CHAPTER-III
METHODOLOGY
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In this chapter, the Selection of Subjects, Selection of Variables, Selection of tests, Reliability of instruments, Competency of tester, Reliability of data, Orientation of subjects, Training programs, Administration of tests, Collection of data, Experimental design and Statistical procedure used have been explained.

SELECTION OF SUBJECTS

Forty two Sivaganga district Cricket players were randomly selected as subjects from the senior and under-19 Cricketers who represented Sivaganga district Cricket team in the Tamil Nadu inter-district tournaments in the seasons 1997-98 and 1998-99.

The age, height and weight of the selected subjects ranged from 18 to 25 years, 154 to 181 centimetres and 54 to 71 kilograms and the means were 21 years 6 months, 169 centimetres and 64 kilograms respectively.

DESIGN

In this study, three group design was used. The groups were designed as
Group I : Control group

Group II : Experimental Group ‘A’
(Field Training without psych-up package)

Group III : Experimental Group ‘B’.(Field training with psych-up package).

For the convenience in illustration, the investigator take the liberty to express experimental group ‘A’ and experimental group ‘B’ as field training without psych-up package and field training with psych-up package groups respectively.

By using the matching procedure on the basis of their initial Cricket playing ability performance test scores, the subjects were divided into three equal groups of fourteen each.

**TRAINING PROGRAMME**

The control group was not exposed to any specific training/conditioning. The experimental groups were subjected to field training schedule which was specially designed to improve the technico-tactical part of the game and also fitness components essential for Cricketers. The field training was given for ten weeks, six days per week, with two hours of duration each in the morning and evening sessions. In addition to the above field training, the experimental group ‘B’ had also undergone psych-up schedule. This psych-up package was given for 20 minutes each day in the morning and evening sessions except on the rest day. The psych-up package consisted of Psych-up strategies namely
SUBJECTS
Forty two Sivaganga District Cricketers

DESIGN
Related Group Design
On initial test of playing Ability

PRE-TEST

Bio-motor Variables
1. Endurance
2. Strength
3. Speed

Physiological Variables
1. Aerobic power
2. Anaerobic power
3. Resting pulse rate

Psychological Variables
1. Imagery ability
2. Mental preparation
3. Self Confidence
4. Anxiety and Worry Management
5. Concentration Ability
6. Relaxation Ability

Group I
Control Group
(n=14)
No specific training / conditioning
(10 weeks)

Group II
Experimental Group ‘A’
(n=14)
Field training without Psych-up package
(10 weeks)

Group III
Experimental Group ‘B’
(n=14)
Field training with Psych-up package
(10 weeks)

POST-TEST

Statistical Analysis (ANCOVA)
PSYCH-UP STRATEGIES

Psych-up Strategies

- Attention focus
  - Attention focus is the ability to focus one's attention on the proper cues in the environment
- Self talk
  - In self talk, a sportsman talks to himself in an attempt to build up his confidence and convince himself that he can succeed
- Relaxation
  - Relaxation strategy has received much attention in recent years. In relaxation there are several techniques. Generally relaxation will give physiological and psychological benefits to the sportsman
- Imagery
  - Imagery is one of the popular mental preparation strategies where sports persons try to mentally picture themselves (going through the actual movement in their mind) prior to competition/training
- Preparatory arousal
  - Preparatory arousal involves getting mad, charged-up, excited, pumped-up and/or aroused just prior to performance. Preparatory arousal means raising one's level of arousal
attention focus, self talk, relaxation, imagery and preparatory arousal. Both field training and psych-up packages are presented in Appendices I and II respectively.

The subjects were free to withdraw their consent in case they felt any discomfort during the period of training. But there were no dropouts in the study. A qualified physician examined the subjects medically and declared that they were fit for the study.

The subjects underwent their respective programmes under the strict supervision of the investigator. Prior to every field training session, the experimental groups had a ten minute warm-up exercise, which included jogging, stretching etcetera.

All the subjects involved in the training programmes were questioned about their stature throughout the training period. None of them reported any injury. However, muscle soreness was reported in the early weeks, but it subsided later. Attendance was calculated for both the experimental groups by dividing the total number of training sessions by the number of sessions present. It was 93.20% for the experimental group with psych-up training and 93.68% for experimental group without psych up training.

PILOT STUDY TO CONSTRUCT TRAINING PROGRAMMES

A pilot study was conducted to assess the initial capacity of the subjects
in order to fix the load. For this, twelve Alagappa University Cricketers were selected at random as subjects and they underwent field training and psych-up package under the watchful eyes of experts and the investigator. Based on the response and capacity of the subjects during the pilot study, training schedule was constructed; however the individual differences were considered. While constructing the training programmes, the basic principles of training were followed. Being a qualified Cricket Coach from Sports Authority of India, Netaji Subhas National Institute of Sports, it was easier for the investigator to construct a field training schedule. The investigator had also undergone one month special training for mental training at sports psychology department.

RELIABILITY OF THE DATA

The reliability of data was ensured by establishing the instrument reliability, tester competency and reliability of test.

INSTRUMENT RELIABILITY

Instruments such as stop watches, ON/OFF switch mats and measuring tape were used for the study. All the instruments were in good condition and workable, purchased in a reputed company. The calibrations were tested and found to be accurate enough to serve the purpose of the study.

TESTER COMPETENCY AND RELIABILITY OF TEST

To ensure that the investigator was well versed in the techniques of
significance at 0.01 level of confidence is 0.71.

The Cricket playing ability of each subject was subjectively rated by three judges on batting/bowling/fielding performance. To see the degree of agreement between the judges, rank order correlation was used in this study. The results revealed high correlation, which means that there was a close agreement in rating between the judges.

**TABLE No.2**

**RANK ORDER CORRELATION FOR JUDGES RATING SCORES ON CRICKET PLAYING ABILITY**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Judges</th>
<th>'r'</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I Vs II</td>
<td>0.89</td>
</tr>
<tr>
<td>2</td>
<td>II Vs III</td>
<td>0.92</td>
</tr>
<tr>
<td>3</td>
<td>I Vs III</td>
<td>0.93</td>
</tr>
</tbody>
</table>

In case of psychological variables, Hardy and Nelson’s questionnaire titled ‘The Mental Skills Questionnaire’; (which was subjected to Face validity) was used in this study.

**ORIENTATION OF THE SUBJECTS**

The investigator clearly explained the selected variables in the study and the purpose of training schedule to the subjects. Before the commencement of the training programmes, one week was spent to teach the training schedule
for the experimental groups. Four ‘one hour’ sessions were spent on alternate
days to have not only the knowledge of the techniques but also a thorough
understanding of training.

Even though the control group did not undergo any training, they were
given a thorough knowledge about the test items followed in this study.

**SELECTION OF VARIABLES**

**BIO-MOTOR VARIABLES**

Endurance is directly or indirectly of high importance in all sports and
games. Cricket is the only long duration game played for five days, six hours
a day. Greater endurance ensures high quality skill of movement execution
which finds expression in accuracy, precision, rhythm, consistency etcetera.
Tyson (1987) says bowlers who can bowl for long spells and batters who can
bat for over four hours to score a century are displaying sound endurance in
the muscle groups responsible for those movements. According to Botham
(1980), the most basic requirement is stamina - the ability to keep going at
one’s best all day.

Strength, especially explosive strength, has influencing role in Cricket.
To bowl faster or to throw the ball fast, one needs strength. Similarly in
batting one needs strength to execute strokes. According to Sivaramakrishnan
et.al. (1998), Wicket keeping involves lot of explosive movements. Tyson
(1987) says that in Cricket strength is important both to batters and bowlers
particularly in muscles of the legs, arms, shoulders, hands and trunk.
In Cricket, Speed is required as running speed to take quick singles, chase a ball and during a fast bowler's run-up; bowling speed is required by a fast bowler to bowl a faster ball and throwing speed is required by a fielder to throw a ball.

Strength is required when executing a powerful hit out of the ground or to bowl a fearful bouncer. Speed is required to take quick singles and to stop a ball before it crosses the boundary. A pace bowler bowling through the entire session shows ample evidence of endurance.

Endurance, Strength and Speed play important role in Cricket according to Tyson (1987), Sivaramakrishnan et.al. (1998), Sharangpani (1992), Ian Botham (1980), and T.E.Srinivasan.

**PHYSIOLOGICAL VARIABLES**

High level of performance of a Cricketer might be dependent upon his physiological make up and it was recognised that physiological fitness was needed for high level performance. Hence aerobic power, anaerobic power and resting pulse rate were selected as physiological components for this investigation. Daryl Foster and David John emphasise the importance of aerobic and anaerobic fitness to attain high level of performance in Cricket. Tyson (1987) also observes similar views.
PSYCHOLOGICAL VARIABLES

Cricket, nowadays, is becoming a mind game. Despite excellent physical condition, technique and tactics, some players/teams perform very badly, the reason being lack of mental fitness. In Cricket, several psychological parameters play decisive role in performance. To name a few are self confidence, concentration, anxiety, motivation, etcetera.

Botham (1980) opines that Concentration is the most vital quality for a Cricketer. Gordon, reports that Self confidence will enhance the Cricketers performance. He further says that pre-game preparation (physical, technical and mental) will facilitate consistent results. Sivaramakrishnan et.al. (1998) observe that visualization, relaxation and mental preparation help the Cricketer to perform better.

PERFORMANCE VARIABLES

The Cricketer’s performance normally can be judged by runs in case of a batsman, wickets in case of a bowler and catches/run outs/stumping/ground fielding in case of a fielder. But all can be judged by an individual playing ability. Due to non-availability of Standardized Skill test in Cricket, subjective rating of Cricket playing ability was selected as performance variables.

Keeping in mind the opinion of the experts, availability of equipments, acceptability of the subjects and the time to be devoted, the following Bio-
motor variables namely Endurance, Strength and Speed; Physiological variables, namely Aerobic power, Anaerobic power, and Resting pulse rate; Psychological variables namely Imagery ability, Mental preparation, Self-confidence, Anxiety & Worry management, Concentration ability and Relaxation ability and Cricket playing ability were selected as variables as they may have direct relation to the performance of Cricket players in competitive situation.

### SELECTION OF TESTS

<table>
<thead>
<tr>
<th>Area</th>
<th>Variables</th>
<th>Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bio-motor</td>
<td>Endurance</td>
<td>Fifteen minute run</td>
</tr>
<tr>
<td></td>
<td>Strength</td>
<td>Push-ups</td>
</tr>
<tr>
<td></td>
<td>Speed</td>
<td>Forty Metres run</td>
</tr>
<tr>
<td>Physiology</td>
<td>Aerobic power</td>
<td>Astrand-Astrand Nomogram (bench stepping)</td>
</tr>
<tr>
<td></td>
<td>Anaerobic power</td>
<td>Margaria-Kalamen power test</td>
</tr>
<tr>
<td></td>
<td>Resting Pulse Rate</td>
<td>Manual method</td>
</tr>
<tr>
<td>Psychology</td>
<td>Imagery ability, Mental preparation, Self confidence, Anxiety &amp; Worry Management, Concentration ability and Relaxation ability</td>
<td>Hardy and Nelson's Mental skills Questionnaire</td>
</tr>
<tr>
<td>Performance</td>
<td>Cricket playing ability</td>
<td>Subjective rating of Batting/Bowling/Fielding skills</td>
</tr>
</tbody>
</table>
COLLECTION OF THE DATA

Pre-test data were collected two days before the training programme. Post test data were collected two days after the training programme. In all the cases, the data were collected on two days in the morning and evening sessions as indicated in the following table.

<table>
<thead>
<tr>
<th>Day</th>
<th>Morning</th>
<th>Evening</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A. Resting Pulse rate</td>
<td>A. Forty mts run</td>
</tr>
<tr>
<td></td>
<td>B. Fifteen Minutes run</td>
<td>B. Playing ability tests</td>
</tr>
<tr>
<td></td>
<td>C. Mental Skills questionnaire</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>A. Aerobic Power</td>
<td>A. Anaerobic Power</td>
</tr>
<tr>
<td></td>
<td>B. Push-ups</td>
<td>B. Playing ability tests</td>
</tr>
</tbody>
</table>

ADMINISTRATION OF TESTS

ENDURANCE (FIFTEEN MINUTES RUN)

Objective

To measure the running endurance of the subjects.

Equipment

Measuring tape, clapper, cones and stop watches.
Procedure and Scoring

In a Cricket ground a 400 mts track was marked with the help of cones, which was 40 metres apart. From starting line on signal, Cricketers started running continuously for 15 minutes. The test was conducted for a group of not more than 10 Cricketers at a time. On fifteenth minute a signal was given where Cricketers stopped running. The distance covered by each individual in 15 minutes was their individual score. If any cricketer stopped running or started walking, his timing was not considered as score. In those cases, one more trial was given. (Tyson, 1987).

STRENGTH (PUSH-UPS)

Objective

To measure the arm strength of the subjects

Equipment

Stop watches and clapper.

Procedure and Scoring

The number of push-ups completed in 30 seconds was measured. Starting with the subject lying face-down with the hands directly under the shoulders, the arms were straightened whilst rest of the body was kept straight. A full push-up was counted when the chest was lowered to touch the ground (Tyson, 1987).
SPEED (FORTY METRES RUN)

Objective

To measure the speed of the subjects.

Facilities and Equipment

Two parallel lines, 40 metres apart were drawn on the standard track. A stop watch with calibration of 1/100 seconds and a clapper were used.

Procedure and Scoring

The subject was asked to stand behind the starting line and instructed to start with a standing start. On hearing the 'clapper sound' the subject had to run forty metres with maximum effort. The best time out of two trials was recorded as the individual’s score (Elliott et.al., 1986).

AEROBIC POWER (ASTRAND-ASTRAND NOMOGRAM)

Objective

To measure the aerobic power of the subjects.

Equipment

For assessing aerobic power, Astrand-Astrand Nomogram was used from submaximal data. The nomogram is said to be more accurate if heart
rates between 125 and 170 beats per minute are used to make the predictions of max VO₂.

For the step test, a bench of 40 cms height was used.

**Procedure and Scoring**

The subjects performed the stepping exercise with the frequency of 30 steps per minute. One minute determination of heart rate was made between minutes 5 and 10 of work. The heart rate and body weight recorded from each subject were then applied to the Astrand - Astrand Nomogram as referred by Fox, et.al. to predict max VO₂. The VO₂ max was estimated by reading horizontally from the body weight scale to the pulse rate scale. The predicted VO₂ max uptake was read on the middle scale. (Fox et.al., 1993).

**ANAEROBIC POWER (MARGARIA - KALAMEN ANAEROBIC POWER TEST)**

**Objective**

To measure the anaerobic power of the subject.

**Equipment**

1. A firm fifteen step staircase
2. Digital timer with switch mats to switch ‘ON’ and switch ‘OFF’ the time.
Procedure and Scoring

The subjects stood 6 metres in front of the staircase. They ran up the stairs as rapidly as possible, taking three steps at a time. The clock was started as the person stepped on the first switch mat (on the 3rd step) and stopped as he stepped on the ninth step. The time it took to traverse the distance between stair 3 and stair 9 was recorded in 0.01 sec. The power generated is a product of the subject’s weight \( w \) and vertical distance \( D \) divided by time \( t \).

\[
P = \frac{W \times D}{t}
\]

where

\[
\begin{align*}
P & = \text{Power} \\
W & = \text{Weight of the subject in kilograms} \\
D & = \text{Vertical height between third and ninth steps in stairs} \\
t & = \text{Time from third to ninth step in seconds (Fox et.al., 1993)}. 
\end{align*}
\]

RESTING PULSE RATE (MANUAL METHOD)

Objective

To measure the resting pulse rate of the subjects.

Equipment

Stop watch and chair
Procedure and Scoring

The pulse rate of all the subjects were recorded in a sitting position in the early morning. Before taking the pulse rate, the subjects were asked to sit in a chair and relax for 10 to 20 minutes. To record the pulse rate, the finger tips were placed on the left radial artery at the wrist in such a manner that pulsation was clear and the number of pulsations were counted for fifteen seconds and then multiplied by four to record for the full minute. (Jenson et.al., 1980).

PSYCHOLOGICAL VARIABLES (MENTAL SKILLS QUESTIONNAIRE)

Objective

To identify general mental strength and weakness level of the subjects.

Tool

Hardy and Nelson’s Mental skill questionnaire was used, which was presented in the appendix-V. This questionnaire measures six important aspects of the mental side of sport performance. They are (1) Imagery ability (2) Mental preparation (3) Self confidence (4) Anxiety & worry management (5) Concentration ability (6) Relaxation ability.

Procedure

The mental skills questionnaire consists of a number of statements about
experiences associated with competitive sport. Each subject was given a questionnaire and a pen. The subject was asked to read each statement very carefully and then circle the appropriate number to indicate the extent to which one agrees with the statement. The rating was based on six point scale from strongly disagree to strongly agree. The subject was asked to answer honestly to each question in relation to his own sporting experience.

Scoring

In each item add all the 4 numbers which have been circled. The lower score represents weakness level and higher score represents stronger level of mental ability (Hardy and Nelson, 1996).

PERFORMANCE VARIABLE (CRICKET PLAYING ABILITY)

Objective

To assess the Cricket playing ability of the subjects.

Facilities and Equipment

Cricket ground and all cricket equipments like bats, balls, stumps, pads, guards, gloves etcetera.

BATTING

One’s batting ability can be best judged by the following factors namely
ability to time the ball, place the ball and to middle the ball with the bat. Foot work and ability to defend as well as to attack with wide range of strokes and improvisation are other important factors in batting. Consistency and coordination are other vital factors in batting.

BOWLING

One’s bowling level can be judged by field work, his ability to swing/cut/spin the ball. Accuracy in line and length, with wide range of variation in deliveries with good nip make the bowler more effective.

FIELDING AND WICKET KEEPING

Consistency in catching/stumping are vital in fielding/wicket keeping. Accuracy and speed of throw in the game situation add to the ability of the fielder. The consistency and precision in collecting the ball both on the off and leg side, the ability for stumping and collecting sharp catches behind the wicket indicate the ability of a wicket keeper.

Scoring

Three judges, who were trained Cricket Coaches recorded the performance of the subject during the pre and post tests. The investigator provided the guidelines to the Coaches for subjective rating of performance. The technico tactical levels were recorded in points to the maximum out of ten.
The scores ranged from 1 to 10. The average of scores from three judges for each subject was regarded as the individual's performance score. The rating scale for evaluation of Cricket playing ability is presented in appendix-IV.

STATISTICAL ANALYSIS

The data was collected from the three groups prior and after the experimental treatment. The pre test and post test data were statistically examined for significant difference, applying the analysis of covariance (ANCOVA) for each and every variable selected for this study. To make adjustments for difference in the initial means and test the adjusted post-test means for significant difference, the analysis of covariance was used.

Whenever the ‘F’ ratio for adjusted test was found to be significant for adjusted post means, Scheffé’s test was followed as a post hoc test to determine which of the paired mean difference was significant.