Chapter III

PROCEDURE

In this chapter the procedure which were adopted for the selection of the subjects, procedure for administering the test item and the method to be employed for statistical analysis of data are described.

SELECTION OF SUBJECTS

The subjects for the study were 20 male elite Badminton players of Kerala, Karnataka, Tamilnadu, Haryana, Madhya Pradesh and Goa in the age group of 18-28 years. The minimum playing experiences of these players were 5/6 years of participating in tournament of Inter-state and above level competitions.

SELECTION OF TEST ITEMS

The first section was demographic information sheet consisting of several questions describing the sample’s age, height, weight and number of years they had participated in their sport. Appendix-A

The test items selected for psychological and physiological parameter for assessing for this study were as under:

2. The Athletic Coping Style Inventory (ACSI-28; Smith, Schutz, Smoll, & Ptacek, 1995)
3. Competitive State Anxiety Inventory – 2 (CSAI-2)
4. Heart rate Zone at different stages of training
5. Calories burn during Training.
6. EPOC (Excess Post Oxygen Consumption)
NARRATION OF THE TEST ITEMS

The parameters of psychological profile are:

Psychological Performance Inventory (PPI) by James E. Loehr (1982). It is a useful psychometric instrument to measure individual’s mental toughness (Appendix-B)

Mental Toughness Test (Loehr, 1982) is personal awareness version, which focuses on, the score range for seven broad personalities and behavioral factors that are associated with success in competitive activity. The idea of mental toughness and the ability to develop mentally tough athletes is a socially popularized concept. Respondents were asked to indicate whether each reason was almost always, often, sometimes, seldom, and almost never. The subject responds to each statement using a five point ordinal scale. Hence the minimum point of response in each system stands at 1 and maximum pole at 5.

The questionnaire had undergone psychometric testing. A factor analyses was performed on participants throughout several studies, resulting in seven factor solutions, which are consistent amongst research.

This questionnaire measures various aspects of mental toughness such as:

Factor 1  Self Confidence
Factor 2  Negative energy control
Factor 3  Attention Control
Factor 4  Visual / imagery control
Factor 5  Motivational Level
Factor 6  Positive energy Control

Factor 7  Attitude Control

The forty two item scale yields an overall mental toughness score as well as seven six-item subscale scores in (a) self-confidence, (b) negative energy control, (c) attention control, (d) visualisation and imagery control, (e) motivation, (f) positive energy and (g) attitude control. Subscale scores ranged from a low of 6 to a desirable high of 30 and total scores from 42 to 210. Scores were recorded on a five point Likert scale anchored by ‘almost always’ and ‘almost never.’

The psychological performance inventory (PPI) is a useful psychometric instrument to measure individual’s mental toughness on the basis of these norms given below:-

26-30  Excellent Skills
20-25  Room for improvement
6-19   Needs special attention

The second part of the questionnaire was:

**The Athletic Coping Style Inventory (ACSI-28)- Appendix- C**

The Athletic Coping Style Inventory (ACSI-28; Smith, Schutz, Smoll, & Ptacek, 1995) was administered to assess individual coping style. The ACSI contains 28 items describing seven sport-specific subscales: Coping with Adversity (4 items), Peaking Under Pressure (4), Goal Setting/Mental Preparation (4), Concentration (4), Freedom from Worry (4), Confidence and Achievement Motivation (4), and Coachability (4). The athletes were required to rate how often they experienced the situations presented in each of the related questions using a 0 = ALMOST NEVER, 1 = SOMETIMES, 2 = OFTEN, 3 = ALMOST ALWAYS a 4-point scale,
Total score or sum of subscales: Scores range from a low of 0 to a high of 12 on each subscale, with higher scores indicating greater strengths on that subscale. The score for the total scale ranges from a low of 0 to a high of 84, with higher scores signifying greater strength.

The definitions associated with the sub-scales of the ACSI-28, as outlined by Smith & Christensen, (1995) are as follows:

1. **Coping with Adversity**: Remains positive and enthusiastic even when things are going badly; remains calm and controlled; can quickly bounce back from mistakes and setbacks.
2. **Peaking Under Pressure**: Is challenged rather than threatened by pressure situations and performs well under pressure; a clutch performer.
3. **Goal Setting/Mental Preparati on**: Sets and works towards specific performance goals; plans and mentally prepares him/herself for competition and clearly has a 'game plan' for the competition.
4. **Concentration**: Not easily distracted; able to focus on the task at hand in both practice and competitive situations, even when adverse or unexpected events occur.
5. **Freedom from Worry**: Does not put pressure on him/herself by worrying about performing poorly or making mistakes; does not worry about what others will think if he/she performs poorly.
6. **Confidence and Achievement Motivation**: Is confident and positively motivated; consistently gives 100% during practice and competitions and works hard to improve his/her skills.
7. **Coachability**: Open to and learns from instruction; accepts constructive criticism without taking it personally or becoming upset.
3. Competitive State Anxiety Inventory – 2 (CSAI-2)

The CSAI-2 is an instrument used to measure state cognitive state anxiety, somatic state anxiety and state self-confidence in competitive situations. The test indicates to choose the answer that corresponds with how they feel at this point in time, right now (*Appendix- D*).

Cognitive anxiety items are numbers 1, 4, 7, 10, 13, 16, 19, 22, and 25.
Somatic anxiety items are numbers 2, 5, 8, 11, **14R**, 17, 20, 23, and 26
State self-confidence items are numbers 6, 9, 12, 15, 18, 21, 24, and 27

According to Martens et al. (1990 p.176) the scoring of the CSAI-2 is achieved the following way. A person rates how they are feeling right now by circling one of the presented answers.

The four-presented answers include
- Not at all (1),
- Somewhat (2),
- Moderately so (3) and
- Very much so (4).

The number that is placed under each answer and in line with each item is a means of scoring each item. Each number is its true value when adding up the scores. Each subscale has it’s own total. This means that a person who has a high score, an example being 36 (4 x 9) will have a high cognitive and somatic anxiety as well as a high self-confidence. The lower the score (9x1) a lesser amount of cognitive and somatic anxiety occurs, self-confidence is also less. It is important to emphasise that there is not total score for the CSAI-2 recorded that is all the separate subscale scores are not added together. What also has to be noted that affects the scoring of the CSAI-2 is question **14R** in the somatic subscale. The R indicates that the score is reversed. To illustrate if a person circled 1 then that item scores 4 points, if a person circles 2 then that item scores 3 points, when 3 is circled then 2 points are awarded and when 4 is circled 1 point is awarded.
This is to ensure that the individual is reading, thinking and comprehending the question and not just randomly circling answers. If a person responds differently to question 14 and 8 then the test is invalid as a person cannot be relaxed as well as not being tense. In relation to the scoring if one response per subscale is missing then the test can still be scored, if more than one item is missing then the test is invalid. The process to score a subscale when an item has not been filled in is as follows. The mean score for the 8 answers are calculated and then multiplied by 9 the answer is then rounded off to the nearest whole number.

Your scores for each will range from 9 to 36, with 9 indicating low anxiety (confidence) and 36 indicating high anxiety confidence.

**Anxiety states (A-state)** is our response to a particular situation

Purpose: The CSAI-2 in an authentic instrument primarily used to gain insight into, and measurement of how, the cognitive and somatic state anxiety relationship affects competitive performance. According to Weinberg and Gould (1999, p.73) cognitive anxiety is the mental element of anxiety that is caused by negative outlooks on success, the individual often experiences unpleasant feelings. The individual therefore usually has a negative self-evaluation of their athletic performance. Somatic anxiety is the individual’s perception of the change in psychological commencement. This perception of change discussed by Weinberg and Gould (1999, p.73) is considered to have a negative result of performance as it produces unpleasant feelings and increases in the psychological symptoms of somatic anxiety such as butterflies in the stomach, clammy hands, shortness of breath and increased heart rate. As somatic and cognitive anxiety is experienced as unpleasant they are correlated to a negative effect on performance because according to Martens et al. (1990, p.125) high levels of state anxiety results in performance relapse. Being able to measure the intensity and direction into somatic anxiety is very beneficial to the athlete in developing awareness, coping and controlling techniques so that somatic anxiety does not hinder or limit competitive performance. The CSAI-2 is used in a variety of contexts, not just between the relationship of somatic anxiety and performance. The CSAI-2 has also been used in conjunction with other instruments in various studies.
Anxiety traits (A-trait) are the characteristics of our personality, our general anxiety level.

Marten developed anxiety traits (A-trait) questionnaires which were tailored specially to sport known as the Sport Competition Anxiety Test (SCAT). Marten recognised that any measure of sport anxiety must take into consideration cognitive anxiety (negative thoughts, worry) and somatic anxiety (physiological response).

The Competitive State Anxiety Inventory or CSAI-2 takes into account the difference between A-state and A-trait and distinguishes between cognitive and somatic anxiety.

NOTE: It should be noted that the psychological parameters were tested only once as there won’t be any changes during various stages or periods of training because these parameters requires time period and training at places to bring changes in it.

The parameters of physiological stress profile are

1. Heart rate Zone at different stages of training
2. Calories burn during Training.
3. EPOC (Excess Post Oxygen Consumption)

This was checked at by applying the following:

A. Counting skipping test. (Stage 1)
B. The shadow court movement test. (Stage 2)
C. Game Situation Test. (Stage 3)

The physiological parameters are tested using Suunto t6c sport tester (figure 1).
Excess post-exercise oxygen consumption (EPOC) is a physiological measure of the oxygen consumed in excess of resting requirements after exercise. Basically, it provides a measure as to the demand of a training session.

The parameters calculated are average heart rate during training, Calories burned and EPOC (Excess Post Oxygen Consumption).

Excess post-exercise oxygen consumption (EPOC, informally called afterburn) is a measurably increased rate of oxygen intake following strenuous activity intended to erase the body's "oxygen deficit." In historical context the term "oxygen debt" was popularized to explain or perhaps attempt to quantify anaerobic energy expenditure, particularly as regards lactic acid/lactate metabolism; in fact, the term "oxygen debt" is still widely used to this day. Direct and indirect calorimeter experiments have, however, definitively disproven any association of lactate metabolism as causal to an elevated oxygen uptake (Scott and Kemp, 2005).

In recovery, oxygen (EPOC) is used in the processes that restore the body to a resting state and adapt it to the exercise just performed. These include: hormone balancing, replenishment of fuel stores, cellular repair, innervation and anabolism. Post-exercise oxygen consumption replenishes the phosphagen system. New ATP is synthesized and some of this ATP donates phosphate groups to creatine until ATP and creatine levels are back to resting state levels again. Post-exercise oxygen is also used to oxidize lactic acid. Lactic acid is produced during exercise and then travels via the blood stream to the kidneys, cardiac muscle, and liver. An increased amount of oxygen is necessary to convert the lactic acid back to pyruvic acid at these locations. Another use of EPOC is to fuel the body's increased metabolism from the increase in body temperature which occurs during exercise (Saladin, 2012).

EPOC is accompanied by an elevated consumption of fuel. In response to exercise, fat stores are broken down and free fatty acids (FFA) are released into the blood. In recovery, the direct oxidation of free fatty acids as fuel and the energy consuming re-
conversion of FFAs back into fat stores both take place (Bahr, 1992; Bahr et al., 1991; Bielinski et al., 1985)

1. Counting skipping test:

Before starting the test the player is asked to do individual warm up and specific warm up using skipping rope. After warm up Suunto t6c sport tester is fixed on the chest and wrist of the player. The player is instructed how to operate the gadget and ask the player to start the Suuntot6c tester at the time of the start of the test. The initial heart rate is noted before the test by the researcher. Using counting skipping rope the number of skipping or jump done by the player in one minute is counted and sport tester is asked to stop by the player when test finishes and note down the final heart rate immediately after the test by the tester. The data is transferred to the laptop using data cable and Suunto t6c software. The data transferred are Average heart rate, Calories burned and EPOC.

2. The shadow court movement test.
The player is asked to do specific warm up so that he can put best during test. The initial heart rate is noted before the test by the researcher. Same as earlier test the player is ask to start the equipment. In this test the player will move in the court and touching all the four corners ie fore court two sides and rear court two sides. Each time the player touches each corner it will be counted as one. And after touching each corner the player has to recover to the base. The tester will count score of the player touching each corner in one minute and the player has to stop the Suunto t6c sport tester when the researcher says stop. After finishing the test the data is transferred to the software.

3. Game situation test.

The test requires a heart rate monitor with memory for storing the registered pulse values. A Suunto t6c sport tester fulfills these requirements.

Before the test, CSAI- II questionnaire for anxiety was given to the players and they were informed regarding opponent to whom they have to play. Keeping the opponent in the mind the players were asked to fill in the questionnaire. A player is tested during a match or match like training conditions. In this the players is asked to play a one game of singles of 21 points to make it much stress full the players is asked to consider the game as final game and at 11 points there was an interval and change of ends. Both the players initial heart rate is noted after warm up. At Love all both the players is asked to start Suunto t6c sport tester (figure2). A video analysis of the game is done during game. As the game finishes the player is asked to stop the sport Tester and the data is recovered and saved in the laptop.

ADMINISTRATION OF TEST AND COLLECTION OF DATA

For the said project the permission from various academies where the elite badminton players are trained has been obtained. Also discussion with the office bearer of Badminton Association of India had been taken. Prior to the administration of the test
the investigator have had a meeting with the concerned national coaches and players. The objectives and purpose of the test was made clear to the subjects so that they are aware of what they are expected to do. Naturally, the information, which it contains, is entirely anonymous and will be used only for research purposes. If the players and coaches require feedback it can be done but with the permission.

The data pertaining psychological profile such as mental toughness, coping skill and anxiety was collected through Mental Toughness questionnaire, athletic coping skill inventory and CSAI II respectively. Physiological stress profile during various stages of training for elite badminton players was tested using Suunto T6c and the data was transferred using Data cable and Suunto software, which is shown in the figure 3. The counting skipping rope test considered as stage 1, Shadow Movement test (Stage 2) and Game situation test is considered as Stage 3. As the stage progresses it is more specific to the game.

Figure 2. Collection of Data on the Laptop
STATISTICAL TECHNIQUE

In order to examine the hypothesis of the study, descriptive statistics such as mean standard deviation and comparative statistics such as analysis of variance was applied for the present study. Psycho-physiological profiling was done for each player separately for their own obtained score that was compared with the norms where it was possible.