

## Chapter 3

# METHODOLOGY

The goals of the study were to determine if psychological skills were enhanced by participation in a PST programme, and whether the changes in psychological skills were related to an improvement in athletic performance. This chapter first sets out the hypotheses that attempt to operationalise these goals. The methodology section also encompasses the research design utilised, the sample used, the details of the PST programme, the data collection, and statistical procedures utilised.

### 3.1 HYPOTHESES

#### Hypothesis 1

**H<sub>0</sub>**: There is no significant improvement in the psychological skills of sprinters at the end of the PST programme

**H<sub>1</sub>**: There is a significant improvement in the psychological skills of sprinters at the end of the PST programme

#### **Hypothesis 1a**

**H<sub>0a</sub>** : There is no significant improvement in self-confidence levels of the sprinters at the end of the PST programme.

**H<sub>1a</sub>** : There is a significant improvement in self-confidence levels of the sprinters at the end of the PST programme

#### **Hypothesis 1b**

**H<sub>0b</sub>** : There is no significant decrease in stress levels of the sprinters at the end of the PST programme.

**H<sub>1b</sub>** : There is a significant decrease in stress levels of the sprinters at the end of the PST programme.

### **Hypothesis 1c**

**H<sub>0c</sub>** : There is no significant increase in the number of sprinters with a narrow and internal attentional style at the end of the PST programme.

**H<sub>1c</sub>** : There is a significant increase in the number of sprinters with a narrow and internal attentional style at the end of the PST programme.

### **Hypothesis 1d**

**H<sub>0d</sub>** : There is no significant improvement in motivation levels of the sprinters at the end of the PST programme.

**H<sub>1d</sub>** : There is a significant improvement in motivation levels of the sprinters at the end of the PST programme.

### **Hypothesis 1e**

**H<sub>0e</sub>** : There is no significant improvement in vividness of mental imagery of the sprinters at the end of the PST programme.

**H<sub>1e</sub>** : There is a significant improvement in vividness of mental imagery of the sprinters at the end of the PST programme.

## **Hypothesis 2**

**H<sub>0</sub>** : There is no significant improvement in athletic performance of the sprinters at the end of the PST programme.

**H<sub>2</sub>** : There is a significant improvement in athletic performance of the sprinters at the end of the PST programme

## **Hypothesis 3**

**H<sub>0</sub>** : There is no significant relationship between the increase in athletic performance of the sprinters and the enhancement of psychological skills at the end of the PST programme.

**H<sub>3</sub>** : There is a significant relationship between the increase in athletic performance of the sprinters and the enhancement of psychological skills at the end of the PST programme.

### **Hypothesis 3a**

**H<sub>0a</sub>** : There is no significant relationship between the athletic performance of the sprinters and self-confidence at the end of the PST programme.

**H<sub>1a</sub>** : There is a significant relationship between the athletic performance of the sprinters and self-confidence at the end of the PST programme.

### **Hypothesis 3b**

**H<sub>0b</sub>** : There is no significant relationship between the athletic performance of the sprinters and stress levels at the end of the PST programme.

**H<sub>1b</sub>** : There is a significant relationship between the athletic performance of the sprinters and stress levels at the end of the PST programme.

### **Hypothesis 3c**

**H<sub>0c</sub>** : There is no significant relationship between the athletic performance of the sprinters and the narrow-internal attentional style at the end of the PST programme.

**H<sub>1c</sub>** : There is a significant relationship between the athletic performance of the sprinters and the narrow-internal attentional style at the end of the PST programme.

### **Hypothesis 3d**

**H<sub>0d</sub>** : There is no significant relationship between the athletic performance of the sprinters and motivation levels at the end of the PST programme.

**H<sub>1d</sub>** : There is a significant relationship between the athletic performance of the sprinters and motivation levels at the end of the PST programme.

### **Hypothesis 3d**

**H<sub>0d</sub>** : There is no significant relationship between the athletic performance of the sprinters and vividness of imagery at the end of the PST programme.

**H<sub>1d</sub>** : There is a significant relationship between the athletic performance of the sprinters and vividness of imagery at the end of the PST programme.

## 3.2 RESEARCH DESIGN

This section provides an explanation of the research methodology used in the present programme, identifies the variables, outlines the research design and the problems associated with the specific design.

A quantitative research method was used. The essential characteristics of a quantitative method are hypothesis testing, concepts are in the form of discrete variables, measures are systematically created before data collection and are standardised, data are in the form of numbers from precise measurements, theory is to a large extent causal and deductive, procedures are standard and assumed to be replicable, and data are analysed utilising statistics, tables or charts, and discussing how what they show relates to the hypotheses (Neuman, 1994).

More specifically, an experimental research method was used to determine if a psychological skills training programme improved the performance of athletes and enhanced their psychological skills. This is an experimental design because the independent variable is being implemented and controlled by the researcher, and the effects on the dependent variable are noted (Kerlinger, 1986).

The independent variable (X) is the PST programme. It is independent in the sense that it is not influenced by any other variable in the experimental situation. There are two dependent variables (DV's),  $Y_1$  and  $Y_2$ . The first dependent variable is psychological skills. The second is athletic performance. These two variables are the presumed effect variables. The DV's are dependent in the sense that performance and psychological skills are assumed to depend on, or be influenced by participating in the PST programme (Kerlinger, 1986).

A one-group pretest-posttest design will be implemented (Kerlinger, 1986).

$$Y_{b1+b2} \quad X \quad Y_{a1+a2}$$

According to Kerlinger (1986), the essential feature of this design is that the sample group will be compared to itself. There is no control group, because there is no pre-existing equivalent group. Hence, being compared to itself is theoretically the best choice as it implies that all possible independent variables associated with the subject's characteristics are controlled. The procedure of this research design commences with measuring the group on the dependent variable before experimental manipulation (pretest). The independent variable is then implemented. Thereafter the subjects are measured again on the dependent variable (posttest). The difference scores ( $Y_{a1+a2} - Y_{b1+b2}$ ) are examined to determine the impact of the independent variable (Kerlinger, 1986).

This design has been criticised as there are numerous other factors that can also contribute to the change in scores. Firstly, the measurement procedure may change the subjects. Such procedures are called reactive measures because they themselves cause the subjects to react, not necessarily the experimental manipulation. History and maturation may also affect posttest scores, and pose a danger to the present study too. The longer the period of time between the two testings, the stronger the chance of extraneous factors influencing the subjects, and consequently the posttest scores. History refers to the variables or events that are specific to the particular experimental situation, while maturation refers to events that are general to any particular situation, and reflect change or growth. A statistical phenomenon that can negatively impact results is the regression effect where test scores change as a "statistical fact of life": on retest, on the average, they regress toward the mean (Kerlinger, 1986).

### 3.3 RESEARCH POPULATION

The type of sampling as well as the subjects who constitute the sample are discussed in this section.

#### **3.3.1 Sampling method**

A nonprobability sampling method was used as the sample was not randomly selected. More specifically, purposive sampling was used. There was an intentional attempt to obtain a representative sample by utilising a presumably typical group of sprinters as the sample (Kerlinger, 1986).

#### **3.3.2 Description of the sample**

The Bureau for Sports Development at Technikon Pretoria, South Africa was approached for subjects, and the team that was allocated were 15 sprinters who run for Technikon Pretoria. The team consists of 15 sprinters, 8 females and 7 males (Figure 13). The age range was relatively wide. Age ranged from 15 years to 25 years (Figure 14).

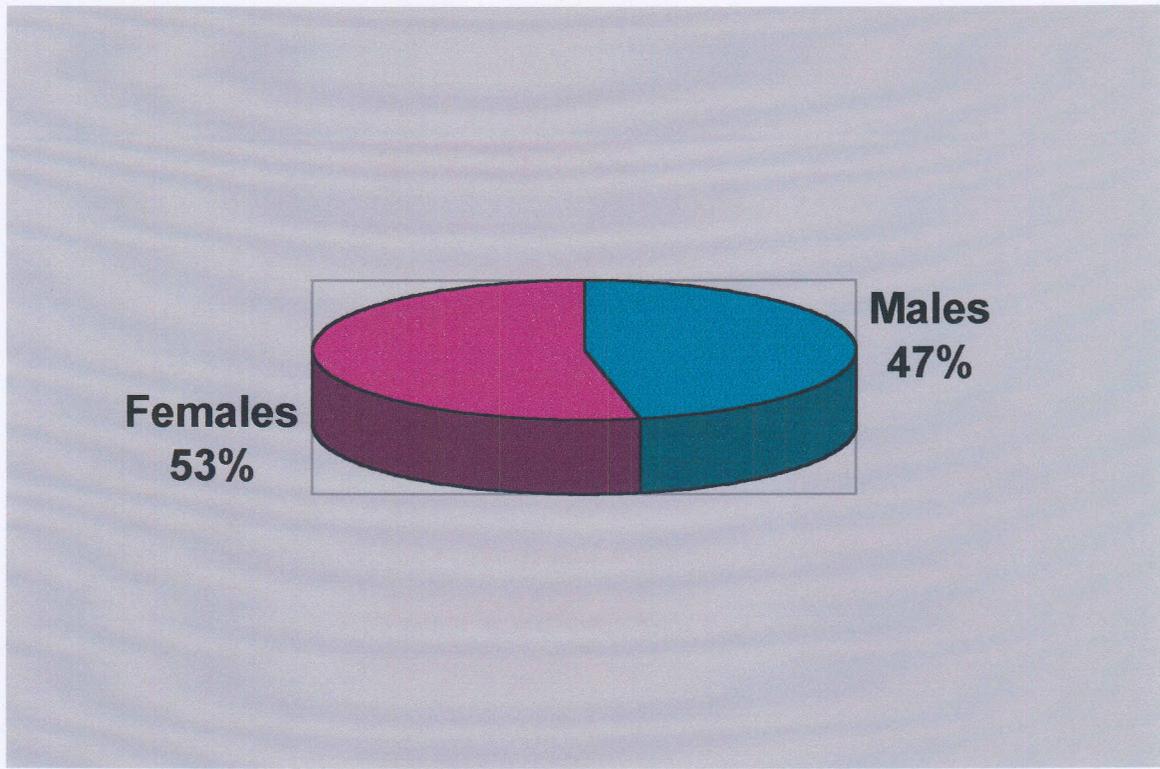


Figure 13. Gender

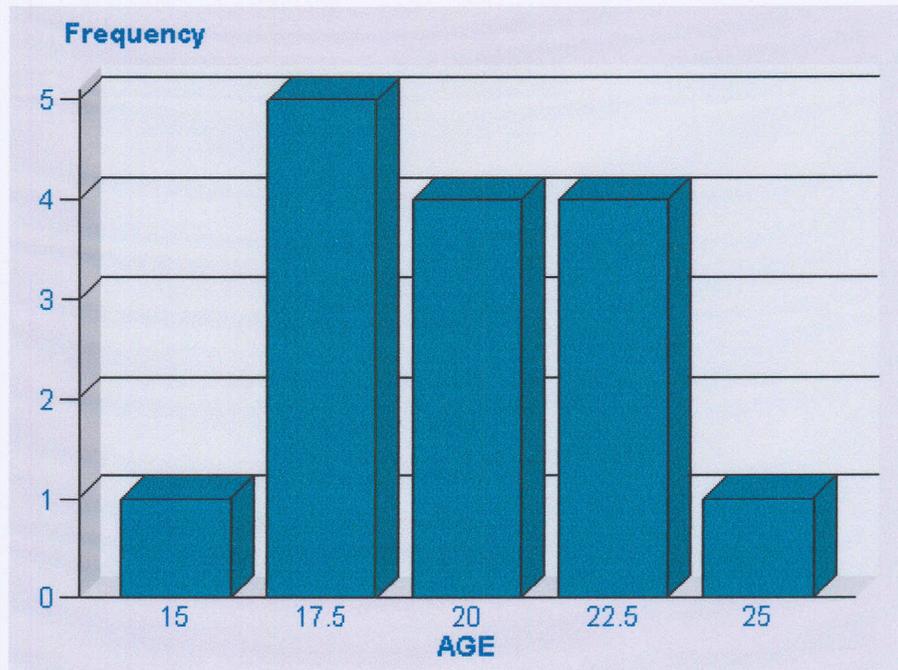


Figure 14. Age.

## **3.4 THE PSYCHOLOGICAL SKILLS TRAINING PROGRAMME**

Detailed information regarding the PST programme will be presented in the proceeding sections. Specifically, when and how the programme was implemented, as well as limitations of the programme.

### **3.4.1 WHEN TO IMPLEMENT A PSYCHOLOGICAL SKILLS TRAINING PROGRAMME**

This section emphasises the timing and the duration of the programme.

The optimal time to initiate a programme is during the off-season or preseason when there is sufficient time to acquire new skills. During this time, there is a relative absence of competition pressure (Weinberg & Gould, 1999). In South Africa, the sprinting season commences in September and ends in April. The winter programme commences in May and ends in August. The primary aim of this programme is to keep the athletes fit and to continue training during the off-season. Hence, the winter programme is the ideal time to commence with the PST programme for sprinters.

Although psychological skills training is an ongoing process, the initial formal programme should last 3 to 6 months. The particular sport, time available, prevailing mental dexterities and the sprinters' commitment also determines how long the programme lasts (Weinberg & Gould, 1999). The winter programme lasts four months. This is sufficient time to implement the formal programme, as long as athlete attendance is consistent.

The biggest mistake usually made is to commence the programme during the running season, generally because of a slump in performance. Coaches then resort to PST training

out of desperation. However, in such cases the training is rarely effective. These skills cannot merely be learnt overnight (Weinberg & Gould, 1999).

The programme commenced at the ideal time. However, due to the high attrition rate, and the limited time available for completion of the study, the programme was implemented a second time, commencing in January with the posttests implemented in October.

### **3.4.2 IMPLEMENTATION OF THE PROGRAMME**

In this section the five stages of the physical programme will be elucidated. The general structure of the programme was based on the stages outlined by Wann (1997). The reasons for selecting this structure were explained in Chapter 2. In order to simplify the facilitation of the programme, the athlete's worksheets were adapted from Winter and Martin's (1993) original materials and compiled into a handbook (see Appendix C) .

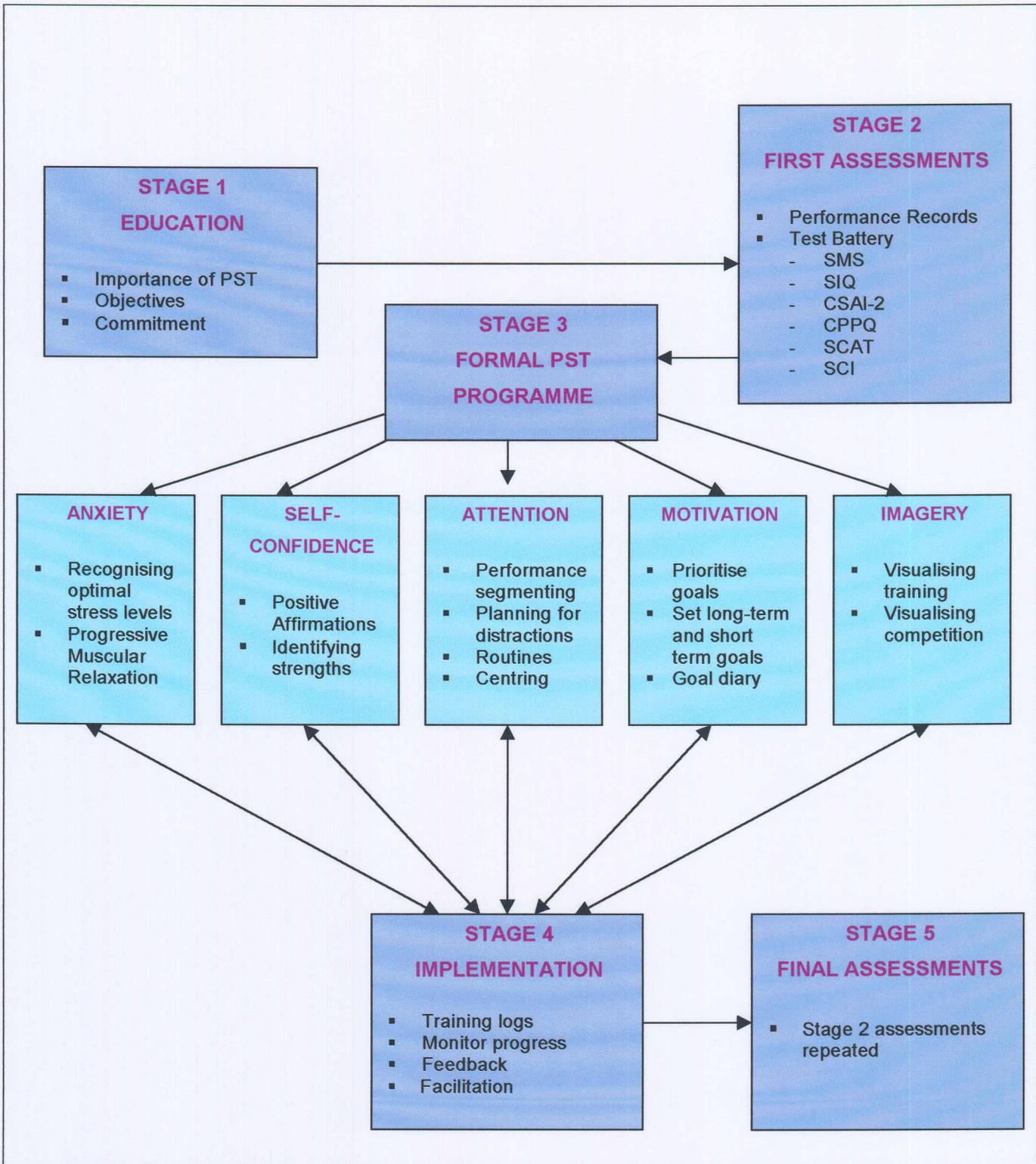


Figure 15: PST Programme

## **Stage 1**

### ***Educate about the importance of the programme***

The athletes were asked to state the psychological skills that they think are important in sprinting and how important they think the psychological aspect of performance is. The time and attention do they devote to psychological skills as opposed to physical skills was also discussed.

The athletes were explained to how psychological skills can be learnt just like physical skills (Weinberg & Gould, 1999).

The athletes were informed about the difference between educational and clinical sport psychology consultants. PST is an educational approach to mental preparation. If there are more serious problems, the athlete should consult a psychologist (Weinberg & Gould, 1999).

## **Stage 2**

### ***Assessment of psychological skills (psychometric testing) and athletic performance***

Six tests measuring self-confidence, stress levels, vividness of mental imagery, motivation, and concentration style were administered by the researcher.

#### **◆ Assessing Self-confidence**

The two inventories predominantly used to assess self-confidence are the Psychological Skills Inventory for Sport (PSIS) and The Sport Confidence Inventory (SCI). These two will be briefly discussed.

The PSIS is an inventory of psychological skills, self-confidence being one of skills evaluated (Hardy et al., 1996). Although Morris and Summers (1995) regard the PSIS as one of the major tests, Hardy and Nelson (1992) as cited in Morris and Summers (1995) have questioned the validity of its use in research.

The SCI assesses confidence both in physical and mental terms. This questionnaire can be used to identify which areas need to be worked on. The SCI was used to assess the sprinters' level of confidence (Weinberg & Gould, 1995).

◆ **Assessing Attentional Style**

Only one attention test is emphasised throughout the literature. Nideffer (1976) constructed the Test of Attentional and Interpersonal Style (TAIS) which will be elaborated upon.

The TAIS has 144 items and 17 subscales, 6 of which measure attentional style (Weinberg & Gould, 1999). The TAIS has proven its internal consistency. TAIS items correlate highly (median 0.53) within scales and moderately across scales. It also has good test-retest reliability. Test-retest reliability for the subscales ranges from a low of 0,60 to 0,93 with a median of 0,83. Evidence for its construct validity has been found, by correlating TAIS scale scores with the same individuals' scores on other psychometric instruments, like the Wechsler Adult Intelligence Scale and the Minnesota Multiphasic Personality Inventory (MMPI). With regard to its predictive validity, two studies have related TAIS scores to actual performance measures. In both studies, behaviour correlated with TAIS scores (Nideffer, 1976).

Although the TAIS was the ideal test to use, the only reason it wasn't utilised was because it was not cost-effective for the present purpose. The Concentration and Personality Profile

Questionnaire (CPPQ) was also developed by Nideffer (1994). It is a shortened version of the TAIS consisting 23 items, and measures the same constructs. The CPPQ asks the athletes to measure these constructs whereas the TAIS measures them directly (G. Miller, personal communication, April 4, 2001).

The relevant subscales of the CPPQ are the attentional subscales: width and direction.

◆ **Assessing Motivation**

The Sport Motivation Scale (SMS) was recently developed to assess motivation. This 28-item scale measures intrinsic motivation, extrinsic motivation and amotivation in sports settings. As Pelletier and his associates have only developed this instrument in 1995, there is little empirical research on the scale's reliability and validity. However, Pelletier et al. (1995) obtained preliminary evidence of the sound psychometric properties of the scale via two studies. The first study supported the seven-factor structure of the scale, provided some evidence for the construct validity for the SMS, and showed an adequate level of internal consistency. The second study indicated satisfactory test-retest reliability after being administered on two occasions.

◆ **Assessing Anxiety**

Anxiety is not generally assessed by one questionnaire. There are three predominant reasons for assessing cognitive and somatic anxiety separately:

- (i) The two types of anxiety may have different antecedents.
- (ii) They affect performance differently. Cognitive anxiety impacts more on purely cognitive tasks, while somatic anxiety will have a negative effect on refined motor tasks.

(iii) Treatment differs (Morris & Summers, 1995).

There are several cognitive measures of anxiety. The Manifest Anxiety Scale (MAS) ascertains chronic trait anxiety, but does not make any predictions with regard to differences in performance between high and low anxious persons. The State-Trait Anxiety Inventory (STAI) is a relatively precise measure of A-trait and A-state. However it is not sport specific. The Sport Anxiety Scale (SAS) measures cognitive and somatic anxiety. The two assessments that will be used are the SCAT and the CSAI-2. The Sport Competition Anxiety Test (SCAT) measures somatic anxiety. It measures the trait anxiety component only. The Competitive State Anxiety Inventory-2 (CSAI-2) measures state anxiety. It measures both cognitive and somatic anxiety (Morris & Summers, 1995).

Anxiety is not usually measure physiologically, because there isn't one single physiological response to the anxiety state. Somatic response to positive and negative arousal may be similar. The relationship between any two measures of anxiety is weak, different athletes' nervous systems respond differently to anxiety, and emotional and physiological responses can't be separated (Morris & Summers, 1995).

◆ **Assessing Imagery**

Martens's (1982) Sport Imagery Questionnaire (SIQ) appearing in Weinberg and Gould (1995, p.295) is the only sport-specific test. It measures imagery on a visual, auditory, kinesthetic and emotional level. Although it has not been sufficiently validated, it is widely used in applied sport psychology (Morris & Summers, 1995). This evaluation measures how well athletes can use all their senses when imagining (Weinberg & Gould, 1999). However as this is the only sport-specific questionnaire available, it was used in the current project.

### **Stage 3**

#### ***Psychological skills training per se***

Winter and Martin's (1993) PST programme for the South Australian Sports Institute was used to provide the training. The rationale for utilising this programme is set out in detail in Chapter 2.

An athlete's manual were adapted from their basic training programme (see Appendix C), in order to simplify facilitation of the programme.

The athletes were consulted three times a week for 2 hours per day by the researcher. Completing the worksheets was facilitated individually with each athlete. Although this could have been done in a group, and would have therefore been much less time-consuming, working with the athlete individually had numerous advantages. Valuable qualitative data was gleaned, rapport was established and it built trust in a manner that would not have been gained from group work, as several of the athlete's 'group persona' was very different from what was presented individually.

Although Winter and Martin's (1993) programme provides audio cassettes as training aids, the researcher personally presented the same information. The training exercises were practised in a group.

### **Stage 4**

#### ***Practice***

The athletes were given a period to overlearn the skills and systematically integrate them into their performance situations. This practice period lasted six months and provided the

athletes with an opportunity to integrate the mental skills into their training and competition situations.

## **Stage 5**

### **Assessments**

The same assessments used in stage 2 were re-administered by the researcher.

## **3.5 DATA COLLECTION**

In accordance with Wann's (1997) structure of the process of a PST programme, Stage 2 and Stage 5 of the programme represented the data collection phases of the study. The pretests were administered in Stage 2 and the posttests were administered in the final stage.

## **3.6 STATISTICAL PROCEDURES**

The choice of statistical techniques available was severely restricted as a result of the size of the sample. To test the first hypothesis, that is, to determine if there was a significant difference in psychological skills between the beginning and end of the programme, Wilcoxon signed ranked tests were used. This test was selected as it is a nonparametric test, that is, it can be used for ranked data, and for data for which the normal distribution cannot be assumed (Galpin, 2001). A paired t-test was used to determine if there is a significant improvement in athletic performance to test the second hypothesis, as the data to test this hypothesis was continuous and interval data. Furthermore, this data met the assumptions of normality, allowing a parametric test to be used (Rosenthal & Rosnow, 1991). To test the third hypothesis, performance was correlated with the various psychological skills using Spearman's correlation coefficient. Due to the nature of the data and the distribution of the

data, Spearman's coefficient was used instead of Pearson's  $r$ . (Rosenthal & Rosnow, 1991).

## Chapter 4

# RESULTS

The results of the analyses of the data are presented in this chapter. For each hypothesis or subhypothesis tested, it is stated where the data to test the hypothesis was located, a table summarising the results is displayed, and the results are analysed in terms of whether the relationship is significant or not.

### 4.1 ANALYSIS AND INTERPRETATION OF SCORES

#### 4.1.1 ANALYSIS AND INTERPRETATION OF TESTS FOR HYPOTHESIS 1

##### Hypothesis 1

**H<sub>1</sub>: There is a significant improvement in the psychological skills of sprinters at the end of the PST programme**

##### **Hypothesis 1a**

**H<sub>1a</sub> : There is a significant improvement in **self-confidence** levels of the sprinters at the end of the PST programme.**

The data to test this hypothesis was located in the pretest and posttest scores of the Self-Confidence Inventory (SCI). The inventory consisted of three scales: Underconfidence, Confidence and Overconfidence. The score on the Confidence scale was used.

Wilcoxon's test was administered on the difference between the pretest and posttest scores

of the SCI, and produced the following results:

Table 5

*Hypothesis 1a*

	Test Statistic	<i>p-value</i>	<i>df</i>
Wilcoxon	14.5	0.1747	14

At the 0.05 level of significance,  $p > 0,05$ . This implies that there is not a significant difference between the confidence scores at the beginning and at the end of the programme.

A possible reason for not being significant is the timing of the administration of the respective tests. The pretests were administered closer to the end of the season, while the posttests were administered closer to the begin of the competition season. At the end of the season, it is more likely that the athletes will remember past performances as they were more recent compared to the posttests, where the athletes have to think back to before the training period. And, past performance has been strongly linked to self-confidence (Morris & Summers, 1995).

**Hypothesis 1b**

**H<sub>1b</sub>** : There is a significant decrease in **stress** levels of the sprinters at the end of the PST programme.

Three types of stress were measured using two questionnaires. The data were located in the pretests and posttests of the Competitive State Anxiety Inventory 2 (CSAI-2) and the Sport Competition Anxiety Test (SCAT). The CSAI-2 consists of three subscales: cognitive state anxiety, somatic state anxiety and state self-confidence. The scores on the state self-confidence subscale will not be used. The SCAT score yields a measure of trait anxiety.

The Wilcoxon test examining the difference in cognitive state anxiety scores on the CSAI-2 yielded the following results:

Table 6

*Hypothesis 1b*

	Test Statistic	<i>p-value</i>	<i>df</i>
Wilcoxon	7.5	0.0047	14

At the 0.05 level of significance,  $p < 0.05$  . This implies that the difference in cognitive anxiety scores is significant.

Furthermore, an inspection of the basic statistical measures of central tendency of the pre- and posttest, indicate that the mean, median and mode on the posttest was lower than those measures on the pretest.

Table 7

*Measures of central tendency – Cognitive Anxiety*

	Pretest	Posttest
Mean	26,4	20,2
Median	27	20
Mode	31	24

Hence, it may be deduced that cognitive anxiety was significantly lower at the end of the PST programme.

The Wilcoxon test administered on the somatic state anxiety scores on the CSAI-2 generated the following results:

Table 8

*Hypothesis 1b (Somatic Anxiety)*

Test Statistic		<i>p-value</i>	<i>df</i>
Wilcoxon	9.0	0.0105	14

At the 0.05 level of significance,  $p < 0,05$ . This implies that there is a significant difference between the pretest and posttest scores.

Looking at the measures of central tendency of the scores, posttest measures were lower than pretest measures.

Table 9

*Measures of central tendency – Somatic Anxiety*

	Pretest	Posttest
Mean	26,7	22,3
Median	27	21
Mode	30	21

It can also be concluded that somatic state anxiety was lower at the end of the programme.

The Wilcoxon test administered on the SCAT scores supplied the following results:

Table 10

*Hypothesis 1b (Trait anxiety)*

	Test Statistic	<i>p-value</i>	<i>df</i>
Wilcoxon	14.0	0,0270	14

At the 0.05 level of significance,  $p < 0,05$ . This suggests that there is a significant difference between the pretest and posttest scores on the SCAT.

Taking into consideration the following measures of central tendency, posttest scores were less than pretest scores.

Table 11

*Measures of central tendency – Trait Anxiety*

	Pretest	Posttest
Mean	23,3	20,4
Median	25	21
Mode	25	14

It may therefore be assumed that trait anxiety also decreased after participation in the PST programme.

Hence, all three types of anxiety assessed, cognitive state anxiety, somatic state anxiety and trait anxiety were significantly reduced after participation in the PST programme.

**Hypothesis 1c**

**H<sub>1c</sub>** : There is a significant increase in the number of sprinters with a narrow-internal **attentional style** at the end of the PST programme.

The data is located in the Concentration and Personality Profile (CPPQ). The concentration profile describes the athletes on two dimensions. The first dimension is width, which may be broad or narrow. The second dimension is direction, which may be internal or external.

Wilcoxon's test was firstly applied to the data to determine if the width of attention of the athletes had changed to yield a greater number of athletes with a narrow width of attention.

The Wilcoxon test rendered the following results:

Table 12

*Hypothesis 1c*

	Test Statistic	P-value	DF
Wilcoxon	2.0	1,000	14

At the 0.05 level of significance,  $p > 0,05$  suggesting that there is no significant difference in the number of athletes with a narrow focus of attention.

The data was then examined to determine if the direction of attention of athletes has altered to produce more athletes with an internal direction of attention. A Wilcoxon test was again used to analyse the results, and produced the following information:

Table 13

*Hypothesis 1d*

	Test Statistic	P-value	DF
Wilcoxon	0.0	0,0078	14

At the 0.05 level of significance,  $p < 0,05$  . This indicates that there is a significant difference in the number of athletes with an internal focus of attention.

Table 14

*Frequencies – Direction of attention*

	Pretest	Posttest
Internal	1	6
External	14	9

An inspection of the amount of athletes with a specific direction of attention focus, reveals that there was an increase in the number of athletes with an internal focus of attention after participation in the PST programme.

Hence, it may be presumed that there is a significant increase in the number of athletes with an internal focus of attention.

### **Hypothesis 1d**

$H_{1d}$  : There is a significant improvement in intrinsic motivation levels of the sprinters at the end of the PST programme.

The data to test this hypothesis was located in the pretest and posttest scores on the Sport Motivation Scale (SMS). The SMS consists of seven subscales: amotivation, intrinsic motivation to know, intrinsic motivation to accomplish things, intrinsic motivation to experience stimulation, and the three types of external motivation, viz. external regulation, introjection and identification. A global score for intrinsic motivation was obtained by summing the scores on the scales measuring intrinsic motivation to know, intrinsic motivation to accomplish things, and intrinsic motivation to experience stimulation.

The Wilcoxon test administered on the total intrinsic motivation scores produced the following results:

Table 15

*Hypothesis 1d*

	Test Statistic	<i>p-value</i>	<i>df</i>
Wilcoxon	51.0	0.6087	14

At the 0.05 level of significance,  $p > 0,05$ . This denotes that there is no significant difference in intrinsic motivation scores between the begin and end of the PST programme.

This result could have been guessed even prior to statistical analysis of the scores. The high rate of attenuation experienced probably already revealed that intrinsic motivation had not increased.

Although the process of goal setting is relatively straightforward, its simplicity may also have been its weakness. It may be speculated that the athletes may sometimes consider the idea of goal setting rather dull and boring (Morris & Summers, 1995). The experience of sport psychologists suggests that there are few athletes who actually utilise the technique of goal setting to its optimum. For goal setting to be genuinely effective in increasing intrinsic motivation, it needs to be an integral part of the athlete's total programme. This necessitates the coach allocating attention and time to reviewing of training and competition goals (Morris & Summers, 1995). Although the athletes were given an implementation phase to integrate skills into their total programme, the coach and sport psychology consultant operated parallel to each other. This limited the effectiveness of the development of the technique of goal setting and the programme as a whole.

## Hypothesis 1e

$H_{1e}$  : There is a significant improvement in vividness of mental imagery of the sprinters at the end of the PST programme.

The data testing this hypothesis was located in the pretest and posttest scores on the Sport Imagery Questionnaire (SIQ).

The Wilcoxon test administered produced the following results:

Table 16

*Hypothesis 1e*

	Test Statistic	<i>p-value</i>	<i>df</i>
Wilcoxon	9.0	0,0037	14

At the 0.05 level of significance,  $p < 0,05$ , implying that there is a significant difference in imagery scores.

A review of the basic measures of central tendency indicate that scores on the posttest were less than scores on the pretest.

Table 17

*Measures of central tendency – Imagery*

	Pretest	Posttest
Mean	34,9	27
Median	32	27
Mode	33	23

Thus, it may be deduced that vividness of mental imagery improved at the end of the programme.

#### 4.1.2 ANALYSIS AND INTERPRETATION OF TESTS FOR HYPOTHESIS 2

##### Hypothesis 2

**H<sub>2</sub> : There is a significant improvement in athletic performance of the sprinters at the end of the PST programme**

The data to test these hypotheses were located in the coach's performance records of the personal best times on the one-hundred metre event of the athletes at the beginning and end of the PST programme.

The t-test administered produced the following results:

Table 18

*Hypothesis 2*

T-Tests			
Difference	<i>df</i>	<i>t Value</i>	<i>Pr &gt;  t </i>
Posttest - pretest	9	-3.41	0.0077

At the 0.05 level of significance,  $p < 0,05$ . This indicates that there is a significant difference between athletic performance at the beginning and end of the programme.

An examination of the basic central tendency measures reveal that posttest values are lower than pretest values.

Table 19

*Measures of central tendency – Athletic performance*

	Pretest	Posttest
Mean	12,413	12,146
Median	12,375	12,225
Mode	13	12

Hence, it may be inferred that there is an improvement in athletic performance after participation in the PST programme.

#### 4.1.3 ANALYSIS AND INTERPRETATION OF TESTS FOR HYPOTHESIS 3

##### Hypothesis 3

**H<sub>3</sub> : There is a significant relationship between the increase in athletic performance of the sprinters and the enhancement of psychological skills at the end of the PST programme.**

##### **Hypothesis 3a**

**H<sub>1a</sub> :** There is a significant correlation between the athletic performance of the sprinters and self-confidence at the end of the PST programme.

The data to test this hypothesis was located in the difference between the personal best times at the beginning and end of the programme, and the difference between self-

confidence scores at the beginning and end of the programme. These two values were correlated using Spearman's Correlation Coefficient. The analysis generated the following results:

Table 20

*Hypothesis 3a*

Spearman Correlation Coefficients	
Prob >  r  under H0: Rho=0	
Number of Observations	
	Self-confidence
	0.03395
Athletic Performance	0.9258
	10

At the 0,05 significance level,  $p > 0,05$  implying that the correlation is not significant.

**Hypothesis 3b**

**H<sub>1b</sub>**: There is a significant correlation between the athletic performance of the sprinters and stress levels at the end of the PST programme.

The data to test this hypothesis was located in the difference between the personal best times at the beginning and end of the programme, and the difference between cognitive anxiety (CSAI-2) scores, somatic anxiety (CSAI-2) scores and trait anxiety (SCAT) scores on the pretest and posttest. These two values were correlated using Spearman's Correlation Coefficient. The analysis produced the following results:

Table 21

*Hypothesis 3b (cognitive anxiety)*

Spearman Correlation Coefficients	
Prob >  r  under H0: Rho=0	
Number of Observations	
	Cognitive anxiety
	0.18829
Athletic performance	0.6024
	10

At the 0,05 significance level,  $p > 0,05$  implying that the correlation is not significant.

Table 22

*Hypothesis 3b (somatic anxiety)*

Spearman Correlation Coefficients	
Prob >  r  under H0: Rho=0	
Number of Observations	
	Somatic anxiety
	-0.17848
Athletic performance	0.6218
	10

At the 0,05 significance level,  $p > 0,05$ . This indicates that the correlation is not significant.

Table 23

*Hypothesis 3b (trait anxiety)*

Spearman Correlation Coefficients	
Prob >  r  under H0: Rho=0	
Number of Observations	
	Trait anxiety
	0.06791
Athletic performance	0.8521
	10

At the 0,05 significance level,  $p > 0,05$ . This implies that the correlation is not significant.

### Hypothesis 3c

$H_{1c}$ : There is a significant correlation between the athletic performance of the sprinters and the narrow and internal attentional style at the end of the PST programme.

The data to test this hypothesis was located in the CPPQ pretest and posttest results and the personal best times at the beginning and end of the programme. These two values were correlated using Spearman's Correlation Coefficient. The analyses generated the following results:

Table 24

*Hypothesis 3c (width)*

Spearman Correlation Coefficients	
Prob >  r  under H0: Rho=0	
Number of Observations	
	Width
	-0.50912
Athletic Performance	0.1329
	10

Table 25

*Hypothesis 3c (direction)*

Spearman Correlation Coefficients	
Prob >  r  under H0: Rho=0	
Number of Observations	
	Direction
	0.35028
Athletic performance	0.3211
	10

The p values for both width and direction are > 0,05. This implies that both correlations are insignificant.

### Hypothesis 3d

**H<sub>1d</sub>** : There is a significant correlation between the athletic performance of the sprinters and intrinsic motivation levels at the end of the PST programme.

The data to test this hypothesis was located in the difference between the personal best times at the beginning and end of the programme, and the difference between intrinsic motivation scores assessed by the SMS at the beginning and end of the programme. These two values were correlated using Spearman's Correlation Coefficient. The analysis generated the following results:

Table 26

*Hypothesis 3d*

Spearman Correlation Coefficients	
Prob >  r  under H <sub>0</sub> : Rho=0	
Number of Observations	
	Intrinsic motivation
	0.5662
Athletic performance	0.0879
	10

At the 0,1 level of significance,  $p < 0,1$ , in conjunction with the  $r$  value of 0.5662 indicates that there is a significant correlation between intrinsic motivation and athletic performance.

### Hypothesis 3e

**H<sub>1d</sub>** : There is a significant correlation between the athletic performance of the sprinters and

vividness of imagery at the end of the PST programme.

The data to test this hypothesis was located in the difference between the personal best times at the beginning and end of the programme, and the difference between imagery scores of the SIM on the pretest and posttest. These two values were correlated using Spearman's Correlation Coefficient. The analysis yielded the following results:

Table 27

*Hypothesis 3e*

Spearman Correlation Coefficients	
Prob >  r  under H0: Rho=0	
Number of Observations	
	Imagery
	0.08025
Athletic performance	0.8256
	10

At the 0,05 significance level,  $p > 0,05$ . This indicates that the correlation is not significant.

## Chapter 5

# CONCLUSION

This chapter concludes the research report presenting the strengths and limitations of the study, and recommendations for future research.

### 5.1 STRENGTHS OF THE STUDY

#### *5.1.1 Effectiveness of the PST programme*

The programme tested led to an improvement of several psychological skills. Cognitive state anxiety, somatic state anxiety and trait anxiety were reduced, and the vividness of mental imagery was enhanced, and a higher number of athletes had an internal focus of attention after participation in the PST programme. However, the programme failed to strengthen intrinsic motivation, boost self-confidence and increase the number of athletes with a narrow focus of attention.

In a review of 23 studies published by Greenspan and Feltz (1989) and cited in Weinberg and Gould (1999), Greenspan and Feltz concluded that in general educationally based psychological interventions effectively enhance competitive performance of collegiate and adult athletes. Vealey's 1994 review, also cited in Weinberg and Gould (1999), found that in 9 of 12 studies psychological interventions led to improved performance (Weinberg & Gould, 1999). The present study is approximately consistent with these previous studies, as there was an overall improvement in psychological skills and performance.

### **5.1.2 Multiple skills under investigation**

According to Gould and Krane (1992) as cited in Morris and Summers (1995) much of the research in sport psychology limits its theoretical value by testing only one theory in a particular study. They suggest testing two or more theories in the same study in order to glean more information.

Although the present study did not test theories, it considered more than only one skill. Martens (1987) contends that psychological skills are closely interrelated. He depicted the relationship between some psychological skills as illustrated in Figure 16 (Appendix A).

## **5.2 LIMITATIONS OF THE STUDY**

### **5.2.1 Sample size**

The small sample size is perhaps the biggest limitation of the study, having two major implications on the statistics. Firstly, it reduced the power of the study, and secondly, it limited the range of statistical procedures suitable for analysis of the present data.

Power refers to the probability of rejecting the null hypothesis when the null hypothesis is false, and therefore requires rejecting. It is the probability of not overlooking an effect or relationship that exists. Power depends on the test statistic used to determine the significance level, the level of alpha ( $\alpha$ ), the sample size and the size of the effect being studied (Rosenthal & Rosnow, 1991). The relatively small sample size, in conjunction with small effects being significant when testing using athletic performance as a variable, implies low power levels for this study.

This is particular evident in the testing of Hypothesis 3. Hardly any significant correlations

were found. This was likely due to the small sample size, rather there actually not being significant correlations (Rosenthal & Rosnow, 1991).

The small sample size also ruled out the use of more suitable statistical procedures. Multivariate techniques could have been more appropriate to illustrate the relationship between psychological skills and performance.

Despite the sample size being a serious problem, it is a difficulty that will be tough to overcome. Athletic teams are generally restrictive in terms of numbers. In order to obtain a large sample size, a study of this nature will have to be carried out on a large scale, and will require ample resources. However, many between group differences will also prevail amongst the teams, which could threaten the external validity of such studies.

### ***5.2.2 Duration of the programme***

Although the programme spanned nine months, some athletes were injured for a significant proportion of the programme, which gave them limited opportunities for practice and implementation of physical and psychological skills. This in turn affected performance on the posttests and personal best times at the end of the programme.

### ***5.2.3 Attrition***

When the PST programme commenced, there were 25 athletes in the sprinting team. At the end of the programme, only 15 of those athletes were still on the team. 40% of the participants had dropped out of the sprinting team. Out of the 10 dropouts, 5 dropped out because they had entered full-time employment, 2 had received sport scholarships at other tertiary institutions and 1 no longer had the time for training because her studies had become very demanding. Only 2 athletes dropped out due to amotivation.

Besides being a major threat to the completion of the present study, the scale of attrition from sport, especially in the teenage years is a serious concern to sport organisations too (Morris & Summers, 1995).

#### **5.2.4 Commitment to the PST programme**

The education phase initially appeared to be successful. The athletes unanimously agreed that psychological skills training was important and indispensable, and needs to be done on a regular basis. They were very enthusiastic about the PST programme. However, in practice, athletes were hesitant to actually devote time to their mental training, preferring to utilise their time for physical training instead. The athletes' lack of commitment to the programme could have been a significant factor affecting the impact of the programme.

A possible method of dealing with this problem, could be to follow the goal setting process discussed in the section of motivation. This process should take place at the beginning of the programme and be specifically related to psychological skills development.

#### **5.2.5 Limitations of the research design**

The criticisms of the research design employed were discussed in Chapter 3. Of particular relevance to the present study is the issue of maturation. Athletic performance could have improved simply by maturation while adhering to the regular training programme, and not due to the impact of the PST programme.

A simple longitudinal design would have countered this problem to a large extent. The same sprinters athletic performance and psychological skills could have been measured over

several years before implementation of the programme (Rosenthal & Rosnow, 1991).

### **5.2.6 Limitations of the PST programme**

#### ◆ **Lack of a team building component**

Vogt and Griffith (in Morris & Summers, 1995, p.423), define team building as “the process by which a work group becomes more effective in accomplishing its tasks and in satisfying the needs of group members”.

Despite sprinting competitions focusing on individual achievement, the sprinters trained as a team. Hence, team spirit emerged as being very meaningful. Amongst numerous other motives, Weinberg and Gould (1999) listed social approval and “family” as possible motives for participation. Teammates are significant as they provide social approval and a sense of family. Several sprinters’ motivation to attend training was negatively affected by these needs not being adequately met. Including a team building component, may have been a beneficial strategy to strengthen motivation.

#### ◆ **Personal counselling**

Parfitt and Hardy (1993) as cited in Morris and Summers (1995) contend that one of the roles of the sport psychology consultant is that of a counsellor. As a counsellor, the sport psychology consultant can assist the athlete with problems like coping with injuries, disappointing performances in competition, and low motivation (Morris & Summers, 1995). But besides such problems that are directly related to performance, personal problems can also impact on performance. Hence, very often it is necessary for the sport psychology consultant to provide counselling for personal problems too. Winter and Martin’s (1993)

programme does not provide a facilitator with any training in basic counselling skills.

◆ **Psychology of the athlete**

One of deficiencies of the study is that self-confidence was not boosted. Research into effective techniques to modify athletic self-confidence has been limited. Mental skills are vital strategies to be used in the development of self-confidence. However, self-confidence is only one component of the athlete's psychology – childhood experiences, belief systems, emotions and cognitions . To alter the psychology of the athlete requires moving the athlete from one set of perceptions and habits to a new set that augments self-confidence. Self-confidence will only be enhanced if the psychology of the athlete is changed. Hence, attention needs to be focused on the psychology of the athlete and the mechanisms for change (Morris & Summers, 1995).

• **Relevant life skills**

The present PST programme demanded facilitating the development of certain life skills that did not affect performance directly on an ad hoc basis. Two life skills that were recurrently visited were time management and problem solving skills.

◆ **Injuries and illness**

Many athletes participating in the programme missed out on training sessions for a considerable duration due to sport injuries or illness. Injuries and illness create a new set of pressures for athletes. Not only do these athletes have to endure the psychological trauma associated with the physical pain and sometimes stressful treatment, but they are also vulnerable to the frustration of not being able to train and compete, and in some cases, they

can't even participate in their usual life activities. Studies by Kolt and Kirkby (1994), Madden, Kirkby and Mc Donald (1989), and Kirkby, Kolt and Lindner (1995) as cited in Morris and Summers (1995) have revealed a connection between injury and negative psychological states in athletes.

Winter and Martin's (1993) programme did not deal directly with coping during illness or when injured. Consequently, when the athletes were injured, they also missed out on psychological skills training.

## **5.3 RECOMMENDATIONS**

### **5.3.1 Longitudinal research**

Sport psychology research has predominantly been cross-sectional. Very few studies have observed the same group of subjects over an extended period of time to understand development and change processes. Longitudinal research appears to be relatively unattractive largely because both the organisations interested in the practical outcomes of research, and the academics who judge each others work on by published reports, expect a rapid outcome (Morris & Summers, 1995).

Longitudinal research on the impact of psychological skills training on athletic performance could present a more comprehensive understanding on the internalisation of psychological skills and their long-term impact on athletic performance (Morris & Summers, 1995).

### **5.3.2 Consideration of Maslow's hierarchy of needs**

Within the South African context, it is essential to take Maslow's hierarchy of needs into

consideration when implementing a psychological skills training programme. According to Maslow's (1970) theory of self-actualisation, as cited in Weiten (1989) human needs are organised in a hierarchy, and lower level needs must be satisfied before higher needs can be fulfilled (see Figure 17, Appendix A), (Weiten, 1989). This theory was strikingly evident when working with sprinters from diverse backgrounds. Coming from an impoverished environment resulted in athletes missing training sessions because of not being able to afford transport costs, hunger, or quitting athletics completely to enter full time employment. At an elite level of competition, this may not be as serious a problem, but at the level of the present study, financial issues contributed to the high attrition rate. This programme facilitates self-actualisation, and psychological skills become secondary if lower level needs are not being met. Without even considering higher level needs, how can an athlete even run optimally if he is starving!

### **5.3.3 Needs analysis and flexibility**

Morris and Summers (1995) cite Parfitt and Hardy's (1993) criticisms of the highly structured approach to psychological skills training. Parfitt and Hardy stress the importance of a needs analysis in the early stages of working with an athlete. It is not always safe to assume that PST is the treatment of choice in all circumstances. As was evident from the programme, there may be time-management or personal life difficulties. Other potential issues include coach-athlete communication problems, psychological barriers from a major injury, or anxiety about a career in sport. Failure to check for such problems may lead to wasted time, effort and other resources and consequently providing ineffective PST (Morris & Summers, 1995).

Although all the athletes were assessed at the beginning of the programme, they were only tested on the skills that they were going to receive training in. Because a structured programme was going to be administered and tested, all the modules were adhered to, even

when athletes had an adequate score for a particular skill. Additional problems that were prevalent were dealt with when they were identified during the programme. This was the biggest advantage of facilitating the programme with each athlete individually. Morris and Summers (1995) advocate this type of flexibility, emphasising that each athlete is different and what is appropriate in one situation may not be appropriate in another.

## 5.4 CONCLUSION

Wann's (1997) framework and Winter and Martin's (1993) programme have much to offer to the development of psychological skills, particularly stress management, attention and mental imagery. However, more techniques for enhancing self-confidence and intrinsic motivation can be included.

The present study adequately illustrated that a psychological skills training programme has a positive impact on the development psychological skills. An increase in athletic performance was also revealed. However, the precise relationship between the enhancement of psychological skills and the improvement of athletic performance is still unclear, as the very small sample size increases the likelihood of rejecting the null hypothesis when the null hypothesis is false, and requires rejecting.