively. At the centre of the board is a shallow hole of .50" diameter and it serves as the goal. On one side of the board there are 10 small circular indentations, each separated by
a distance of 2 cms. The first indentation is at a distance of 3 cms from the goal, the second at 5 cms, the third at 7 cms and so on upto the last at 21 cms. These indentations serve as the points from where the subjects can try to reach the goal in each trial. Further they also serve the purpose of slowing down the ball as it moves and to provide a resting place for it. On either side of each of the indentation, is drawn a horizontal white line of length 3.50". In the circular region with a diameter of 2" around the goal, are a number of well dispersed small indentations to minimise the zig-zag incessant motion of the ball after crossing over the goal and make the ball come to rest in any one of them quickly.

Administration of the goal risk test

The risk board was placed on the even surface of a table at one edge. At the start of the test, the subject was given the following instructions: "This is a task to measure eye-hand coordination. You have to stand behind the board, without learning on it. You can place the steel ball at any of your preferred distance (indentation) and gently push it in a straight line by holing a stick, erect behind the ball. (The investigator actually demonstrates how to perform the task). If the ball drops in the central hole (goal) you get success and an appropriate
positive score. For example, if you get success by trying from the 3rd indentation, you will receive a score of 3, from hole 4 a score of 4 and so on. The maximum possible score is 10 for getting success from the 10th hole. If the ball misses the central hole, it amounts to failure performance and will fetch appropriate negative score corresponding to the hole from where the trial was taken. Thus failure performance, emanating from the 5th hole will result in a score value of -5 and so on.

You will get 10 trials and the maximum and minimum possible scores are 100 and -100 respectively. In these 10 trials you are free to change distances as you think fit".

Each subject was given 10 trials (initial) and in every trial the investigator noted the preferred distance and the obtained condition of success or failure, in the scoring sheet [Appendix-V (A)]

After these 10 initial trials, the subject was given the following instructions: "Since you are not familiar in this task, you could not score as you expected. Hence you will get practice of 5 consecutive trials from each of these 10 small indentations, ordered as follows: 1,4,9,6,8,5,3,7,10,2.

From the performance of the structured practice of the subject, the experimenter calculated the number of successful
shots out of the 5 hits taken from each of the 10 small holes (indentations). Based on this, the investigator, placed wooden blocks each of size 1½"x3/4"x3/4" on the white lines against each small hole. These appropriately painted blocks, placed on the left edge of the board, indicate the number of successful shots out of the 5 hits in the structured practice read as 0/5, 1/5, 2/5, 3/5, 4/5, 5/5 etc.

The subject was given further instructions at this stage as follows: "Now you are familiar in this task and your ability has been "calibrated". Each of these small wooden blocks placed against each indentation depicts a visual picture of your chances of success from that hole. Now you will be given another 10 trials. In the light of the knowledge of your ability, now you can try. You are free to change the choice distance in each of these 10 trials as you see fit and the scoring pattern announced earlier, remains the same".

As before, the investigator, noted the preferred distance and the obtained condition of success or failure for each of these 10 trials (final)

Scoring
On the basis of the performance of each subject in the structured practice, his probability of success ($P_s$) was calculated for each of the 10 distances and $(1 - P_s)$ is the corresponding risk score associated with each of these distances. From these risk score values associated with various distances, mean preferred risk was calculated for the initial and final 10 choice hits for each individual.

Risk aversion score for a particular distance is the numerical value of the difference between .5 and the risk score of that distance. Average risk aversion score was calculated for the initial and final 10 choice hits. Average preferred distance and the total number of winning shots were also computed for initial and final 10 choice hits. Weighted score was calculated, in terms of the distance of the particular small hole from the central hole (goal). Thus the weighted score for the different holes will be as follows:

<table>
<thead>
<tr>
<th>Hole number</th>
<th>Weighted score for successful shots</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>7</td>
</tr>
</tbody>
</table>
Thus, the total weighted scores for the successful shots alone were calculated for the initial as well as the final 10 choice hits.

Control of socio-economic status and intelligence of pupils:

As many research studies reveal that socio-economic status and intelligence affect academic achievement significantly, it has been decided to control these two variables in the sample, using a socio-economic status scale and an intelligence test.

6. Socio-economic Status Scale

In determining the socio-economic status of subjects, Kuppuswamy's socio-economic status scale has been made use of. It is being used by many researchers particularly in this part of our country. For the present study this socio-economic scale has
been modified (Appendix-I) suitably to get a comprehensive socio-
economic status score (SES) for each student and control this
variable in the sample studied. The following features were
considered and incorporated appropriately so as to revise the
scale and make it upto date:

a) In giving scores for educational, occupational and economic
status for the parents of each student both father and mother
were taken for consideration and scores were assigned separately
for each. In the present set up, majority of mothers, especially in metropolitan cities like Madras, are well educated and employed.

b) The distant education programmes like correspondence courses,
open universities etc. have made the access for graduate and
post-graduate degrees much easier.

c) The top income range can no longer be taken as Rs.1000/-p.m
since even class IV employees draw more than Rs.750/-p.m

Scoring:
The maximum possible scores [(Appendix - I (a)] are as
follows:

(i) Educational status 16
This test consists of 60 matrices or designs. They are divided into 5 sets A, B, C, D and E, containing 12 matrices in each. A portion of each matrix is removed and the same is given below the matrix as one of 6 or 8 alternatives. The subject has to find out the removed portion of the matrix from the alternatives provided.

Scoring:

ey for the scale has been taken from the manual of J.C. Raven. The 'Score' is the number of matrices answered correctly. Based upon the intelligence scores, students were classified as

<table>
<thead>
<tr>
<th>Grade</th>
<th>Label</th>
<th>Score range</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Superior</td>
<td>95th percentile and above</td>
</tr>
<tr>
<td>II</td>
<td>Above Average</td>
<td>75th to 94th percentile</td>
</tr>
<tr>
<td>III</td>
<td>Average</td>
<td>26th to 74th percentile</td>
</tr>
<tr>
<td>IV</td>
<td>Below Average</td>
<td>6th to 25th percentile</td>
</tr>
<tr>
<td>V</td>
<td>Intellectually defective</td>
<td>0 to 5th percentile</td>
</tr>
</tbody>
</table>

Time-schedule for these tests were as follows:
Socio-economic status scale  -  5 mts.
Intelligence Test            -  45 mts.

--------
Total            50 mts.

--------

SAMPLE

Since the study involves probability measures in risk preference and choice behaviour tests, it was thought that the concept of probability would not be well understood by students below the higher secondary level. Further choice behaviour and risk-taking are affected by age, sex and cultural factors. Hence it was decided to include only male students of equal ages. Thus the male students of higher secondary stage, in the city of Madras constituted the population for the present study.

Of the 128 higher secondary schools in Madras, six boys' schools were selected randomly (details given in Table I) and all students of these schools studying in classes XI and XII, numbering nine hundred and forty were approached and the socio-economic status scale and the intelligence test were administered as group tests, taking 10 students at a time. From the scores obtained by the students, 193 who were in the average level (Grade III) in both socio-economic status and intelligence were
selected for the main study.

Further to study the effect of intelligence and socio-economic status on academic achievement along with the other independent variables selected for the study, 92 students who had high variations in intelligence and socio-economic status were also included in the study. Thus the total sample consists of 285 higher secondary school boys, of which 193 have equal intelligence and socio-economic status grades.

The following tables show the distribution of pupils drawn from different schools in the sample
Table I: Showing the distribution of the students drawn from different schools, in the sample

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of the School</th>
<th>Number of Students taken from</th>
<th>Total number of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>XI std</td>
<td>XII std</td>
</tr>
<tr>
<td>1.</td>
<td>Madras Christian College</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>School, Chetput, Madras-31</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Hindu Higher Secondary</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>School, Triplicane, Madras-5</td>
<td>30</td>
<td>29</td>
</tr>
<tr>
<td>3.</td>
<td>Kellet Higher Secondary</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>School, Triplicane, Madras-5</td>
<td>23</td>
<td>5</td>
</tr>
<tr>
<td>4.</td>
<td>Santhome Higher Secondary</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>School, Madras-4</td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>5.</td>
<td>Wesley Higher Secondary</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>School, Royapettah, Madras-14</td>
<td>4</td>
<td>31</td>
</tr>
<tr>
<td>6.</td>
<td>P.S. Higher Secondary School</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Madras-4</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>147</strong></td>
<td><strong>138</strong></td>
</tr>
</tbody>
</table>
Table-II: Showing a distribution of the students drawn from different schools in the sample I.Q. and SES were held constant.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of the School</th>
<th>Number of Students Selected from</th>
<th>Total number of students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>XI std</td>
<td>XII std.</td>
</tr>
<tr>
<td>1.</td>
<td>Madras Christian College</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Madras-31</td>
<td>49</td>
<td>26</td>
</tr>
<tr>
<td>2.</td>
<td>Hindu Higher Secondary</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>School, Madras-5</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>3.</td>
<td>Kellet Higher Secondary</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>School Madras-5</td>
<td>13</td>
<td>4</td>
</tr>
<tr>
<td>4.</td>
<td>Santhome Higher Secondary</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>School, Madras-4</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>5.</td>
<td>Wesley Higher Secondary</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>School, Madras-14</td>
<td>4</td>
<td>21</td>
</tr>
<tr>
<td>6.</td>
<td>P.S. Higher Secondary</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>School Madras-4</td>
<td>10</td>
<td>8</td>
</tr>
</tbody>
</table>

Total: 104 89 193
Pilot Study

A Pilot study was conducted on 30 students (drawing 5 from each of the 6 schools), selected randomly from the sample of 193 students, to establish the reliability and validity of the different tests used, to streamline the instructions to be given to the students for each test and to determine the optimum time duration for each test.

Validity and reliability of the tests

Choice behaviour test

Reliability:

The test-retest method is not feasible here because there are possibilities of individual responses becoming modified due to discussion with peers during the time interval between successive administrations of the test. Hence split-half technique has been adopted and a correlation coefficient of .69 was obtained using, Spearman-Brown formula which is highly significant

Validity:

The choice Dilemma Test was validated against Rao's
Achievement motivation test which is a verbal test designed to measure achievement motivation of students of standard VIII to XII and has been frequently used by Indian researchers. A correlation coefficient of .62 was obtained for 30 subjects who underwent both these tests and this value is highly significant at .01 level. Further, the categorization of people into two classes—maximising success and minimising failures—by this test got discriminated in their academic level of performance, persistence in a task with differential expectancy of success and risk behaviour, establishing its concurrent validity (Kelly, 1969).

Level of aspiration test

Reliability:

Rotter (1942) accepts that it is extremely difficult to obtain a real measure of reliability of the scores used. Retest technique according to Rotter can not be considered as repetition of the first but to a large extent a new situation. As there are complete changes during the course of the test, it is difficult to measure by split-half technique. But he says that inspite of these difficulties, odd-even technique probably gives a better reliability of the measure than does test-retest method. (Rotter, 1943). The reliability coefficient calculated by split-half
technique was found to be .68. Further, test-retest reliability measure calculated was .57 with a gap of two months and it is higher than the test-retest reliability of .46 obtained by Rotter.

Validity:

This test has been validated by Rotter, the designer of this test and many others. In Indian situation, this test has been widely used by Muthayya (1962), Sinha (1970) and others.

In the present experimental situation, it is suffice to establish the validity of the test, by proving that significant proportion of the variance of the obtained scores is attributable to the variance of the theoretical true scores. Thus the index of reliability (square root of the reliability coefficient) is taken as a measure of validity (Garrett, 1979) and this works out in our study to be .825 which is highly significant.

Persistence test

Reliability

The test-retest method is not suitable here, because learning would have taken place between the successive administrations of the test, atleast in respect of items A, C and D. Further 'split-half'technique could not also be followed here since item 'B' is quite different from others in that it is
insoluble and it has been quoted with different difficulty levels (80% and 20% performance norms). Keeping these in mind, Kudar and Richardson's coefficient of reliability, using the technique of "rational equivalence" was determined as due considerations were given to the inter correlations of the items in the test and the correlation of the items with the test as a whole. The coefficient of reliability was thus found to be highly significant ($r = .76$).

Validity:

Norman Feather has established the validity of the line-maze test of persistence which was very similar to the one used in the present study. In the present study, the validity measure has been computed in terms of index of reliability which gives the relationship between the variances of the obtained scores and their theoretical true counterparts. The obtained validity measure .87, is highly significant.

Goal risk test

Reliability

Using the test-retest technique the reliability of the risk test has been established by finding the correlation between the
mean preferred distances of the 10 choice hits in the initial trial of the risk test, administered two times, separated by a time interval of one month. A correlation of .74 was obtained and it is significant at .01 level.

Validity:

The 10 indentations of the risk board is divided into three regions i.e 1 to 3, 4 to 7, and 8 to 10. They are called low region (anxiety region), middle region and high region (risk region). The validity of the risk test has been established by finding the percentage of hits falling in these three regions during the initial trial of 10 hits allowed for each subject. $\chi^2$-analysis reveals that the percentages of hits falling in the three regions are significant at .01 level (tested against the null hypothesis of equal probability theory) as shown below:
Table III - $\chi^2$ analysis of the percentage of hits falling in the three regions - anxiety region, middle region and risk region during the initial trial of 10 hits of each student in the pilot study.

<table>
<thead>
<tr>
<th>No. of subjects</th>
<th>Total no. of hits</th>
<th>Percentage of hits falling in the</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Anxiety Region</td>
</tr>
<tr>
<td>30</td>
<td>300 (fo)</td>
<td>47.9</td>
</tr>
<tr>
<td></td>
<td>(fe)</td>
<td>33.33</td>
</tr>
</tbody>
</table>

$\chi^2 = 11.893$  

Table value of $\chi^2_{df=2, \alpha=0.1} = 9.210$

As seen above, most subjects fear about the increasing negative scores as the distance of the indentation from the goal increases and hence they resort to attempt more hits from the 'Anxiety Region.' The percentage of frequency of hits decreases as the distances of the indentations increase which implies that performance in this task involves risk, and that too gradually increasing with higher level of performance.

**MAIN STUDY**

The instruments mentioned above - (i) choice behaviour test, (ii) level of aspiration test (iii) persistence test and
(iv) goal risk test - were used to collect the data for the main study, following the procedures mentioned for the administration of the tests. The tests were administered in a random sequence individually for every student in the sample of 285 higher secondary school students. The time schedule for each of these tests, finalised on the basis of the pilot study were as follows:

<table>
<thead>
<tr>
<th>Name of test</th>
<th>Time taken (in minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I  Choice Dilemma Test</td>
<td>15</td>
</tr>
<tr>
<td>II Level of aspiration Test</td>
<td>15</td>
</tr>
<tr>
<td>III Persistence test</td>
<td>10</td>
</tr>
<tr>
<td>IV Goal risk test</td>
<td>50</td>
</tr>
</tbody>
</table>

Total 1 hour and 30 mts.

While administering the persistence test, about one half of the students, chosen randomly were informed that the 'performance norm' of task B is 80% and for the other half it was quoted as 20%. The following tables state the number of students from each of the three academic achievement groups-high, moderate and low-who were informed of the 'performance norm' as 80% and 20% respectively.
Table IV showing the distribution of students of the three achievement groups in the 80% & 20% performance norms.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Number of students in the categories of 'performance norms'</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>80%</td>
</tr>
<tr>
<td>High achievement</td>
<td>38</td>
</tr>
<tr>
<td>Moderate achievement</td>
<td>72</td>
</tr>
<tr>
<td>Low achievement</td>
<td>31</td>
</tr>
<tr>
<td>Total</td>
<td>141</td>
</tr>
</tbody>
</table>

Table V. showing the distribution of students of the three achievement groups having equal I.Q. and SES levels, in the 80% & 20% performance norms categories.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Number of students in the categories of 'performance norms'</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>80%</td>
</tr>
<tr>
<td>High achievement</td>
<td>21</td>
</tr>
<tr>
<td>Moderate achievement</td>
<td>52</td>
</tr>
<tr>
<td>Low achievement</td>
<td>22</td>
</tr>
<tr>
<td>Total</td>
<td>95</td>
</tr>
</tbody>
</table>
Following the appropriate methods described earlier, the tests were marked and each student was assigned various scores (Appendix VI). The obtained data were analysed using appropriate statistical techniques to study the relative influence of the different motivational variables on academic achievement the results of which are discussed in the light of the hypotheses formulated and the next chapter presents this analysis and discussion part of the study.