Chapter III

METHODOLOGY

Research methodology involves the systematic procedure by which the researcher starts from the initial identification of the problem to its final conclusion. The role of the methodology is to carry out the research work in a scientific and valid manner.

The purpose of the study was to find out the comparison of Multimedia Computer Assisted Instruction, Traditional Instruction and Combined Instruction on learning the skills of Tennis. This chapter discusses the methodology used in the selection of subjects, selection of variables, selection of tests, orientation to the subjects, competence of the tester, reliability of the instruments, reliability of the data, awareness of computer and multimedia literacy, training programme, collection of data, administration of tests, experimental design and statistical techniques.

Selection of Subjects

To achieve the purpose of the study, thirty six subjects were selected randomly from the St.John’s College of Physical Education, Veeravanallur, Tirunelveli district, Tamil Nadu, India. All the subjects were studying (B.P.E), Bachelor of Physical Education. Their age ranged
from 17 to 25 years. Tennis was included in the undergraduate course in Bachelor of Physical Education as theory and practical papers.

The selected subjects were randomly divided into three experimental groups namely Multimedia Computer Assisted Instruction Group (MCAIG) (n=12), Traditional Instruction Group (TIG) (n=12) and Combined Instruction Group (CIG) (n=12). The Computer Assisted Instruction Group received teaching components through computer programmes such as video shows, clippings, and so forth for tennis for 30 minutes duration followed by one hour self practice in the playground. Traditional Instruction Group received a 30 minutes lecture/demonstration covering the same instructional content followed by one hour self practice in the play ground and the Combined Instruction Group received both instructions 15 minutes each (total 30 minutes) followed by self practice for one hour duration with the assistance of the investigator. The duration of the experiment lasted for eight weeks and the number of sessions per week was confined to three alternative days, in addition to the regular academic programme as per the curriculum. The pre and post test data were collected from the subjects before and after the experimentation respectively on the selected dependent variables such as forehand drive, backhand drive, service and rallying ability.
### TABLE I
CHARACTERISTICS OF SUBJECTS BY GROUP

<table>
<thead>
<tr>
<th>Group</th>
<th>Number of subjects</th>
<th>Age (Yrs)</th>
<th>Height (Cms)</th>
<th>Weight (Kgs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCAIG</td>
<td>12</td>
<td>18.25±3.69</td>
<td>163.75±4.03</td>
<td>53.92±3.92</td>
</tr>
<tr>
<td>TIG</td>
<td>12</td>
<td>18.83±1.34</td>
<td>161.42±3.89</td>
<td>54.92±3.60</td>
</tr>
<tr>
<td>CIG</td>
<td>12</td>
<td>18.67±1.30</td>
<td>163.03±4.01</td>
<td>54.22±3.51</td>
</tr>
</tbody>
</table>

### Selection of Variables

Computers have been used over two decades as an assisting tool for the given information by teachers and coaches at all levels of education and sports training. In many educational programmes computers have been used not only as an educational mean, but as an active part of the educational procedure.

It is commonly accepted that the development of the technology and the inventions of the computers is radical and so, resulting in the development of software and multimedia. Software technology is used for different subjects and different levels.

The concept of multimedia includes the use of one or more means that they have text, images, graphics, digital video, sounds, etc. Such multimedia programmes are used not only concepts, ideas and theories but also the skill components. Obviously they are used at best in disseminating Physical Education major. Its main features are the correct performance of a certain sport skill, information about regulation and
rules, giving feedback to the student or the players. Films and videos of individual and performances of teams have long been used by players, coaches and sport scientists to analyze and improve the performance in technical skills and team tactics.

The use of the conventional instruction can positively affect the learning of skills, when it is being used as a mean for the demonstration of the technique, but it is not superior to mental practice. The use of the conventional instruction is not practical for on–field research because of the heavy equipment and the lack of portability. Furthermore the presence of an expert is necessary for the correction of skills executed by the players. In addition conventional instruction lacks the advantages of the mental captures of the correct technique of tennis.

Coaching tennis is very technical. Not only a coach has to be able to explain, possibly demonstrate, and know what players need to do with their limbs and for training. He also need to be able to visualize the small or sometimes big things that tennis players are doing resulting in holding them back from progressing.

Keeping the above concept in mind, the following dependent and independent variables were selected for this study.
Dependent Variables

The following criterion variables were selected as dependent variables such as

1. Forehand drive
2. Backhand drive
4. Rallying ability

Independent Variables

1. Computer Assisted Instruction
2. Traditional Instruction
3. Combined Instruction (Traditional Instruction with Computer Assisted Instruction)

Selection of Tests

As per the available literature the selected variables were tested by using the following standardized tests and they were presented in Table II.

TABLE II
TEST SELECTION

<table>
<thead>
<tr>
<th>S.No</th>
<th>Variables</th>
<th>Tests</th>
<th>Unit of measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Forehand Drive</td>
<td>Hewitt tennis Achievement test</td>
<td>Numbers</td>
</tr>
<tr>
<td>2</td>
<td>Backhand Drive</td>
<td>Hewitt tennis Achievement test</td>
<td>Numbers</td>
</tr>
<tr>
<td>3</td>
<td>Service</td>
<td>Hewitt tennis Achievement test</td>
<td>Numbers</td>
</tr>
<tr>
<td>4</td>
<td>Rallying Ability</td>
<td>Sherman Untimed Consecutive rally test</td>
<td>Numbers</td>
</tr>
</tbody>
</table>
Orientation to the Subjects

The investigator explained the purpose of the study to the subjects and their part in the study. For the collection of the data, the investigator explained the procedure of testing the selected dependent variables, and gave instructions about the procedure to be adopted by them. Four sessions were spent to familiarize the subjects with the techniques involved to execute the training of tennis skills. It helped them perform training perfectly and avoid injuries. Further the subjects were specially oriented, and advised to avoid the special practice of any of the specific training programme till the end of the experimental period. The participants of all the groups were sufficiently motivated to perform their maximal level during the training and the testing periods.

Competence of the Tester

All the measurements in this study were taken by the investigator with the assistance of students from the St. Johns College of Physical Education, Veeravanallur, Tirunelveli district, Tamil Nadu, India. To ensure that the investigator and his assistants were well versed with the techniques of conducting tests, they had a number of practice sessions in the correct testing procedure prior to the tests.
Reliability of Instruments

Instruments used for this study were stop watches and Tennis court with equipment and measurements availed from the St. John’s College of Physical Education, Veeravanallur, Tirunelveli district, Tamil Nadu, India. The instruments were purchased from reliable and standardized companies and were considered accurate enough to serve the purpose of the study.

Reliability of the Data

Test and retest method was followed in order to establish the reliability of the data by using ten subjects at random. All the dependent variables selected for the present study were tested twice by the same personnel under similar conditions. The Intra class co-efficient of correlation was used to find out the reliability of the data and the results are presented in Table III.

<table>
<thead>
<tr>
<th>S.No</th>
<th>Variables</th>
<th>R - Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fore hand Drive</td>
<td>.894*</td>
</tr>
<tr>
<td>2</td>
<td>Backhand Drive</td>
<td>.915*</td>
</tr>
<tr>
<td>3</td>
<td>Service</td>
<td>.913*</td>
</tr>
<tr>
<td>4</td>
<td>Rallying ability</td>
<td>.901*</td>
</tr>
</tbody>
</table>

*Significant at 0.01 level of confidence. (Table value required for significance at 0.01 level of confidence is 0.79)
Since the obtained 'R' values were much higher than the required value, the data were accepted as reliable in terms of instrument, tester and the subjects.

**Awareness of Computer and Multimedia Literacy**

Prior to the formal study sessions, the subjects were made to get the awareness of computer and multimedia literacy, so that they can handle the computer with ease during their training periods. The orientation about computers was given to the students. They were asked to learn the fundamentals of operating computers. They were taught how to use the computers for their study. The operational systems include how to open the files, close the files, switching over to next page/programmes and so forth. They got familiarized with computers within seven days. They had the capacity to individually handle the computers on the eighth day.

**Training Programme**

The training programme was imparted at the Bachelor of Physical Education (B.P.E) students of St.John’s College of Physical Education, Veeravanallur, Tirunelveli district, Tamil Nadu, India. First they were familiarized with each exercise which they had to undergo with the help of an expert. It was an eight week progressive training programme for the three experimental groups. Pretest and post test data were collected
from experimental groups. The training programmes of eight weeks were given in Appendix.

The students were taught through Multimedia Computer Assisted Instruction (MCAI) for a period of three days (Monday, Wednesday and Friday) up to eight weeks at the rate of 30 minutes per day in the evening. The students were taught individually by using computers. Tennis techniques were covered in the period of investigation. The students were asked to make self-practice with the help of the Computer Assisted Instruction. All the stages in the sequence were arranged in a sequential order. The students were not allowed to use the handbook at home.

**Group I (Computer Assisted Instruction Group)**

Group I consisted of twelve subjects, who received teaching components through computer programmes such as video shows, clippings, and so forth for tennis skills for 30 minutes duration followed by an hour self practice in the play ground for a period of eight weeks with three alternative days (Monday, Wednesday and Friday) per week. They were never allowed to avail any special teaching/coaching other than their regular practice as per the curriculum.

**Group II (Traditional Instruction Group)**

Group II consisted of twelve subjects, who underwent traditional tennis skills 30 minutes with the help of three experts including the
instructor, who was a qualified person in Tennis and self practice in one hour for a period of eight weeks with three alternative days (Monday, Wednesday and Friday) per week.

They were never allowed to avail any special teaching/coaching other than their regular practice as per the curriculum.

**Group III (Combined Instruction Group)**

Group III consisted of twelve subjects, who underwent combination of computer assisted tennis training and traditional tennis training 15 minutes each, followed by self practice an hour for a period of eight weeks with three alternative days (Monday, Wednesday and Friday) per week. They were never allowed to avail any special teaching / coaching other than their regular practice as per the curriculum.

The duration of training session in all days was ranging from one hour to one and half hours approximately which included warming up and limbering down. All the subjects involved in this study were carefully monitored throughout the training programme to be away from injuries. They were questioned about their health status throughout the training programme. None of them reported with any injuries. However, muscle soreness appeared in the earlier period of the training programme and was reduced in due course.
Collection of Data

The pre and post tests data were collected on the selected criterion variables prior to and immediately after the training period from the selected subjects at the Bachelor of Physical Education (B.P.E) students of St.John’s College of Physical Education, Veeravanallur, Tirunelveli district, Tamil Nadu, India during the academic year 2012-13. The tests were administered in the evening sessions. The data on selected variables were collected by standardized tools.

Administration of Tests

1. Forehand Drive

Purpose

To evaluate the forehand drive in tennis.

Equipment Needed

Tennis Racquets, balls, a measuring tape, two 7 feet high poles.

Procedure

The forehand drives are tested on the court. The student will stand in the receiving position at the center mark of the baseline. The teacher will be on the other side of the net hitting balls to the student being tested. The student are ready to perform forehand drive, but he must perform 10 forehand drives. Each returned ball is scored from 0 to 5 points depending on where the return lands.
Scoring

The ball must travel between the net and the 7 foot rope or it will be scored a zero. Balls that land on the line earn the higher value. A perfect score is 50.

2. Backhand Drive

Purpose

To evaluate the backhand drive in tennis.

Equipment Needed

Tennis Racquets, balls, a measuring tape, two 7 feet high poles.

Procedure

The backhand drives are tested on the court. The student will stand in the receiving position at the center mark of the baseline. The teacher will be on the other side of the net hitting balls to the student being tested. The students are ready to perform backhand drive, but he must perform
10 backhand drives. Each returned ball is scored from 0 to 5 points depending on where the return lands.

**Scoring**

The ball must travel between the net and the 7 foot rope or it will be scored a zero. Balls that land on the line earn the higher value. A perfect score is 50.

3. Service

**Purpose**

To evaluate the service ability in tennis

**Equipment Needed**

Tennis Racquets, balls, a measuring tape, two 7 feet high poles, record sheet and pen or pencil.

**Procedure**

The students stand to the right of the centre line behind the base
line. Ten balls are served into marked service court target. To be counted. Served balls must pass between the net and the rope. Ball that hit the rope and net balls are repeated.

**Scoring**

Each of the ten serves is scored from 0 to 6 points depending on where it lands in the service target. Served balls must go over the 7 feet rope and those wide (or) long are scored zero. Balls that land on a line earn the higher value. A perfect score is 60.

4. Rally test

**Purpose**

To evaluate the rallying ability in tennis

**Equipment Needed**

Tennis Racquets, balls, a measuring tape, backboard.
Procedure

The students attempt to achieve the greatest number of consecutive rallies into the target with each ball of each trail. In starting the ball for the rally, the student drops the ball and hit it on the floor of first bounce in the target area. All the balls are to be conducted on or prior to the first bounce through the consecutive rally. Each student has a total of 3 trials which are scored. Each trial consists of three balls. All students in a group are to finish the first trial before the second trial is taken. Failure to accomplish the following items ends the consecutive rally for a particular ball of a particular trial.
i). To rally the ball into designated.

ii). To contacts the ball in the first bounce when starting the rally.

iii). To contacts the ball on the first bounce throughout the consecutive rally.

iv). To has at least one foot behind the restraining line.

**Scoring**

The score for each trial is the number consecutive good rallies for each trial. The final score for the first test is the sum of all the balls on each of the three trials.

**Experimental Design**

This study was conducted to determine possible cause and effect of the relationship of Multimedia Computer Assisted Instruction, Traditional Instruction and Combined Instruction. A pre and post test randomized design was employed for this investigation. This study consisted of three experimental groups, Group-I \((n=12)\) underwent Multimedia Computer Assisted Instruction, Group-II \((n=12)\) underwent Traditional Instruction and Group III \((n=12)\) underwent Combined Instruction.

All the subjects were tested prior to and immediately after the experimentation in the game of tennis skills of forehand drive, backhand drive, service, and rallying ability.
**Statistical Technique**

The data collected from the subjects were analyzed with descriptive statistics and paired sample ‘t’-test to find out the influence of the selected independent variables on the criterion variables. No attempt was made to equate the groups in any manner. Hence, to make adjustments for difference in the initial means and test the adjusted post test means for significant differences, the analysis of covariance (ANCOVA) was used (Broota, 1989). The scheffe’s test was used as post-hoc test to determine which of the paired means differed significantly where the differences in adjusted post test means resided in univariate ANCOVA among three groups. All the above statistical analysis tests were computed at 0.05 level of significance (P<0.05).

**Justifications for Using One-Way ANCOVA**

One-way univariate analysis of covariance (ANCOVA) was used to determine how each dependent variable was influenced by independent variables while controlling for a covariate (pre test) (Hair, Anderson, Tatham, and Black., 1998). Analysis of covariance adjusts the mean of each dependent variable to what they would be if all groups started out equally on the covariate. In this study, pre test scores of selected variables have been shown to correlate with the post test scores, thus they were considered as appropriate covariates.
Assumptions for ANCOVA

A preliminary analysis was conducted to determine whether the prerequisite assumptions of ANCOVA were met before preceding the univariate analysis. Thus, the assumption of equality of variance (homogeneity) and the homogeneity of regression slopes were examined.

Levene’s test of equality of error variances on selected variables was calculated and presented in table IV.

<table>
<thead>
<tr>
<th>Variables</th>
<th>F-Ratio</th>
<th>df1</th>
<th>df2</th>
<th>sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forehand Drive</td>
<td>0.21</td>
<td>2</td>
<td>33</td>
<td>.721</td>
</tr>
<tr>
<td>Backhand Drive</td>
<td>0.83</td>
<td>2</td>
<td>33</td>
<td>.678</td>
</tr>
<tr>
<td>Service</td>
<td>1.08</td>
<td>2</td>
<td>33</td>
<td>.353</td>
</tr>
<tr>
<td>Rallying ability</td>
<td>1.64</td>
<td>2</td>
<td>33</td>
<td>.211</td>
</tr>
</tbody>
</table>

(The table value required for 0.05 level of significance with df 2 & 33 is 3.28).

Homogeneity of variances is a term that is used to indicate that the groups have the similar variances. Thus, in Levene’s test of equality of error variances table, the obtained F-values of the selected dependent variables were less than the confidence interval value of 0.05, which indicates that the variance of each group was not significantly different from one another.

Therefore, the homogeneity of variance of comparing the three
groups regardless of the ability level for each of the dependent variables indicated that homogeneity of variance has been met for all the four dependent variables. Hence, it was concluded that the assumption of homogeneity of variance has been met for computing univariate ANCOVA.

The test of significance of the regression of post test (dependent variable) on pre test (covariate) were analyzed and presented in table V.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Sources of Variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forehand drive</td>
<td>Group *Pre Test</td>
<td>526.94</td>
<td>1</td>
<td>526.94</td>
<td>29.78*</td>
</tr>
<tr>
<td></td>
<td>Error</td>
<td>283.19</td>
<td>32</td>
<td>8.85</td>
<td></td>
</tr>
<tr>
<td>Backhand drive</td>
<td>Group *Pre Test</td>
<td>411.06</td>
<td>1</td>
<td>411.06</td>
<td>37.44*</td>
</tr>
<tr>
<td></td>
<td>Error</td>
<td>175.69</td>
<td>32</td>
<td>5.49</td>
<td></td>
</tr>
<tr>
<td>Service</td>
<td>Group *Pre Test</td>
<td>347.84</td>
<td>1</td>
<td>347.84</td>
<td>24.72*</td>
</tr>
<tr>
<td></td>
<td>Error</td>
<td>225.15</td>
<td>32</td>
<td>7.04</td>
<td></td>
</tr>
<tr>
<td>Rallying ability</td>
<td>Group *Pre Test</td>
<td>597.08</td>
<td>1</td>
<td>597.08</td>
<td>14.80*</td>
</tr>
<tr>
<td></td>
<td>Error</td>
<td>645.50</td>
<td>32</td>
<td>20.17</td>
<td></td>
</tr>
</tbody>
</table>

* Significant at .05 level of confidence. (The table value required for 0.05 level of significance with df 1, 32 is 4.15)

From the above table it was observed that regression based (ANCOVA) predicts the post test scores significantly well from the pre test scores on all the dependent variables. It shows that the pre and post
test scores of selected dependent variables were significantly associated.
As in regression, it is important that the association between the outcome and the covariate is linear.

After determining the assumptions for computing ANCOVA have been met with the pre data analysis, the univariate ANCOVA statistical output was examined. Then, providing the ANCOVA result was statistically significant, the univariate results were examined for each dependent variable. For the significant univariate results, the post hoc comparisons were performed to identify where the differences resided. The pair wise comparisons statistics was used for the post hoc results. The results of the descriptive analysis, paired sample ‘t’ test, univariate tests, the pair wise comparisons among the three dependent variables are reported in chapter four.