CHAPTER III
RESEARCH METHODOLOGY

3.0 Introduction
3.1.0 Title of the Study
3.2.0 Objectives of the Study
3.2.1 Descriptive Objectives of the Study
3.2.2 Differential Objectives of the Study
3.3.0 Assumptions of the Study
3.4.0 Hypotheses of the Study
3.5.0 Research Methodology
3.6.0 Sampling Procedure
3.7.0 Tool
3.7.1 Math Phobia
3.7.1.1 Mathematics Phobia Scale (MPS)
3.7.1.2 Mathematics Phobia Scale (MPS)
3.7.2.2 Mathematics Phobia
3.7.2.3 Selection of Items
3.7.2.4 Initial Tryout
3.7.2.5 Item Analysis
3.7.2.6 Reliability
3.7.2.7 Validity
3.7.2.8 Content Validity of Mathematics Phobia Scale
3.7.2.9 Face Validity of Mathematics Phobia Scale
3.7.2.10 Intrinsic Validity Mathematics Phobia
3.7.3. Self-Confidence inventory
3.7.4 Style of learning and thinking (SOLAT)
3.8.0 Procedure of Data Collection
3.9.0 Scoring Procedure
3.9.1 Math Phobia
3.9.2. Self Confidence
3.9.3. Hemisphecity
3.10 Data Analysis
3.11 Conclusion
CHAPTER III

RESEARCH METHODOLOGY

3.0 Introduction

Once the research problem has been identified, stating the problem is an important task that has to be carried out. Defining the problem helps to specify the problem under study in a clear out manner. This process helps the researcher to avoid the duplication and to separate his study in careful directions from the previous studies.

This chapter deals with the methodology followed in the present research investigation. The methodology adopted in this research study is presented under different headings such as title of the problem, objectives, assumptions, hypotheses, research design, locale and sample of the study, tools used in this study, data collection, scoring procedure and statistical technique used in the study.

3.1. Title of the Study

Impact of Mathematics Phobia on Self Confidence, Achievement in Mathematics in Relation to Hemisphericity at High School Level

3.2. Objectives of the Study

The following objectives have been framed for the present study.

3.2.1 Descriptive Objectives of the Study

1. To identify the Mathematics Phobia in students at high school level.
2. To assess the level of Self Confidence of students at high school level.
3. To assess the level of achievement in Mathematics of students at high school level.
4. To find out the Hemisphericity of students at high school level.
3.2.2 Differential Objectives of the Study

1. To find out the significant difference between mathematics phobias of students with respect to their hemisphericity at high school level.

2. To find out the significant difference between self-confidence of students with respect to their hemisphericity at high school level.

3. To find out the significant difference between in Mathematics achievement of students with respect to their hemisphericity at high school level.

4. To find out the significant differences between mathematics phobia of students at high school level due to the variation in their age, gender, medium, father qualification, father occupation, mother qualification, mother occupation, family size, income, interested subject and type of school.

5. To find out the significant differences between self-confidence of students at high school level due to the variation in their age, gender, medium, father qualification, father occupation, mother qualification, mother occupation, family size, income, interested subject and type of school.

6. To find out the significant differences between achievement in Mathematics of students at high school level due to the variation in their age, gender, medium, father qualification, father occupation, mother qualification, mother occupation, family size, income, interested subject and type of school.

7. To find out the contribution of certain demographic variables such as age, gender, medium, father qualification, father occupation, mother qualification, mother occupation, family size, income, interested subject and type of school to mathematics phobia in students at high school.

8. To find out the relationship if any between mathematics phobia with self-confidence and achievement in Mathematics of students at high school level.

9. To find out the significant relationship between hemisphericity with mathematics phobia, achievement in mathematics and self-confidence of students at high school level.
3.3 Assumptions of the Study

The present study has the following assumptions.

1. High school students may have phobia towards Mathematics.
2. High school students may have some level of self confidence.
3. High school students may have certain type of brain dominance.
4. Phobia may affect the Achievement in Mathematics.
5. Demographic variables may affect the Mathematics achievement and self confidence.

3.4 Hypotheses of the Study

The following are the formulated hypotheses for the present investigation.

1. There is no significant difference between mathematics phobias of students with respect to their hemisphericity at high school level.
2. There is no significant difference between self-confidence of students with respect to their hemisphericity at high school level.
3. There is no significant difference between in Mathematic achievement of students with respect to their hemisphericity at high school level.
4. There are no significant differences between mathematics phobia of students at high school level due to the variation in their age, gender, medium, father qualification, father occupation, mother qualification, mother occupation, family size, income, interested subject and type of school.
5. There are no significant differences between self-confidence of students at high school level due to the variation in their age, gender, medium, father qualification, father occupation, mother qualification, mother occupation, family size, income, interested subject and type of school.
6. There are no significant differences between achievement in mathematics of students at high school level due to the variation in their age, gender, medium, father qualification, father occupation, mother qualification,
mother occupation, family size, income, interested subject and type of school.

7. Age, gender, medium, father qualification, father occupation, mother qualification, mother occupation, family size, income, interested subject and type of school are not the significant predictors of Mathematics Phobia of students at high school level.

8. There are no significant relationships between mathematics phobia with self-confidence and achievement in mathematics of students at high school level.

9. There are no significant correlation between hemisphericity with mathematics phobia achievement in mathematics and self-confidence of students at high school level.

3.5 Research Methodology

The most important problem after defining the research problem is preparing the design of the research project, which is popularly known as the 'research design'. A research design helps to decide upon issues like what, when, where, how much, by what means, etc., with regard to an enquiry or a research study. "A research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure. In fact, the research design is the conceptual structures within which research is conducted; it constitutes the blueprint for the collection, measurement and analysis of data" (Sellitz, et.al. 1962).

The creditability of the results in research depends very much upon the methods used. For the present study, the investigator wanted to collect the data which give the basic information reflecting mathematics phobia, self confidence, hemisphericity and achievement in mathematics of the high school students. At this juncture, it is more appropriate to elicit the response of the students on various items of the tools. For this research, survey was found to be more appropriate.
3.6 Sampling Procedure

There are 32 districts in Tamil Nadu. The locale of the present investigation is Chennai and Thiruvallur district of Tamil Nadu. Here the students are heterogeneous in nature. Because, they are come from various parts of this country. So the investigator had chosen the districts which contain urban, semi urban and rural area to conduct the research.

Approximately 1500 schools are located in Chennai and Thiruvallur District. Since these districts covers all levels of residential locality the investigator selected only 30 schools for the study. Out of all students studying in these districts only 1142 selected for the study.

The sample of 1142 students includes 532 boys and 610 girls studying in IX standard taken as a sample from Government, Government Aided and private schools from rural, urban and semi-urban area of Chennai and Thiruvallur Districts in Tamil Nadu students of both Tamil and English medium.

Table 3.1 Sample distribution

<table>
<thead>
<tr>
<th>Gender</th>
<th>Government</th>
<th>Government Aided</th>
<th>Private</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>256</td>
<td>156</td>
<td>120</td>
<td>532</td>
</tr>
<tr>
<td>Female</td>
<td>284</td>
<td>250</td>
<td>76</td>
<td>610</td>
</tr>
<tr>
<td>Total</td>
<td>540</td>
<td>406</td>
<td>196</td>
<td>1142</td>
</tr>
</tbody>
</table>
3.7.0 Tool

Three tools have been used in this study. Out of three, the investigator developed one tool for assessing mathematics phobia. Standardized tools for self confidence and hemisphericity were used. The information of the tools is given under a separate caption.

3.7.1 Math Phobia

For assessing the math phobia of high school students, the investigator developed an Mathematics phobia scale for high school students. The investigator has developed the tool in the following procedure.

3.7.1.1 Mathematics Phobia Scale (MPS)

To assess the Mathematics phobia the investigator constructed and standardized the tool Mathematics Phobia Scale (MPS).
It was initially constructed with 70 items after opinion from the juries of experts in this field, it was reduced to 60 items. After the item analysis 5 items were removed from the tool, and then the final tool was arrived with 55 items. It is 5 point scale. It has four dimensions i.e. self (20 items), mathematics teacher (13 items), parents (6 items), and curriculum (16 items). The reliability of the MPS was established by test-retest method. One and half month after the first test, retest was conducted for 40 students. The reliability coefficient of correlation is 0.79. So the tool is highly reliable. Validity of the tool was established by face validity, content validity and construct validity.

Out of 55 items, item number 15 and 58 are negative items remaining are positive items. Positive items are scored as 5,4,3,2, and 1. Negative items are scored as 1,2,3,4,and 5.

3.7.1.2 Mathematics Phobia Scale (MPS)

Before developing the tool the investigator conceptualized the mathematics phobia problems of high school students and formalized the operational definitions as detailed.

3.7.2.2 Mathematics Phobia

Mathematics Phobia is a process of irrational fear on mathematics in any situation. Mathematics Phobia occurs in various conditions and situations like new teacher, new book, new class room new peer group and new syllabus and etc.

Self: Math phobia, which is exhibited by many students, is the persistent, illogical, intense fear of not succeeding in math. It is the belief that one is unable to handle the difficulty associated with learning due to some disability. Many people incorrectly assume that math phobia and an inability to be successful in mathematics are inherited from one's parents. Attitude towards mathematics also play a major role on learning Mathematics.
Mathematics teacher: teacher is a role model for the students. If the mathematics teacher is attracted by students, the students will give more importance on mathematics and give more efforts to learn mathematics.

Parents: parents are the first teacher. So they have more responsibility towards their wards education. The quantum of support given by parents on their wards will play a role on fear or phobia of the students.

Curriculum: curriculum is the hero of the education. It gives a runway or pathway of the education. If the curriculum is not appropriate according to the need and interest of the students, they may not show the interest and involvement on mathematics.

3.7.2.3 Selection of Items

On the basis of related literature and detailed discussion with experts in this field, it was planned to construct a scale to assess math phobia. 15 to 25 items were constructed on each area of math phobia in the discussions. Maximum care was taken to see that each item corresponded to the specific area under which it was constructed and they do not overlap.

The items were constructed in the form of statements. Each statement was related to a situation and experience of math phobia. Altogether 70 statements were constructed and the following precautions were taken while constructing the items.

1. Each item was constructed in simple English and translated in Tamil so that it could be easily understood.
2. Careful attention was taken to make the items free from the factor of social desirability.
3. Sufficient care was paid to see that each item was related to the math phobia.
4. In order to control the acquiescence set of subjects, items were constructed in both positive and negative forms.

3.7.2.4 Initial Tryout

The items were randomly arranged and were applied to an unselected group of 100 high school students. No time limit was given to the subject and they were asked to read carefully each of the items and express own opinion in terms of any of the five alternatives. They were also asked to mention, if the statements were either vague or difficult in respect of their meanings. The test items were again checked on the responses obtained in the tryout. Statements which belonged to any of the following categories were dropped.

1. Statements which were responded to either favorably or unfavorably almost invariably.
2. Statements which were considered difficult or vague.

Thus, out of 70 items, 4 items were rejected totally. The remaining 66 statements were given to 5 teachers of Psychology and educational Psychology to judge the clarity and face validity of each item. In the light of their judgment 4 more were dropped and the rest 60 were retained for final tryout and item analysis.

3.7.2.5 Item Analysis

The item analysis of 60 items on the response of a sample of 100 high school students was made on a test with five alternatives. The response scores of each individual were summed across 60 items. Top 27 and bottom 27 subjects were screened out. These two extreme group were used to check the discriminative indices of each of the item by adopting the criterion of internal consistency suggested by Likert (1932). t- test were calculated by comparing the mean scores of two extreme groups on each items and whose t- values were significant at 0.01 level were retained in the inventory. Thus 55 items were selected for final form.

It is 5 point scale. It has four dimensions i.e. self (20 items), mathematics teacher (13 items), parents (6 items), and curriculum (16 items).
Out of 55 items, item number 15 and 58 are negative items remaining are positive items.

This scale intends to indicate the math phobia only. Therefore, high score indicates high in math phobia and the low score indicates less math phobia.

### 3.7.2.6 Reliability

A tool is reliable to the extent that it measured accurately and consistently from one time to another (Best, 1977). If an instrument is unreliable, the information attained is ambiguous, inconsistent and useless (James and Sally, 1984). So, it is necessary to establish the reliability and validity of the tools to be used in any study. Henry, E.Garret and Wood Worth (1966) described four methods of establishing the reliability of a tool. They are a) Test-Retest method, b) Alternative or Parallel forms, c) Split-half method, d) Rational equivalence method and e) Kuder’s Richerdson method (K-R-20).

In order to ascertain the reliability on the inventory, internal consistency as determined by test retest method was calculated on the basis of responses given by a sample of 100 high school students. The product moment coefficient of correlation between odd and even halves was found to be 0.79 and the co-efficient of internal consistency as corrected by spearman – brown formula was found to be 0.77.

The reliabilities of the mathematics phobia problems of high school students by using Test-retest method and Split half method for the measuring the mathematics phobia problems of high school students, was positive and high (0.77, and 0.79) indicating its reliability for the study.

### 3.7.2.7 Validity

Validity of the research tool or procedure that measures what it purpose (or) it purpose to measure. John W Best (1989) quoted that validity is the quality of a data gathering instrument or procedure that enables it to measure what it is supposed to measure. The index of reliability is sometimes taken as a measure of
validity (Garret and Wordsworth, 1981). For ascertaining the validity, the investigator used content validity, face validity and intrinsic validity.

3.7.2.8 Content Validity of Mathematics Phobia Scale

Content validity explains whether the items in a test are constructed around appropriate content. Best (1977) measures that there is no numerical way to express the content validity, but it can be assessed by a panel of experts in the field of who could judge its adequacy. The statements in the mathematics phobia problems of high school students were listed based on the review of related literature and consultation from education, special education, psychology and medicine. Their suggestions have been taken into account to enhance the content and quality of items. Therefore, it can be said that the mathematics phobia scale used to measure the mathematics phobia problems of high school students developed by the investigator possess content validity.

3.7.2.9 Face Validity of Mathematics Phobia Scale

This is the term used to characterize test materials that appear to measure what test the author desires to measure. That is, the inventory contains items that seem to be related to the variable being measured. The investigator here assured that by the opinion of the panel experts who are familiar with the subject content, statements for measurement of mathematics phobia problems of high school students by using in high school Students do possess face validity.

3.7.2.10 Intrinsic Validity Mathematics Phobia

Intrinsic validity is stated that as how well the obtained scores measured the tests true score component. The square root of the reliability values of the tool means its intrinsic validity. The obtained intrinsic validity of mathematics phobia problems of high school students is high (0.88) and validated.
3.7.3 Self-Confidence inventory

Self-Confidence inventory was developed and standardized by M. Basavanna, Department of psychology, S.V. University, Tirupati. It is an inventory of 100 items, to be answered either true or false. Can be scored easily, the higher the score indicate the level of higher self-confidence and lower score is the level of lower self-confidence.

Reliability: Split-half reliability was found to be 0.91.

Validity: Item validities for all the items are at or above 0.90.

There are 68 items are negative statements. They are 1 to 10, 16 to 25, 31 to 40, 46 to 55, 61 to 70, 76 to 85, 91 to 98. Remaining 32 items are positive items, they are 11 to 15, 26 to 30, 41 to 45, 56 to 60, 71 to 75, 86 to 90, 99 and 100. Positive items are scored as 1 for true and 0 for false, at the same time negative items are scored as 0 for true and 1 for false.

3.7.4 Style of learning and thinking (SOLAT)

The tool to assess the hemisphericity of the students the investigator has used the Style of Learning and Thinking (SOLAT) inventory developed and standardized by Venkateraman (1994). It is a modified version of tool developed by Torrance. It has 50 items with 3 alternatives first option indicates the right brain process, second option indicates left brain process both options indicates integrated brain process. The reliability of the tool was measured by test – retest method. One month after the first test, retest was conducted for 300 students of 150 boys and 150 girls. The reliability coefficient of correlation for the right hemisphere function was found to be 0.89. For the left hemisphere function the coefficient of correlation was found to be 0.65. The coefficient of correlation of integrated score was 0.71. These coefficients suggest that the SOLAT possess reliability to a significant level.

The validity of this was established with content validity, construct validity and concurrent validity. So it indicates that this tool has high validity.
There are 3 alternatives for each item. First alternative is an indicative of right brain dominance, second alternative is an indicative of left brain dominance and if any body chooses both alternatives is an indicative of integrated brain dominance.

### 3.8.0 Procedure of Data Collection

Necessary permission from the principal/ Head Master of the High and Higher Secondary were obtained and the students were contacted. They were told about the objectives of the study. It was followed by giving instructions related to the tool to be used for the collection of data. The instructions were like “these questionnaires are a self-administering questionnaire”. The purpose of the questionnaire was then explained to the students. It was assured that their replies would be kept confidential. The students were requested to read the instructions carefully and to ask for any clarifications, if there was any difficulty in the understanding of the instructions. It was emphasized that no item should be omitted and there was nothing ‘right’ or ‘wrong’ about the questions. There was no time limit for the questionnaires. However, it took approximately 45 minutes to complete it. After this, the clarifications sought by the students were attended too. Once they were cleared, a copy of the tools were given to them, with a request to give the responses as freely and objectively as possible and they could take as much time as they liked but no need of spending too much time on a particular item. After getting the filled in questionnaires the scoring was done as per the instructions in the instructions in the manual.

### 3.9.0 Scoring Procedure

Scoring procedures are given below for 3 different questionnaires in separate sub title.
3.9.1 Math Phobia

Out of 55 items, item number 15 and 58 are negative items remaining are positive items. Positive items are scored as 5, 4, 3, 2, and 1. Negative items are scored as 1, 2, 3, 4, and 5.

3.9.2 Self Confidence

There are 68 items are negative statements. They are 1 to 10, 16 to 25, 31 to 40, 46 to 55, 61 to 70, 76 to 85, 91 to 98. Remaining 32 items are positive items, they are 11 to 15, 26 to 30, 41 to 45, 56 to 60, 71 to 75, 86 to 90, 99 and 100. Positive items are scored as 1 for true and 0 for false, at the same time negative items are scored as 0 for true and 1 for false.

3.9.3 Hemisphrecity

There are 3 alternatives for each item. First alternative is an indicative of right brain dominance, second alternative is an indicative of left brain dominance and if any body chooses both alternatives is an indicative of integrated brain dominance.

3.10 Data Analysis

The Data were analyzed with the help of percentage, mean, SD, t-test analysis of variance (ANOVA) and correlation.

The SPSS–12.0 software has been applied to compute all statistical calculations for the present investigation.

3.11 Conclusion

In this chapter the methodology was given in detail. Forth coming chapters will explain in detain about the analysis and result.