THE EFFECT OF SELF-TALK AS AN ANXIETY REGULATION INTERVENTION ON COINCIDENT ANTICIPATION TIMING AND BATTING PERFORMANCE IN CRICKET

By

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Declaration

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Abstract

Ways, in which anxiety levels can be managed, in order to achieve optimal performance, has constantly been given attention in the sport psychology literature. Theories, hypotheses and explanations on how anxiety can be managed, using different strategies, are proposed, but little scientific research has tested these strategies. Previous research in the field of sports psychology suggests that the topic of anxiety has been a particularly strong focus of research. Little is however known about the use of self-talk as an anxiety regulation strategy. Therefore the intervention programme in this study focused on piloting the implementation and use of self-talk as an anxiety regulation strategy to improve coincident anticipation timing and batting performance in cricket

The sample used in this study included fifteen cricket players, who played at an intermediate level, who were randomly divided into a control group (n= 8) and an experimental group (n=7). They performed in the pre-test, post-test and retention test, which consisted of a coincident anticipation timing test (CAT) and a batting performance test (BPT). The BPT tested the batsmen in shot accuracy and their quality of interception. At each testing stage the batsmen were required to fill out a revised version of the Competitive State Anxiety Questionnaire (CSAI-2R) and the Self-Talk Questionnaire (STQ). Only the experimental group received the 3 week intervention programme.

Results indicated that although the performance of both groups improved during the study, in the CAT and BPT tests, no significant improvements were seen as a result of the Self-Talk Anxiety Regulation Strategy. The experimental group showed a decrease in anxiety levels. However, the results were not significant.

From this study, it can be concluded that self-talk as an anxiety regulation intervention, did not have a significant effect on the coincident anticipation timing or batting performance (shot accuracy or quality of interception) of cricket batsmen. Self-talk as an Anxiety Regulation Strategy did not have a significant reduction on the anxiety levels of cricket batsmen.

The implication of these findings suggests that self-talk may not an effective anxiety regulation strategy for cricket batsmen. However, more research needs to be done specifically on the implementation and use of self-talk as an anxiety regulation strategy, on an individual basis and how it can be used effectively in order to achieve optimal performance.

Key words: anxiety, cricket batting, self-talk, coincident anticipation timing, batting performance

Opsomming

Die maniere waarop angsvlakke bestuur kan word om optimale prestasie te bevorder geniet amper konstante aandag in die sportsielkunde-literatuur. Teorieë, hipoteses en verduidelikings oor die maniere waarop angs, deur middel van verskeie strategieë, bestuur kan word, word voorgestel, maar daar is min wetenskaplike navorsing wat hierdie strategieë toets. Vorige navorsing op die terrein van sportsielkunde wys daarop dat angs, as navorsingsfokus, baie aandag geniet. Min is egter bekend oor die gebruik van selfspraak as ‘n angs-reguleringstrategie. Die intervensieprogram in hierdie studie het dus op die loods, implementering en gebruik van selfspraak as ‘n angs-reguleringstrategie gefokus om gelyktydige antisiperende tydsberekening en kolfprestasie in krieket te verbeter.

In hierdie studie is gebruik gemaak van vyftien krieketkolwers wat lede was van die Maties Krieketklub van die Universiteit van Stellenbosch. Al die kolwers moes ‘n hersiene weergawe van die “Competitive State Anxiety Questionnaire (CSAI-2R)” en die “Self-Talk Questionnaire (STQ)” invul. Daarna moes hulle aan die voortoets deelneem, wat bestaan het uit ‘n gelyktydige antisiperende tydsberekeningstoets en ‘n kolfprestasietoets. In laasgenoemde toets is die akkuraatheid van kolwers se houe en die kwaliteit van balintersepsie getoets.

Daarna is die kolwers ewekansig in ‘n kontrolegroep en ‘n eksperimentele groep verdeel. Slegs die eksperimentele groep het toe die intervensie ontvang. Dit het bestaan uit ‘n program wat drie weke lank geduur het, en het ingesluit twee krieketoefeninge waarin hulle geleer is hoe om die selfspraakstrategieë te gebruik en te implementeer. Albei groepe moes toe weer die “Competitive State Anxiety Questionnaire (CSAI-2R)” en die “Self-Talk Questionnaire (STQ)” invul. Al vyftien kolwers moes toe deelneem aan die na-toets en twee weke later ook aan die retensietoets, wat in albei gevalle weer die invul van die vraelyste ingesluit het, sowel as die gelyktydige antisiperende tydsberekeningstoets en die kolfprestasietoets. Nadat die na-toets en retensietoetse plaasgevind het, is die selfspraakprogram aan die kontrolegroep gebied.

Die resultate het aangedui dat beide groepe se prestasie in die gelyktydige antisiperende tydsberekeningstoets en die kolfprestasietoets tydens die studie verbeter het. Geen beduidende verbetering het plaasgevind as gevolg van die selfspraakprogram nie. Alhowel die eksperimentele groep ‘n afname in angsvlakke getoon het, was dit nie statisties beduidend nie.

Die resultate van hierdie studie het dus aangetoon dat selfspraak as ‘n angsregulerende intervensie nie ‘n beduidende uitwerking gehad het op die gelyktydige antisiperende tydsberekening en die kolfprestasie (akkuraatheid van houe en kwaliteit van balintersepsie) van kolwers nie. Daar was ook geen beduidende afname in die angsvlakke of **selfvertroue** van kolwers as gevolg van die selfspraak as angsregulerende intervensie nie.

Sleutelwoorde: angs, krieketkolfwerk, selfspraak, gelyktydige antisiperende tydsberekening, kolfprestasie

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Opinions expressed and conclusions arrived at, are those of the author and do not necessarily reflect those of the above institutions.

Table of Contents

List of Figures

List of Tables

List of Abbreviations Used

ANOVA: Analysis of Variance

A-State: State anxiety

A-Trait: Trait anxiety

BAT: Bassin Anticipation Timer

BPT: Batting Performance Test

CAT: Coincident Anticipation Timing

CBM: Cognitive Bias Modification

CSAI-2R: Competitive State Anxiety Inventory-Second Revised

km/h: kilometres per hour

km: kilometres

min: minutes

mph: miles per hour

ms: milliseconds

p.: page number

QE: Quiet Eye

SAM: Self-help for Anxiety Management

CHAPTER ONE
INTRODUCTION

1.1. Background and Context of the Study

In recent years South Africa has hosted large scale events such as the Rugby World Cup, Cricket World Cup and the FIFA World Cup football. This hints at a belief by powerful interests that sport continues to play an important role in the "new" South Africa (Nauright, 2007). There is constant attention being drawn to what the youth in our country can achieve in order to empower themselves and others. Sport has had a huge impact on this and on the integration of people from different backgrounds, cultures and ethnic groups. It has also provided opportunities for historically disadvantaged individuals to be part of a team or compete individually in their chosen sport.

In a country where there is constant exposure to violence, poverty and gangsterism, sport can also provide individuals, communities and organisations with a way to combat some of these issues or other issues related to these struggles, like drug and alcohol usage. One such example is an American-based non-profit organisation called Grassroots which aims to promote HIV/AIDS education and prevention in Africa and build resiliency among teens, through the power of soccer (Peacock-Villada, DeCelles, Banda, 2007). Hence, sport is not only used to encourage a healthy lifestyle and physical activity, but also used as a tool to tackle socio-economic issues in South Africa.

Much emphasis is placed on competitive sports at school and at university level in South Africa. A huge amount of effort goes into encouraging students, from a young age, to participate in sport and much emphasis is placed on performance and sporting success. For example, at most schools it is compulsory for a student to take part in a summer and winter sport. The sports that are mostly offered are rugby, hockey, netball, soccer and cricket. Excelling in any of these sports has the potential to lead to opportunities for bursaries at school and at university level. This can provide a huge incentive for individuals to do well in sport, in order for them to attend university, whereas before, particularly for previously disadvantaged persons, this might not have been possible. Another advantage of taking part in sport or being part of a team could also be that if the team or individual performs well, there might be an opportunity to travel extensively and take part in sport on an international level.

However, in order for South African youth to perform well in sports and because of the role that sports plays in this country, more research is needed into the factors that affect optimal performance in sport. Most of the research done in this field is conducted in high income western countries. The findings of these studies are relied on in terms of interventions used to improve sports performance in South Africa. However, because of the diversity of the South African population, in terms of physical, emotional and psychological needs, we need research with a focus on South African individuals.

In terms of assessments according to Foxcroft (1997, p.231) "there is urgent need to develop and norm culturally appropriate tests for the South African population, as this will generally enhance the fair and ethical use of tests". Researchers need to recognise cultural variation and related variables like language, education, acculturation to western society and socio-economic background, for instance, as moderators of psychological test performance in South Africa (Bedell, Van Eeden & Van Staden, 1999). It is within this context that I set out to pilot a self-talk anxiety intervention with young male cricketers living in the Western Cape province of South Africa.

1.2. Rationale

This study takes place in the broad context of a time where more research is being conducted and there is a move to include not only the physical aspects, but also the impact that psychological constructs, like anxiety, self-confidence and cognitions have on individuals and as a results on their performance in sport. Cultural barriers that inhibited the ideas of psychological aspects that affect performance are also being broken down by the integration of people from different ethnicities and psycho-education of the population. There is an increase in research being done within the sports psychology field, with South African populations.

With the rise of technology in South Africa today, more knowledge on sports performance and psychological aspects thereof is becoming accessible to people, even in the poorer communities. Therefore the dissemination of information with regards to this, particularly to the youth, is easier. There is a definite need for the focus of research in psychological sports performance, as in this study, to be done with students, whether at school or universities. Of particular interest and with regards to the current study, is the impact that the psychological aspect of anxiety has on the performance of an individual, in the game of cricket.

Anxiety as a variable in sports performance, as discussed below is a complex aspect to operationalise and measure. Ways, in which it can be measured, in order for strategies to manage anxiety to be developed, need to be researched more thoroughly. Many studies are done on enhancing performance, using a mental skills package. This is geared towards psychological performance in general and not always specifically towards managing anxiety. Many of the studies geared towards managing anxiety use multiple or combined strategies or techniques. Only a few studies have dealt with self-talk as a strategy specifically to manage anxiety, in order to improve performance.

Therefore, in order for athletes to perform optimally and in order for sports psychologists to provide athletes with interventions to help them manage anxiety, it is vital that a sound theoretical knowledge of the performance anxiety relationship is gained, as well as the underlying mechanisms that affect anxiety. The focus of this study was to examine self-talk as an anxiety regulation intervention on coincident anticipation timing and how these impact on performance in sport, particularly cricket batting. Therefore, an understanding of the relationship among the three, namely anxiety, coincident anticipation timing and cricket batting is paramount.

The understanding of the interactions among these variables is especially important in the game of cricket. When batting, which is an interceptive timing task, decisions about when to hit the ball and when to move to make contact with the ball, need to be made in split seconds. Anxiety regulation strategies, such as the one that was used in this study, namely self-talk as a mental preparation routine, should assist the batsman to cope with variable conditions and multiple stimuli, particularly under conditions of stress and competition. The specific mental preparation strategy that was used in this study was that of self-talk.

1.3. Anxiety and Sports Performance

One of the aspects of psychological performance is that of anxiety and how it affects an individual (Jones, 2002). Anxiety and the effect that is has on sports performance is widely researched and more focus is being given to this area within the sports psychology field. The reasons for this according to Hanton and Connaughton (2002) are firstly, because athletes need to perform at their best in highly anxiety-producing situations during competition. Secondly, sports psychologists are constantly aiming to produce interventions that will aid athletes to cope in these high pressured situations, therefore more knowledge needs to be attained with regards to the anxiety-performance relationship (Hanton & Connaughton, 2002).

Although there is more and more research into the anxiety-performance relationship, much of it has been one-dimensional and quite simplistic (McNally, 2002). Examples of these include early theories like the Inverted-U hypothesis (Yerkes & Dodson, 1908) and Drive theory (Hull, 1943), which looked into the arousal and performance relationship. The majority of research that has been done in sports psychologies claims that anxiety affects performance in a negative way and that it does not lead to or facilitate optimal performance. Little insight has been given into how and why anxiety affects performance, in other words looking at the underlying mechanisms of anxiety-performance relationship. In sport different levels of anxiety will impact on performance and decision making. What is regarded as important by Janelle (2002) is the influence that anxiety exerts upon the complex coordination of underlying mechanisms, such as attention, memory and vision and action.

The four most commonly researched and implemented psychological skills/techniques in sport are imagery, relaxation, self-talk and goal setting (Hardy et al., 1996). Different techniques and strategies are used by different athletes to regulate anxiety, one of which is using a basic psychological technique like self-talk. Other examples of strategies could be arousal energising techniques, relaxation responses, biofeedback, cognitive behavioural therapy and mental preparation routines (Gould & Udry, 1994). This study focused on a cognitive behavioural strategy, but more specifically looking into the use, functions and effectiveness of self-talk as an anxiety regulation strategy. These different strategies and techniques will be discussed in more detail later on.

1.4. Anxiety and Performance in Cricket Batting

Cricket is a sport that requires an immense amount of strategic thinking and is one of the most mentally challenging sports an individual can play (Bull, Shambrook, James & Brooks, 2005). This leaves many sports psychologists with the challenge of how to improve performance, specifically mental performance, in order to enhance physical performance. Anxiety can have the potential to affect performance negatively or positively, whether an individual's speciality is cricket batting, bowling, wicket keeping or fielding.

Certain aspects in the game of cricket, like batting performance, will be affected by the levels of anxiety an individual experiences. Batting in cricket is an example of a complex coordination in which the batsman may experience high levels of anxiety, which can affect his/her attentional control and success in timing the interception with the ball, as well as direction, accuracy of shot and speed of the ball. It is therefore important for batsmen to be able to regulate their anxiety levels in order to perform at their best. Some decisions in cricket batting need to be quick and spontaneous, while others are more calculated and require more time. Both of these decision-making aspects can be affected by anxiety.

Planning and control of specific sports actions, like cricket batting, require decisions to be made that will be most effective for the game and these will sometimes require split second decisions. For example, according to Land and Mcleod (2000), a cricket batsman sometimes only has between 100-200 milliseconds (ms) to follow the trajectory of a ball, after it has bounced and handle late changes in the flight of a ball. This would mean that being able to accurately anticipate the flight path of the ball is highly advantageous.

In fact, what makes sport experts differ in their ability is the way that they use the amount and type of knowledge to anticipate better and make more effective decisions (Williams, Davids, & Williams, 2005). Coincident anticipation timing consists of "timing an impulse type of response (pressing a button) to coincide with the moving object's arrival at the target" (Lobjois, Benguigui, & Bertsch, 2005, p. 398). For example if we look at a batsman who will use his vision to watch the ball and other cues that the bowler might give, (that could indicate the movement of the ball), he needs to anticipate when to move, in order to hit the ball at the exact time that his decision coincides with when the ball arrives. This decision can be hugely impacted on by anxiety, which in turn can affect attention and focus, for example.

Batting performance or performance in the skill of batting, specifically cricket batting, requires a complex interaction between decision making processes, other cognitive processes and motor coordination. Strategies need to be geared towards addressing this complex interaction and how anxiety impacts on these different variables, like attention and self-confidence for example, that could be influenced. One such technique that is used in an attempt to address anxiety and the effects thereof is that of self-talk. The present study looked specifically at the influence of self-talk as an anxiety regulation strategy on the decision of coincident anticipation timing, in cricket batting.

1.5. Anxiety, Self-talk, Self-Confidence and Attention

Research into the anxiety performance relationship, in the past, could be said to only have started to scratch the surface of what was truly happening in terms of what variables anxiety was having an impact on. Whether the impact is of a positive nature or a negative nature, or both is still unclear. However, what is clear is that there is a definite link between the effects of anxiety and underlying cognitive mechanisms. Some of the mechanisms researched that could be said to impact on this interaction are aspects such as effort, motivation, attention, working memory and self-confidence.

In the current study it is proposed, based on theoretical evidence, that there is a link specifically between anxiety, attention and self-confidence. It is hypothesised that if anxiety levels can be decreased, then this will result in an increase in attention and self-confidence and hence an improvement in performance. This is built on the premise that anxiety has a debilitating effect on performance. The aim of this study was to implement an intervention that uses self-talk as an anxiety regulation strategy. This in turn will cause attention to the task at hand (CAT, shot accuracy and quality of interception) to improve and self-confidence to increase, hence causing an increase in optimal performance. Anxiety and self-confidence were measured using the CSAI-2R as mentioned before.

1.6. Research Aim, Objectives and Hypotheses

The research aim, objectives and hypotheses were:

1.6.1. Aim

The aim of this study was to pilot an intervention to investigate the effect of self-talk as an anxiety intervention strategy on the levels anxiety and in turn on levels of self-confidence, as well as on coincident anticipation timing and batting performance (shot accuracy and quality of interception) in cricket.

1.6.2. Objectives

The primary objective of this study was to determine the effect of self-talk as an anxiety intervention on the levels of anxiety and in turn the levels of self-confidence, as well as the effect of the intervention on coincident anticipation timing and batting performance of cricket batters.

The secondary objective of this study was to determine whether the effects of self-talk as an anxiety regulation intervention on levels of anxiety and in turn levels of self-confidence, batting performance and coincident anticipation timing of cricket batters were retained, after a period of 2 weeks.

1.6.3. Hypotheses

The research hypotheses of this study can be divided into three sub-headings as follows:

1.6.3.1. Effect of Intervention on Anxiety Levels and Self-Confidence of Cricketers

1. There will be a significant difference in the pre-to-post-test levels of anxiety and levels of self-confidence reported by cricketers who have received an anxiety regulation strategy, namely self-talk.
2. There will be a significant difference in the levels of anxiety and levels of self-confidence reported by cricketers who have received an anxiety regulation intervention, namely self-talk and a control group of cricketers who did not receive the intervention.
3. There will be a significant difference between the post-test and the retention test in the levels of anxiety and levels of self- confidence of cricketers who received an anxiety regulation intervention, namely self-talk.

1.6.3.2. Effect of Intervention on Batting Performance of Cricketers

4. There will be a significant difference in the pre-to-post-test batting performance of a group of cricketers who have received an anxiety regulation intervention, namely self-talk.
5. There will be a significant difference in the batting performance of cricketers who have received an anxiety regulation intervention, namely self-talk, and that of a control group of cricketers who did not receive the intervention.
6. There will be a significant difference between the post-test and the retention test in the batting performance of cricketers who received an anxiety regulation intervention, namely self-talk.

1.6.3.3. Effect of Intervention of Coincident Anticipation Timing of Cricketers

7. There will be a significant difference in the pre-to-post-test coincident anticipation timing of a group of cricketers (experimental and control group) who have received an anxiety regulation intervention, namely self-talk
8. There will a significant difference in the coincident anticipation timing of cricketers who have received an anxiety regulation intervention, namely self-talk, and a control group of cricketers who did not receive the intervention.
9. There will be a significant difference between the post-test and the retention test in the coincident anticipation timing of cricketers who received an anxiety regulation intervention, namely self-talk.

1.7. Significance of Research

The current research study will contribute not only to the field of Psychology, but also to the field of Sport Psychology and Sport Sciences. Performance in sport is one of the most researched and focused on aspects on a local and international level. In many instances athletes spend a substantial amount of time on mental skills training as well as physical training because both affect performance. Therefore, research that links these components is vital.

Various studies in sport that have implemented strategies in order to manage or attempt to control levels of anxiety have done so using mental skills packages or combined fashion interventions. More research is needed into how self-talk as an anxiety regulation strategy in isolation can be effective, if at all and how. Even fewer studies have been done on anxiety management and self-talk, in the game of cricket, particularly cricket batting performance and coincident anticipation timing. The link between cricket batting performance, self-confidence and attention and a theoretical framework thereof is also limited in terms of research that has been done. This study will attempt to explore these ideas and concepts and the links between these variables.

1.8. Assumptions

One of the assumptions of this study is that participants' physical and mental health was consistent throughout all phases of the study, whether it was during the pre-testing, practices, post-testing or retention testing. This is important as in order to implement psychological strategies, participants need to be focused on the training, development and implementation thereof. If a participant incurred an injury during the phases in the study, this could affect performance in the tests and also lead to distraction. Likewise environmental stressors unrelated to sport (such as relationship break ups and academic stress) could have affected the psychological states of the participants.

During pre-testing, post-testing and retention testing, participants were required to fill out the CSAI-2R and it can be assumed that participants were truthful in their responses to this assessment. This testing was done using two pieces of equipment and it can be assumed that these, namely the ball machine and the Bassin Anticipation Timing machine, operated the same throughout each testing session.

When looking at the results and analyses of the current study two assumptions can be made. Firstly it can be assumed that results are normally distributed. Secondly it can also be assumed that the experimental group and control group are independent of each other.

1.9. Brief Chapter Overview

This thesis is structured into 6 chapters. The first chapter gives some background into the study and highlights the research aims, objectives and hypotheses. Significance of the study, limitations of the research, definitions of key terms and the studies assumptions are also part of this chapter. The second chapter is the Literature Review, where previous research and topics relating to this study are discussed. The main areas of interest are Anxiety, Batting Performance and Coincident Anticipation Timing and Anxiety regulation strategies, specifically Self-Talk and how these link to Self-Confidence and Attention.

The theoretical framework and presentation of the intervention form part of the third chapter in this study. The fourth chapter gives an outline and discusses in detail how the research was conducted i.e. Research Methodology. The research procedure, research design, measuring instruments, data collection, data analysis and ethical considerations are made clear. The Results and Discussion forms the fifth chapter of this thesis, where answers are given to each research question, including a discussion of these. The sixth chapter provides a Summary of the study and the Limitations of the study. It also suggests some recommendations for future research, based on results and discussions from this study.

The References and Glossary is added at the end of the study, as well as the Appendices.

CHAPTER 2
LITERATURE REVIEW

2.1. Introduction

There is a tremendous amount of interest in and research being done on performance in sport, especially with regard to the psychological aspects of performance and how to increase the level of individual and team abilities and success. Much of this research however comes from Western, educated, industrialized, rich, and democratic countries (the so-called WEIRD countries). The following review starts with a discussion of the approaches to understanding anxiety in psychology, in general. The difference between the meaning of the terms anxiety, stress, arousal and pressure are evaluated and different types of anxiety are explored. How anxiety is understood in sports, how it is measured and how it is operationalised in sport is discussed. A few prominent models of anxiety and performance in sport are explored.

Since the focus of the study is on cricket batting, batting performance and how it is measured will be discussed, as well as some psychological and physiological aspects of batting. Studies done on coincident anticipation timing will also be looked at, some relating to cricket and others relating to other sports. Lastly, how athletes manage their anxiety and what strategies have been implemented in the past is considered. Self-talk strategies used by athletes in various sports, as well as in cricket, are explored.

2.2. Approaches to Understanding Anxiety in Psychology

2.2.1. Psychoanalytic Theories

Sigmund Freud is one of the earlier contributors to the understanding of anxiety from a psychoanalytic perspective. He defined anxiety as “something felt, an unpleasant emotional (affective) state that is universally experienced” (Spielberger, 1972, p.5) that is different to other feelings such as anger, grief or sorrow (Spielberger, 1972). Patients with this state were said to have anxiety-neurosis (Spielberger, 1966). Freud suggested that anxiety was an avoidance of overstimulation and that there were three aspects to anxiety (Strongman, 1995). Firstly he postulated that anxiety was an unpleasant feeling, secondly that there was some sort of discharge process and thirdly a perception of the phenomena involved with this discharge (Strongman, 1995).

Freud's focus was on the sources of stimulation which lead to anxiety (Spielberger, 1966). Anxiety within this theory is seen as a way to handle a threatening situation and necessary for the development of neurotic behaviour (Strongman, 1995). Freud distinguished between neurotic anxiety and objective anxiety, depending on whether the source was from the external world or from internal impulses (Spielberger 1966).

2.2.2. Learning and Behavioural Theories

Both the psychoanalytic and learning/behavioural theories believe that anxiety symptoms and causes happen from early childhood. The learning/behavioural theorists propose that anxiety is a learnt behaviour and that once it is learnt it is the motivator for maladaptive behaviour (Strongman, 1995). Research in anxiety can be traced back to the early theories of Pavlov and Watson. Simply put they proposed that individuals are conditioned into behaviour by the fear of anxiety. A later theory proposed by Eysenck (1957) suggests that anxiety can also be learnt and looks into how anxiety is shaped by our personalities (introversion, extraversion and neuroticism) and how it can be inherited.

2.2.3. Physiological Theories

Learning and behavioural theories were the starting point for looking into the physiological and neurophysiological theories of anxiety. In short, the physiological theories try to establish which parts of the central nervous system are responsible or involved in emotion in general and particularly anxiety (Strongman, 1995). These theories rely on a model of human psychology that has its basis in natural science (Strongman, 1995).

2.2.4. Phenomenological/existential Theories

Somewhat more positive theories of anxiety were those from a phenomenological/existential perspective. Anxiety in this sense was seen as a natural part of life or state experienced by an individual and is considered unavoidable (Strongman, 1995). The thinking behind these theories is that in life we have choices to make and at each choice we are presented with anxiety. In order to become truly actualised, we must face the anxiety and in that is our freedom and growth (Strongman, 1995).

2.2.5. Uncertainty Theories

Uncertainty theorists propose that much of our anxiety is as result of being uncertain in a situation where a person feels helpless (Strongman, 1995). It is the uncertainty of not knowing what to do when an individual is under threat and of what the future might hold (Strongman, 1995). In these theories uncertainty is the core of anxiety, which is also linked to other feelings such as sadness, shame and guilt (Strongman, 1995).

2.2.6. Cognitive Theories

Of much interest linked to the current study is that of the cognitive theories of anxiety. Particularly looking at the theory of Eysenck who drew attention to taking into account the impact of anxiety with regards to the cognitive system, physiological and behavioural (Strongman, 1995). One of the most influential accounts of the relationship between anxiety and performance is the attentional control theory (Eysenck et al., 2007). This theory hypothesises that anxiety prioritises the stimulus-driven attentional system over the goal-directed attentional control (Calvo & Eysenck, 1998). This was the start of a multidimensional conceptualisation of anxiety (Hardy, 1999). Eysenck distinguishes between individuals with high or low trait anxiety and considers the effect of memory on the impact and experience of anxiety (Strongman, 1995).

Each individual's experience of anxiety and his/her thoughts and behaviours related to this can be considered unique, particularly at sports level and therefore interventions that address thoughts and behaviours are considered vital, within this cognitive approach. However, in order to develop and assess interventions, we first need to explore what is meant by the term anxiety and how it differs from other terms used in the field of psychology.

2.3. Difference between Anxiety and Arousal, Stress and Pressure

Within these different approaches to anxiety in the psychology field, researchers often use a few terms for example, stress and arousal as synonymous with the term anxiety. Before we can look at anxiety in sport and types of anxiety, there are a few terms we need to define. These include arousal, stress and pressure. A distinction needs to be made between these in order for working operational definitions to be constructed, which is helpful for the sake of clarity.

Anxiety is different from arousal which is defined as the "intensity dimension of behaviour, the state of the organism varying on a continuum from deep sleep to intense excitement" (Martens, Vealey & Burton, 1990, p.6). According to Bath (2000) arousal can either be positive or negative and can have both advantageous and unfavourable effects on performance. This is on the contrary to anxiety, which is only negative and unfavourable.

Another term that can also be confused with anxiety is pressure. An example of this might be someone who says "I am under a lot of pressure" in reference to a negative emotional state. Early research on performance defined pressure as "any factor or combination of factors that increases the importance of performing well on a particular occasion" (Baumeister, 1984, p. 610). In certain sports the term pressure is often linked to the concept of choking, the definition, which is the "failure to perform up to whatever level of skill and ability the person has at the time" (Vickers, 2007, p. 89).

According to Geukes, Mesagno, Hanrahan and Kellmann (2013) performing under pressure ranges on a continuum, where three possible outcomes could occur: decreased performance (i.e. choking), stable performance and increased performance (i.e. clutching). Clutch performance is defined by Otten (2009) as "any performance increment or superior performance that occurs under pressure circumstances" (p. 584). According to Otten (2009) the tendency of an athlete to choke versus clutch performance depends on his/her individual personalities. From this it is clear that pressure can have a positive, stable or negative impact on performance and so therefore should not be equated with the term anxiety.

The term stress refers to the complex psychobiological process that consists of three major elements: stressors, perceptions or appraisals of danger (threats), and emotional reactions (Hackfort & Spielberger, 1989) and is also often used as meaning the same as anxiety. Stress unlike anxiety can be seen as being positive, negative or neutral (Bath, 2000). The relationship between stress and anxiety could be seen as anxiety being a component of stress or is experienced as a result of stress (Janelle, 2002).

As we can see from these definitions these concepts do have different meanings. According to Janelle (2002), although these concepts are all interrelated, each has unique characteristics. If they are looked at individually, however, they can be seen to have different effects on performance (Janelle, 2002). This brings us to the next area of importance in terms of anxiety and that is of the different types of anxiety within research in the field of psychology in general, which forms the basis of types of anxiety in sports psychology.

2.4. Types of Anxiety

According to Spielberger's State-Trait Anxiety Theory (Spielberger, 1972), a distinction can be made between Trait anxiety (A-Trait) and State anxiety (A-state). Trait anxiety (A-Trait) is described as a relatively stable and permanent personality trait (Bath, 2000). It is a predisposition to see certain environmental situations as stressful and for the individual to react to these situations with an increased state anxiety (Anshel, et al., 1991). On the other hand, State anxiety (A-State) is a brief/transitory state, which varies in intensity and fluctuates over time (Spielberger, 1972). A-state consists of consciously perceived feelings of tension and apprehension, and heightened autonomic nervous system activity (Spielberger, 1972). The relationship between the two is that state anxiety is determined interactively, by trait anxiety and by situational stress (Eysenck, 1992). Within the context of sport, those individuals who are low trait anxious and experience high state anxiety would find it increases performance; but, those individuals who are high trait anxious and experience state anxiety will find it debilitative to athletic performance (Hardy et al., 1996).

According to Sue, Sue and Sue (2006), anxiety can manifest in three ways. Firstly, it can be cognitive manifestations that take place in a person's thoughts. In terms of sport this can be an athlete who is worried about his or her individual performance, the situation in which he or she must perform and what the consequences will be if the performance is not good (Vickers, 2007). It is also suggested by Vickers (2007) that of the different manifestations, cognitive anxiety is the most controversial and seems to have the greatest impact on sports performance. Secondly, it can be behavioural manifestations that occur in a person's actions (Sue et al., 2006). In the game of cricket for example, this could entail how an individual acts before going in to bat, as well as while batting. In an extreme case it might be that the individual decides not to attend a match because of the level of anxiety being experienced.

Lastly, somatic manifestations are those changes which occur in a person's physiological and biological reactions. Morris, Davis, and Hutchings (1981, p. 541) define somatic anxiety as "one's perception of the psychological affective elements of anxiety experience, that is, indications of autonomic arousal and unpleasant feeling states, such as nervousness and tension". Examples of these could be rapid heart rate, shortness of breath, clammy hands, butterflies in the stomach and tense muscles, all of which can have a profound effect on sport performance (Vickers, 2007).

Many theorists have tried to examine anxiety in terms of looking at all the ways in which anxiety can manifest or be described and have made attempts to define different types of anxiety. Trait anxiety, state anxiety, cognitive, behavioural and somatic anxiety were discussed above (Spielberger, 1972; Sue et al., 2006). In terms of the current study, there is a need to explore how these types of anxieties manifest in sport and how it impacts on specific sports.

2.5. Anxiety in Sport

According to Jones (1995) much of early research from clinical and educational psychology was used to build a theoretical foundation for competitive anxiety. There are a number of activities in which anxiety affects the performance and psychological functioning of individuals. Some of these activities could include test taking (Musch & Broder, 1999); math performance (Ashcraft & Kirk, 2001; Beilock, 2008); sports (Gay, Monsma & Torres-McGehee, 2011); the performing arts in dance (Manley & Wilson, 1980), visual art (Nanda, Eisen, Zadeh & Owen, 2011); music (Hoffman & Hanrahan, 2012; Kenny, Davis & Oates, 2004; Kenny & Osborne, 2006); and physical education (Barkoukis, Rodafinos, Koidou, & Tsorbatzoudis, 2012).

Of particular interest and with regards to the current study, is that of how anxiety affects performance within sport, specifically in cricket. One of the struggles that sports psychologists are faced with when looking at anxiety in sport is with how to conceptualise anxiety and methodological issues, like for example, how to measure anxiety without making the individual anxious by measurement thereof. The focus of research into this has particularly been on the anxiety-performance relationship (Jones, 1995). Three major conceptual approaches to competitive anxiety in sport, according to Jones (1995) are also discussed namely, arousal models, general anxiety models and multidimensional models of anxiety.

2.5.1. Operationalization and Measurement of Anxiety

According to Ostrow (1996) there is much disagreement about the most useful theory of anxiety and sports performance, as well as the most appropriate instrument to measure anxiety in athletes. According to Wilkinson (2013) among the most widely used sport-specific measures for assessment in Sport and Exercise Psychology research and practice are the Competitive State Anxiety Inventory—2 (CSAI–2), the Sport Anxiety Scale (SAS), the Task and Ego Orientation in Sport Questionnaire (TEOSQ), the Group Environment Questionnaire (GEQ), and the Athletic Skills Coping Inventory—28 (ACSI–28). Anxiety is one of the most commonly measured constructs in sport psychology, with at least 22 published scales devoted to its measurement (Ostrow, 1996).

According to Raglin and Hanin (2000) the most commonly used assessment of anxiety is through self-report. Other approaches, like behavioural (pacing) and physiological indicators (heartbeat) can be time-consuming and misleading, as these are sometimes unrelated to anxiety and can be quite invasive (Jones, 1995). Because of the nature of anxiety, it was stressed by Spielberger (1972) that anxiety be assessed in terms of trait (stable) and state (transitory) anxiety. This formed the basis for other measures of anxiety.

Of particular interest with regards to the current study is the CSAI-2R which measures the self-report of somatic (physiological and biological), cognitive (thoughts) and self-confidence at each moment. This assessment tool is according to Wilkinson (2013) possibly the most extensively used inventory to assess state anxiety. According to Hardy (1999), cognitive anxiety (or worry) is operationalised in terms of performers' concerns about performing well and the consequences of failing to do so. Somatic anxiety is operationalised in terms of performers' perceptions of their physiological response to psychological stress. Self-confidence was operationalised as performers' beliefs about themselves and being able to meet the challenge of the specific task to be performed.

Some of the limitations of using self-report as assessment of anxiety are that the athlete might not have the verbal ability in order to express his/her self or might not have an adequate level of self-awareness (Hackfort & Schwenkmezger, 1993). The CSAI-2R requires self-awareness at the various points of assessment, which could cause distress and discomfort. Another point made by Hackfort and Schwenkmezger (1993) is that assessing anxiety might be the cause for a distraction or potentially serve to direct attention to emotional states, which in turn alters responses. In a study like the current one, assessment that involves the same measure for the pre, post and retention test might also lead to habitual or stereotypical responses (Raglin & Hanin, 2000). Participants might also be guided by social desirability and social and experimental expectations, which can in turn, affect responses to assessment (Raglin & Hanin, 2000).

2.5.2. Models of Anxiety Regulation and Performance in Sport

2.5.2.1. Arousal Based Models of Anxiety

Early research, such as the theory developed by Yerkes and Dodson (1908), known as the Inverted-U hypothesis, attempted to explain the anxiety performance relationship, as a function of level of arousal. The effects of arousal on performance are known to be curvilinear with the potential for either positive or negative (Mahoney & Meyers, 1985). This model was based on the premise that the best performance could be achieved with an average level of arousal (McNally, 2002). It is still widely used to this day and has only recently been re-examined and compared with current theories that address anxiety (Arent & Landers, 2003). Another theory that was popular in the past was developed by Hull (1943) called the Drive theory. The main assumption here was that an increase in arousal is directly proportional to an increase in performance (Hull, 1943). Hull's theory contributed to an understanding of audience-induced arousal and athletic performance, as well as the relationship between learning and arousal (Bath, 2000). According to Janelle (2002), the Inverted U-hypothesis and Drive theories are seen as stress-performance, unidimensional and quite simplistic theories, although still worth taking into consideration.

2.5.2.2. General Anxiety Based Models of Anxiety

There have been many subsequent efforts to propose theories that deal specifically with anxiety, like Spielberger's state-trait approach and the Individual Zones of Optimal Functioning (IZOF) theory (Hanin, 1980, 1989). A measuring instrument called the State-Trait Anxiety Inventory (STAI) was developed (Spielberger, Gorsuch & Lushene, 1970) to measure generalised and undifferentiated anxiety state (Jones, 1995). This was based on the Inverted-U Hypothesis where both low and high levels of anxiety interfere with anxiety (Jones, 1995).

Still focusing on optimal levels of performance the IZOF theory was developed and was considered a person-environment interaction model (Jones, 1995). This model suggested that repeated observations of performance levels, as well as looking at pre-competition and performance state anxiety, a ZOF could be established for optimal performance (Jones 1995). Although the IZOF was considered useful in a practical sense and beneficial in looking at within-subject variation, it is still criticized for its unidimenstional nature and for being non-sport specific (Jones, 1995).

What is important in terms of looking at anxiety is the "why" and the "how" it impacts on performance (Hanron & Connaughton, 2002). From different research studies in athletic performance, there seems to be some agreement that there is an optimal level of anxiety needed for effective performance (Janelle, 2002). The discrepancies in these studies would be where exactly this optimal level lies and what the different mechanisms are that can aid in effective performance (Janelle, 2002).

2.5.2.3. Multidimensional Anxiety Based Models

Hardy and Fazey's (1987) Cusp Catastrophe model of Anxiety and Performance, Multidimensional anxiety theory/Theory of Competitive Anxiety (Martens, et al., 1990) and the Processing Efficiency Theory (Eysenck & Calvo, 1992) were of the first multidimensional models of anxiety. These models start looking at the cognitive factors influencing performance, as well as the physiological factors and finally tried to establish the relationship between these factors (Humara 1999). According to Vine (2010), these models tend to be descriptive in nature and look at the relationship between anxiety and / or arousal and performance.

The Cusp Catastrophe model in particular suggested that research be looked at in terms of an interactive approach between anxiety and performance (Hanron & Connaughton, 2002). This model suggests that "under conditions of high physiological arousal, elevated cognitive anxiety will debilitate sporting performance, whereas increases in the intensity of the cognitive component under conditions of low arousal can be beneficial to performance" (Hanton, Mellalieu & Hall, 2004). It is however suggested that these above mentioned models do not explain the actual mechanisms of anxiety that underlie this relationship (Janelle, 2002).

Understanding the relationship between anxiety and sport performance in a clinical setting was included in the aims of cognitive psychology, which was later linked to sport (Humara, 1999). Research in this area looks at mental processes and memory structures of athletes to understand behaviour and also suggests that cognitive processes, like learning, sensation, memory, attention, and problem solving are influenced by anxiety (Straub & Williams, 1984). Of particular interest with regards to the current study is that of cognitive behavioural interventions. The reason for this is that one of the underlying principles of cognitive behavioural therapy is that self-talk can have benefits and that treatments are aimed at changing individual's thoughts, interpretations and behaviours (Hatzigeorgiadis, Zourbanos, Galanis & Theodorakis, 2011).

By looking at the mechanisms that influence failure as a result of anxiety, it is proposed that a better understanding of how emotional and motivational factors work with memory and attention to influence skill learning and performance will be gained (DeCaro, Thomas, Albert, & Beilock, 2010). The current study looks particularly at the cognitive process of attention and how the construct of self-confidence is affected by anxiety.

2.5.2.3.1. Anxiety and Attention

It is suggested by Janelle (2002) that changes in psychological and physiological activation are seen to cause some attentional alterations. Some well-documented alterations in cognitive behaviour include: attentional narrowing, distraction (or hyper vigilance) by irrelevant or threatening cues, reinvestment in controlled processing and inefficiency of attentional allocation (Janelle, 2002).

Literature from cognitive psychology has been used to better understand the relationship and mechanisms of attention, from an attentional processing perspective (Eysenck, Derakshan, Santos, & Calvo, 2007; Janelle, 2002; Onnis, Dadds, & Bryant, 2011). In arousal situations, specific symptoms of anxiety include a fast heartbeat, a feeling of fear, high blood pressure, heightened muscular tension, or lack of concentration and relaxation (Wong, 2006). Since an athlete's brain activity dictates his or her muscular movements, it is suggested that athletes learn to focus their attention at a particular time in specific situations in order to reach their performance goal (Wong, 2006). This could be manipulating attention to proper competition stimuli, or eliminating unwanted negative thoughts that may be causing anxiety (Wong, 2006). Two models to look at in terms of the attentional processing perspective and its relationship to anxiety are the Self-focus and Distraction models, which look specifically at the phenomenon of choking and why it occurs (Vickers, 2007).

The Self-focus model suggests that in high-pressure settings, athletes pay too much attention to the internal processors or focus on their physiological, technical or emotional state. The Distraction models of choking (Bleilock & Carr, 2001; Esyenck, 1992; Lewis & Linder, 1997) see choking as occurring when an athlete's attention is not focused on the primary task, which causes a cognitive deficit that impairs performance. Many studies have been done to show that focusing attention externally, as opposed to internally leads to higher level of performance (Wallace, Baumeister, & Vohs, 2005; Wulf, 2008; Wulf, Gärtner, McConnel, & Schwarz, 2002; Wulf, McNevin, Fuchs, Ritter, & Toole, 2000; Wulf, McNevin, & Shea, 2001; Wulf & Su, 2007; Zarghami, Saemi, & Fathi, 2012).

A study done by Eysenck, et al., (2007) looks at the Attentional Control theory, which is primarily concerned with the effects of anxiety on cognitive performance, which can in turn be related to sport. This theory is an extension of the Processing Efficiency Theory developed by Eysenck and Calvo (1992). Both of these theories look at working memory and suggest that anxiety impairs the efficiency of the central executive component of the working memory system (Derakshan, & Eysenck, 2009). In the more recent theory anxiety is seen as negatively affecting or decreasing the influence of the functioning of the goal-directed attentional system and in turn increases the influence of the stimulus-driven attentional system (Eysenck et al., 2007). This theory forms part of the theoretical framework for the current study and will be discussed in depth later on.

2.5.2.3.2. Anxiety and Self-Confidence

Cognitive anxiety and self-confidence are suggested to be factors that are linked to an athlete's expectations of success and perceptions of one's own ability and of the opponent (Jones, 1995). Self-confidence can be conceptualised as "one's belief in meeting the challenge of the task to be performed" (Woodman & Hardy, 2003, p. 443). Individuals who experience high levels of anxiety and self-confidence at the same time tend to perform optimally, whereas individuals who experience heightened anxiety, without the feelings that confidence brings, may not perform to their optimal (Hanton et al., 2004).

According to Humara (1999) whether or not an athlete is a novice or an expert, will influence the amount or level of self-confidence he or she has. It is also suggested that individuals who possess high levels of self-confidence can use this as a protective factor against the effects of cognitive anxiety and physiological arousal (Humara, 1999). According to Burton (1988) cognitive anxiety has been found to have a negative linear relationship with performance, whereas self-confidence has found to have a positive linear relationship with performance. Interestingly, somatic anxiety in particular has found to have an inverted-u shaped relationship with performance (Burton, 1988). These relationships form the hypothesis of the multidimensional theory by Martens et al (1990).

From the discussion above it is clear that anxiety impacts on underlying mechanisms, like memory, attention and self-confidence, for example and that it in turn affects sports performance. What is important to consider next is how psychological aspects, like anxiety, impact on the game of cricket, specifically looking at performance in the task of batting.

2.6. Psychological Aspects and Anxiety in Cricket

How does anxiety affect performance in the different activities that individuals and teams take part in? Of special interest in the current study, is how psychological aspects, specifically anxiety, affects performance in sport and specifically looking at how anxiety impacts on cricket batting performance and on coincident anticipation timing, in particular. This will be explored under two separate sections, as described below.

2.6.1. Batting Performance

2.6.1.1. Introduction

In order to look at how anxiety affects cricket batting, one of the things to discuss first is how an athlete or coach measures the batting performance or ability of a batsman. The concept of batting average is defined below and ways to measure batting performance are discussed. There are also a growing number of studies that have researched aspects of cricket batting in order to establish what is needed to be an elite batsman (Lemmer, 2004; Slogrove, Potgieter & Foxcroft 2002; Slogrove, Potgieter & Foxcroft., 2003).

Two areas are particularly important when looking at the current research and they are the psychological aspects, including anxiety and the physiological aspects of cricket batting. Cricket specific research related to the psychological aspects is reviewed. Other cricket specific research has been done in areas such as kinematics, physiology, brain function, visual tracking and perceptual decision making (Taliep, Prim & Gray, 2010). Some studies related to these areas are discussed in this section. The concept of coincident anticipation timing (CAT) and the effect of anxiety on this will also be discussed, as CAT was measured in the current study.

2.6.1.2. Measuring Batting Performance

Batting performance is often measured by a batsman's batting average. Batting average can be defined as "the number of runs scored in all innings divided by the total number of innings" (Van Staden, Meiring, Steyn, and Fabris-Rotelli (2010, p. 75). According to Lemmer (2004), it is not sufficient to only look at the batting average, because it does not reflect the batsman's performance accurately and does not take into account other important skills, like consistency and strike rate that would contribute to their performance. Strike rate, which is the average number of runs scored per hundred balls faced, and consistency, which is the variation of scores, also needs to be taken into account and included in the batting performance measure (Lemmer, 2004).

In 2009, Lemmer suggested that a sound basis for comparison should be established in order to compare batsmen (and bowlers), on a local and international level. This is then used by coaches as a basis to choose teams from a provincial level, to perform at an international level (Lemmer, 2009). Specifically looking at batsmen in this particular study, the comparison is made by determining appropriate weights for runs scored by batsmen (Lemmer, 2009). Once we know what the most accurate way to measure batting performance is, we can look at aspects of cricket batting that affect batting performance.

2.6.1.3. Batting Performance and Psychological aspects

The psychology of being an elite batsman has not necessarily been widely researched. A study conducted by Slogrove, et al. (2002) looked at the Batting Related Experiences of South African Universities (SAU) Cricketers. Quantitative data, based on a questionnaire, called the Mental Processes during Batting in Cricket Questionnaire found five strongly supported batting related experiences of the SAU Cricketers (Slogrove, et al., 2002). These were "playing of each delivery on its merit; feeling a sudden rush of nervousness when having to bat; expecting to be perfect in their batting; using a pre-delivery routine before facing their first delivery in an innings; and an over-analysis of their batting when in bad form" (Slogrove, et al., 2002, p. 97).

Of the most important, related to the current study would involve feeling a rush of nervousness (anxiety), which was ranked the highest and using a pre-delivery routine, before batting. Other recommendations from Slogrove, et al. (2002) were that a differentiation needs to be made between somatic and cognitive anxiety and that since batting is such an individualised activity, that batsmen be counselled on an individual basis (Slogrove, et al., 2002).

Subsequent research by Slogrove, et al. (2003), looked at the Thought Sampling of Cricketers during Batting, where in-depth interviews were done. According to the results, three major dimensions were noted and these were cognitions, affect and related behaviours (Slogrove, et al., 2003). Within each of these dimensions, different categories were found, as shown in the Table 2.1.

Table 2.1

Categories for the Dimensions of Thoughts of Cricket Batsmen (from Slogrove et al., 2003)

Cognitions	Affect	Behaviours
Task-focused thoughts	Positive/normal affective states	Batting strategy
Positive/motivational thoughts	Negative affective states	Behavioural routines
Negative/inappropriate thoughts		Inter-personal issues
Assorted thoughts		Observation
		Physical practice
		Reaction to unfavourable situations
		Visual focus

The study also mentions how important attentional focus is and how a batsman needs to learn to "switch on" and switch off" in their concentration (Slogrove, et al., 2003). One of the issues that came up is that batsmen need to find ways to assist them with negative and task-irrelevant thought that may interfere with attentional focus. One of the suggestions was that of pre-performance routines like self-talk that can be used to control attention. Linked to the current study, Slogrove, et al. (2003) emphasise the important role of self-talk in sports performance and refer to the study done by Hardy and Jones (1994). In the latter study they specifically talk about the need for training in self-talk skills to help with anxiety and attention control. They also mention how athletes should be taught how to use these strategies effectively. One of the recommendations for future self-talk usage was that batsmen need to be encouraged to use more positive self-talk as opposed to negative, which seemed to be more prominent (Slogrove, et al., 2003). For instance instead of saying "don't go out now", the batman should rephrase this as "bat through the innings". The current study made use of positive self-talk cues (Slogrove, et al., 2003).

Thelwell, Weston and Greenlees (2007) conducted a similar study where they identified sources of stress and associated coping strategies for professional cricket batsmen. The results revealed a total of 25 general dimensions for the sources of stress and a total of 23 general dimensions for the coping strategies of batsmen. Most of the strategies were cognitive strategies, for example use of goals and imagery and one of the more common strategies used was found to be the use of self-talk. Various times when self-talk was used it was to provide positive or constructive reminders and give general focus, to benefit skill execution and rationalising. Other times included the use of self-talk for arousal, relaxing, focusing and motivation.

The idea of defining a psychological profile that classifies specialised roles like a batsman, bowler, all-rounder and wicket keeper could have an impact on the mental preparation strategies recommended for each. Jooste, Toriola, Van Wyk and Steyn (2014) concluded that there is no distinctive psychological profile that could classify players into performing specialised roles. Their study included 127 South African cricket players and they looked at the relationship between psychological skills and players' specialised roles. Their study did find that there was a trend for all-rounders to be more psychologically skilled than either specialist bowlers or specialist batsmen (Jooste, et al., 2014).

It is interesting to note that "batsmen recorded lower scores in terms of coping with adversity, confidence and motivation, peaking under pressure, and freedom from worry, compared to bowlers and all-rounders" (Jooste, et al., 2014, p.112). Coachability was rated as the highest psychological skill for batsmen and the batting group had a calculated general coping-skills score of 62.56% (Jooste, et al., 2014). The study also showed that batsmen had the lowest scores in mental preparation, self-confidence, concentration ability, and relaxation ability (Jooste, et al., 2014). Because batting is such a specialised role within cricket, it would seem vital to have an intervention programme, like the one in the current study that is tailored towards batsmen specifically.

2.6.1.4. Batting Performance and Physiological aspects

Besides the psychological aspects that affect batting in cricket, studies have also been done on the physiological aspects of cricket that are important to consider. One such local study was done by Noakes and Durandt (2000) where they looked specifically at physiological requirements of cricket. An interesting finding was that players in the South African national cricket team were as "fit" as the South African national rugby team, which competed in the 1999 World Cup Cricket and Rugby, respectively (Noakes & Durandt, 2000). They reported that cricket players are smaller in size and lighter in weight, when compared to South African rugby players. They also noted that batsmen in particular where smaller than players in the rest of the team.

Another South African study done by Taliep et al. (2010) linked to the physiology of cricket batsmen, looked at upper body muscle strength and in particular, when it comes to batting performance, in cricket batting. In this study batting performance was defined by the maximum hitting distance in a batting task and strike rate and batting average, during a One-Day and Twenty-Twenty match. There was evidence found that showed a strong association between upper body strength and hitting distance, but not that of match performance variables, such as strike rate and batting average Taliep et al. (2010).

On an international level an interesting study was conducted by Webster and Roberts (2011) where their aim was to determine the effect of cricket leg guards on running performance. They found that the additional weight of the pads increased the total time taken to complete three runs by up to 0.5s, compared to running without the weight of the pads (Webster & Roberts, 2011). They also found that the design of the pad (i.e. using a wide pad) affected the running performance in a negative way (Webster & Roberts, 2011). The cause of this was measured using biomechanical analysis and investigating running kinematics, stride parameters and ground reaction forces (Webster & Roberts, 2011). The consequences in effect, then of wearing pads, in terms of running performance, was that the risk of being run-out increases and there is a reduction in the number of runs that could be scored from one shot (Webster & Roberts, 2011).

Vickery, Dascombe and Duffield (2014) conducted a study where they compared the physiological, movement and technical demands of centre-wicket Battlezone, traditional, net-based training and one-day cricket matches of sub-elite cricket players. The study included measurement of heart rate, blood lactate concentration, rating of perceived exertion and movement patterns of players (Vickery et al., 2014). Significant results were found where "specifically, Battlezone training invoked the greatest physiological and physical demands from batsmen in comparison to traditional cricket training and one-day matches" (Vickery et al, 2014 p. 722). Of the four training sessions, the results suggest that in order to replicate the physiological, physical and technical demands of one-day cricket that the Battlezone and traditional cricket training be used (Vickery et al., 2014). It could be argued that if the physiological, physical and technical demands of cricket are replicated in such a way, that the same would be replicated in terms of the psychological demands, even in terms of anxiety levels.

2.6.1.5. Batting performance, Visual Attention and Anxiety

One of the physiological aspects which has a great impact on batting performance is that of visual attention. It is suggested by Janelle (2002) that anxiety impacts on visual attention, specifically on gaze behaviour and in the efficiency thereof, amongst a multitude of perceptual-motor tasks. Therefore this topic will be looked at in brief. Linked to visual attention is the concept of coincident anticipation timing, which will be discussed later, however important to note at this point.

Two key terms referred to in batting performance and visual attention studies are "gaze control" and "quiet eye". Gaze control "is the process of directing the gaze to objects or events within a scene in real time and in the service of the on-going perceptual, cognitive, and behavioural activity" (Henderson, 2003, p. 498). According to Vickers (2007), there are three categories of gaze control and these are gaze control in targeting tasks, gaze control in interceptive timing tasks and gaze control in tactical tasks. In interceptive timing tasks the main aim is to control the object as it is being received and in order to do this the player needs to read the object using gaze and attention systems and track the object as it is approaching (Vickers, 2007). As in the case of the current study, batting is construed as an interceptive timing task.

According to Vickers (2007, p. 11), quiet eye is the "final fixation or tracking gaze that is located on a specific location or object in the visuomotor workspace within 3 degrees of visual angle (or less) for a minimum of 100ms". Another important concept to take into account is that of visual-motor control, which is described by Vickers (2007) as the way that visual information is received by an individual and is used to guide a specific action. This entails linking perception of visual information from the environment to action, which leads to motor performance (Van Velden, 2010). The negative affect of anxiety on the control of visual attention introduces the possibility that a mental skills strategy to regulate anxiety could have a positive effect on the visual attention control of a cricket batsman.

One of the crucial mechanisms underlying batting performance is that of the control of visual attention, which also influences coincident anticipation timing, and is also influenced by anxiety. Behan and Wilson (2008) looked at state anxiety and visual attention and how individuals controlled their gaze behaviour in the specific task of archery. The specific gaze behaviour measured in Behan and Wilson (2008) was the duration of quiet eye (QE). Results of this specific study showed that the duration of quiet eye was affected negatively by anxiety, in that anxiety resulted in a shorter quiet eye period. According to Vickers (2007), elite players have well controlled quiet eye duration and that this in turn positively affects their performance.

In a study conducted by Causer, Holmes, Smith and Williams (2011) they looked at Anxiety, Movement Kinematics, and Visual Attention in Elite-Level Performers, as well as testing predictions of the ATC theory. Although the CSAI-2R was not used in this study, measurements for somatic anxiety, cognitive anxiety and self-confidence were done, as well as measuring mental effort. The results were consistent with the ATC theory were it was found that increases in anxiety lead to reductions in goal-directed attention, indicated by quiet-eye duration. This in turn significantly impacts on performance efficiency and effectiveness.

As we can see from above anxiety can have a great impact on the physiological aspects of cricket, as well as affecting visual attention, particularly in an interceptive timing task like cricket batting. Another interesting aspect of batting performance is that of perceptual decision making and this will be discussed further.

2.6.1.6. Batting Performance and Perceptual Decision-Making

One of the most important questions that was asked in a study by Muller, Abernathy and Farrow (2006) was "How do world-class cricket batsmen anticipate a bowler's intention?" They wanted to know how these batsmen pick up on advanced information, in order for them to anticipate the type and length of balls bowled by swing and spin bowlers. Four different experiments were conducted and they found that there was a difference between intermediate and low-skilled players, when comparing them to the high-skilled players, when it came to picking up on these advanced cues (Muller et al., 2006). They found that as in earlier studies high-skilled batsmen are able to predict the type and length of ball bowled, by swing bowler and spin bowler. High-skilled batsmen also tended to show a persistent capability to use early sources of information, whereas the low-skilled batsmen did not.

The dependent relationship between perception and decision-making, which as in the above study is using sensory systems to gather information and then deciding on a behaviour, is linked to the concept of coincident anticipation timing, which is linked to object flight (as in the cricket ball), discussed in section 4.3.3.

The studies mentioned above show that when measuring batting performance, only using the batting average is not sufficient and that there are other skills that also need to be taken into account. Psychological aspects and the effect of anxiety on cricket batting were discussed. A complete study of batting performance should include more than psychological variables. One needs to consider physiological, kinematic, visual attention and perceptual decision-making. Studies show that there is a definite relationship between anxiety, visual attention, performance and expertise. The concepts of gaze control and quiet eye were explained. Since coincident anticipation timing forms part of batting performance and is also considered to be affected by anxiety, it will be discussed in the following section below.

2.6.1.7. Coincident Anticipation Timing

The current study looked at cricket batting which is an interceptive timing task. Linked to this is the idea is that the batsman needs to use his vision to anticipate and decide when to move, in order to hit the ball, at the precise time that his decision coincides with when the cricket ball arrives, a concept known as coincident anticipation timing.

This action can be defined as:

> Individual's ability to judge the speed of a moving object, to anticipate its arrival at a specified point in space and to initiate a movement that would be coincident with the arrival of the object at the judged point in space (i.e., "initiate a movement that would allow the object to be intercepted. (Ivy, et al., 1984, p.466)

An instrument called the Bassin Anticipation Timer can be used to measure coincident anticipation timing. Coker (2006) studied the influence of target location on coincident timing performance and found that the coincident timing performance was not dependent on the method of the stimulus that was presented to the participants. The object of the Bassin Anticipation Timer is to make a simple finger-press on a white button to accurately coincide with the arrival of the light at the end of the runway. In Coker's (2006) study two types of stimuli were used, in order to establish whether it would affect the measurement of coincident timing performance. The first stimuli used the above mentioned method, where the target light was the final light in the series of lights, down the runway. The second stimuli tested used the method where the target light was not the final light in the series of lights down the runway. In other words, in this method the lights continued past the target light. The test was run over 20 trials, with velocities of 4, 8 and 12 mph. This is important to the current study because the reliability and validity of the instrument was demonstrated.

Van Velden (2010) studied coincident anticipation timing and cricket batting performance and looked at how a perceptual motor training programme would affect both variables. The results indicated that when compared to the control group, the experimental group's coincident anticipation timing and batting performance did not improve significantly despite their participation in a visual skills programme. He recommended that future research look into the psychological aspects of the cricketers, in particular their levels of anxiety, which could have an influence on their test results.

The purpose of a study conducted by Ak and Koçak (2010) was to compare the coincident anticipation timing and reaction times of 10 to 14 year old tennis and table tennis players and examine possible sex differences. Both tennis and table tennis rely on coincident anticipation timing for accurate execution of strokes. It was concluded that tennis players performed better in the coincident-anticipation timing task than table tennis players, whereas table tennis players had lower mean reaction time than tennis players (Ak & Koçak, 2010). It was also found that male players didn't make as many errors in the coincident-anticipation timing task as their female counterparts (Ak & Koçak, 2010).

The effect of expertise on coincident-timing accuracy in a fast ball game, specifically table tennis, was examined by Ripoll and Latiri (1997). Experts and novices were compared in a perceptual visual task, where the aim was to remove motor mechanisms or responses from the study, in order to look at the visual system separately. It was found that experts did not differ when performing under the constant velocity condition. There was, however, a difference in the decelerative condition, which indicated that experts were less "trajectory-dependent" than novices and more accurate in the decelerated condition. This result showed that experts had a better adaptation of the perceptual system when encountering the constraints during table tennis and had better responses for decelerated trajectories. The proficient performance could be attributed to an adaptation of the experts' visual systems, as a result of the actual game where these types of trajectories are found.

Muller and Abernethy (2012) conducted a study where they looked at expert interception and expert anticipatory skills in striking sports, one of these being cricket. Important to note in this study is that visual information is seen as one of the things that guide the striking action and it was found that this is different between experts and novices. It was found that there is a difference in the ability of a novice performer versus an expert performer to acquire useful perceptual information for anticipation from three different aspects, namely priori event probability, kinematics of the opponent's movements and early object flight.

In the game of cricket examples of these could be previous bowling patterns of the bowler or where the fielders are on the field, the bowler's front foot-impact and ball release and lastly which way the ball bounces. It is suggested that for an expert, body positioning is guided by early perceptual information and then later information from object flight is used to fine-tune the interception (Muller & Abernethy, 2012). Although priori event probability and kinematics of the opponent's movements and object flight are relevant to the game of cricket, it would seem that coincident anticipation timing falls into the aspect of object flight. It is also important to note that in the study by Muller and Abernathy (2012) it is mentioned from early on that the expertise paradigm, where experts are compared to novices, has many advantages.

2.6.1.8. Coincident Anticipation Timing and Anxiety

As seen from the above discussion there have been several studies that have looked at coincident anticipation timing and the measurement and accuracy thereof. Few studies however have looked at the effect of anxiety on coincident anticipation timing. Vater, Roca, and Williams (2015) tested the predictions of the ACT in a study conducted on soccer players. They examined how anxiety affected visual search strategies, performance efficiency, and performance effectiveness using a dynamic, temporal-constrained anticipation task.

Findings showed that anxiety leads to a decrease in performance efficiency (response time, perceived mental effort, and eye-movements) and that there was no difference in response accuracy (effectiveness) (Vater et al., 2015). There was a difference in the results when comparing the higher skilled players with the lower skilled players, in the two separate tasks, in terms of the number of fixation locations, as a result of anxiety (Vater et al., 2015). Vater et al., (2015, p.190) suggest that 'anxiety has a negative effect on higher level cognitive function particularly in relation to the ability to recognize familiarity and structure in the evolving patterns of play across task constraints'. Overall the findings of this study provide support for ACT and that anxiety impairs processing efficiency and top-down attentional control (goal-driven stimulus) (Vater et al., 2015).

Another study linked to the ACT was a study done by Cocks, Jackson, Bishop, and Williams (2016), where they tested the predictions of this theory and looked at the impact of anxiety on anticipation using a dynamic, time-constrained task related to the game of tennis. They also examined the involvement of high and low-level cognitive processes in anticipation and how their importance may be impacted on by anxiety (Cocks et al., 2016). Findings provide partial support for the ACT theoretical framework as processing efficiency was affected on a greater scale than that of performance effectiveness, when participants were under high levels of anxiety (Cocks et al., 2016).

Participants reported high levels of somatic and cognitive anxiety and low levels of self-confidence during the testing. Anxiety impacted on the skilled performers where there was a reduction in the ability to incorporate and utilise contextual information and reducing the ability to produce lateral judgements (Cocks et al, 2016). This study suggests that anxiety impacts on attention, effort, self-confidence and anticipation, which in turn affect motor and cognitive processes.

A study that made use of the Bassin Anticipation Timer in order to measure coincident anticipation was conducted by Duncan, et al. (2016). They aimed to investigate whether the effects of changes in physiological arousal on timing performance during competition and practice (Duncan et al, 2016). This was done using four incremental exercise conditions. The results of the study suggest that anticipation timing performance is negatively affected when physiological arousal and cognitive anxiety are high (Duncan et al, 2016).

In conclusion the concept of coincident anticipation timing was discussed, as well as the measurement thereof. Since batting performance and coincident anticipation timing is linked to visual attention some studies related to how visual attention affects CAT, were looked at. Various other sports, like tennis and table tennis and CAT related to these were discussed and the difference in CAT of expert and novice athletes was considered. How CAT is also linked to anxiety and how anxiety impacts on performance in CAT was explored. If athletes can improve their CAT, by looking at how anxiety impacts on the performance thereof, they will achieve more optimal results. However the question that needs to be answered is how does an athlete regulate and manage his/her anxiety in general? What techniques, strategies or skills has been put in place before, which ones have worked and which ones haven't and which ones still need more research? This will be the discussion for the next section.

2.7. Anxiety Regulation and Management in Sport

Skills, techniques and strategies as general terms are often used as synonymous with one other. The difference among these terms, from a sport psychology point of view, will be discussed. Different anxiety regulation management strategies, including combined fashion strategies, strategies used as mental preparation techniques and use of technology to manage anxiety will be explored. Finally self-talk as an anxiety management strategy will be looked at in detail, as this is the focus of the study.

2.7.1. Psychological Skills, Techniques and Strategies

It has been suggested by Birrer and Morgan (2009) that a differentiation is made between a psychological skill, a psychological technique and a psychological strategy. In most studies conducted, the use of the terms skill, technique or strategy are used interchangeably (Birrer & Morgan, 2009). A skill is the "the learned capacity (or ability) to carry out a specific task" and the desired outcome (e.g. increase in self-confidence and attention) (Birrer & Morgan, 2009, p.79).

The procedure that an athlete uses in order to enhance the capacity of the skill, in order to perform the task and promote the desired outcome (e.g. self-talk or imagery) is considered a technique (Birrer & Morgan, 2009). According to Hardy et al. (1996) these techniques can be used in a single (imagery or self-talk) or combined fashion (e.g. pre-competition routines where imagery and self-talk are used together). As mentioned before four of the most commonly used basic psychological techniques used in order to enhance performance, in sports psychology interventions, are imagery, goal-setting, self-talk and physical relaxation (Birrer & Morgan, 2009).

A strategy is the use of one or more psychological techniques that are used as a plan of action, in order to achieve the enhancement of psychological skills (Birrer & Morgan, 2009). According to Gould and Udry (1994), whether or not athletes regulate their emotional arousal can influence performance positively or negatively. They looked at five different categories of arousal regulation strategies, namely, arousal energising techniques, biofeedback techniques, relaxation response strategies, cognitive behavioural interventions, and mental preparation routines (Gould & Udry, 1994). Each of these strategies is linked to the potential to self-regulate anxiety as a negative emotional response to arousal. Gould and Udry (1994) are of the strong opinion that anxiety should be viewed as a multidimensional construct that comprises of a physiological component and a cognitive component and that these have a direct impact on regulation of anxiety.

2.7.2. Anxiety Regulation Management Strategies

As mentioned before many interventions in sport have combined techniques in order to attempt to regulate anxiety for optimal performance. Strategies that include self-talk will be discussed. According to Mamassis and Dogani (2004) there are many studies that show a direct relationship between the use of one or a set of psychological techniques and an improvement in performance. Mental preparation routines, also known as pre-performance routines have often incorporated various techniques, including self-talk, as an anxiety regulation intervention, as part of mental skills packages. Some studies linked to these will be looked at. Since the use of technology consumes the world we live in today, a brief discussion on the use of technology to manage anxiety had been added. The focus of the current study is on self-talk as an isolated strategy and studies related to this are explored.

2.7.2.1. Combined-fashion Strategies

A season-long case study on two elite junior tennis players was done by Mamassis and Dogani (2004), where in addition to their practices these players were exposed to five different psychological skills. These were goal setting, positive thinking and self-talk, concentration and routines, arousal regulation techniques and imagery. The study included a control group and is valuable in terms of its unique case study nature. It aims to provide a more in-depth understanding of factors that produce anxiety as well as affect self-confidence (Mamassis & Dogani, 2004).

The CSAI-2 was used in order to assess somatic anxiety, cognitive anxiety and self-confidence and performance was assessed by asking eight questions related to a different aspect of tennis performance. The results showed the greatest difference between the two groups at the pre and post-test, in terms of self-confidence. An increase in the direction dimension of the somatic anxiety, cognitive anxiety and self-confidence for the intervention group was seen. Overall, tennis performance was enhanced for the participants in the intervention groups after the mental training program (Mamassis & Dogani, 2004).

A good study combined mental imagery and self-talk intervention study was done by Peluso, Eugenio, Ross, Gfeller and LaVoie (2005). According to them imagery and self-talk are implemented to assist athlete's in regulating arousal, reducing maladaptive behaviours, reconstructing negative thoughts and to increase concentration and focus (Peluso et al., 2005).The study aimed to examine the effects of performance enhancement techniques (PETs) on motor skill performance, specifically in this study a golf-putting task (Peluso et al., 2005).

Participants from the age of 18 to 25 volunteered and were randomly assigned to one of nine groups, which were: simultaneous externally verbalized self-talk or imagery condition, a delayed externally verbalized self-talk or imagery condition, a simultaneous internally verbalized self-talk or imagery condition, a delayed internally verbalized self-talk or imagery condition and a no instruction control condition. Unlike the current study participants did not participate in an intervention phase, however they received instruction for the use of imagery and self-talk during the post testing phase (Peluso et al., 2005).

After each pre-test and post-test evaluation participants were asked whether or not they made use of self-talk or imagery during the tests. Participants were also required to fill out two questionnaires, one being the Self-Efficacy Questionnaire and the Sports Imagery Questionnaire. Results from this study indicated that using PETs does enhance performance. It also indicated that participants who engaged in ten hours or less of athletic activity per week, preferred self-talk strategies. Participants who took part in athletic activity for more than ten hours a week had a preference for imagery strategies (Peluso et al., 2005).

2.7.2.2. Strategies Used As Mental Preparation Routines

In a study by Robazza and Bortoli (1998), interviews were conducted with an Olympic archery team in order to identify mental/psychological factors associated with excellence and mental preparation strategies that were used. The results indicated that positive expectations, concentration, facilitating emotions, body awareness and technical preparation were necessary for effective performance, in terms of mental factors. Mental preparation strategies identified for effective performance included "(a) autonomic control (emotion control, somatic control, internal dialogue, and focus on shooting), (b) imagery (visualization, self-talk), (c) task-focused concentration (body and action control, thought control) and (d) reaction to mistakes (focus on correct execution, mistake disregard, shooting analysis)" (Robazza & Bortoli, 1998, p.219).

Autonomic control was the general dimension used to control emotions, muscular tension, breathing and thoughts, in an effort to attain ideal emotional, cognitive and physical readiness (Robazza & Bortoli, 1998). Mental rehearsal procedures in the form of imagery were done before the impending shooting performance (Robazza & Bortoli, 1998). Task orientation focalized the archers on the action, orienting attention to specific cues of the shooting routine (Robazza & Bortoli, 1998). Archers also used three approaches to cope with technical faults and undesirable outcomes (Robazza & Bortoli, 1998).

These were firstly to re-focalize attention upon execution without attempting to correct errors trying to recover the ideal feelings associated with optimal shooting (Robazza & Bortoli, 1998). Secondly archers engaged in attempts of removing errors and diverting attention from them (Robazza & Bortoli, 1998). Lastly archers oriented attention to mistakes, thus gaining useful information in order to modify subsequent shooting (Robazza & Bortoli, 1998).

In a more recent case study with a youth tumbling athlete, Faggiani, McRobert and Knowles (2005) examined the development of pre-performance routines (PPR) for acrobatic gymnastics. Pre-performance routines (PPRs), defined as a "sequence of task-relevant thoughts and actions which an athlete engages in systematically prior to his or her performance of a specific sports skill (Moran, 1996, p.177). The mental skills constructs that were looked at as possible routines were those of goal setting, emotional control, automaticity, relaxation, activation, self-talk, imagery and attentional control.

The study was divided into five phases, the first being completing the Test of Performance Strategies, the second phase (intervention development) was the development of a personalized PPR program, the third phase (intervention phase) was the implementation of the PPR programme. The fourth phase (post intervention/ evaluation) was an evaluation of the PPR program effects by applying the instruments used in the first phase and the fifth phase (6 month follow-up/retention phase) involved re-administering the questionnaire and a follow up interview (Faggiani et al., 2005).

The third phase which was the implementation phase was done over seven weeks. Meetings between author one and the gymnast were held each week for approximately 30 minutes each in the first four weeks. In the last three weeks the interventions were monitored via telephone and training observation, as well as a "home-task" given to the gymnast. From this study it was concluded that there was a perceived increase in the effective use of psychological skills post intervention and that the PPR's were more consistent, showing control and automaticity of routine (Faggiani et al., 2005).

2.7.2.3. Use of Technology to Manage Anxiety

Computer, phone or tablet applications can be used to help regulate levels of anxiety. The University of West England created an application "SAM" (Self-help for Anxiety Management) which helps an individual to understand and manage anxiety (www.sam-app.org.uk). Another example is an application by Google Play, called "Stop Panic and Anxiety Self-help", which teaches an individual how to tolerate and manage the symptoms of anxiety (www.play.google.com). According to Google it has audios, articles and a cognitive diary that aids in helping individuals to deal with anxiety symptoms.

"iCan Hypnosis" also developed an application, called Anxiety Free, which teaches an individual some strategies to reduce anxiety and the consequences that might follow, through self-hypnosis (Anxiety Free: iCan Hypnosis with Donald Mackinnon. Reduce stress & Mackinnon, 2015). Another application which is available on the iTunes store called "Anxiety Mint - Cognitive Bias Modification (CBM) For Anxiety", was developed by Jason Pegg, which as the name says uses CBM to reduce anxiety (www.itunes.apple.com).

2.7.2.4. Self-talk as an Anxiety Management Strategy

From the above discussion it can be seen that various studies have been done on the nature and implementation of anxiety reduction management strategies, self-talk, being one of them. For the purpose of the current study it is vital to explore self-talk in more detail, as well as studies that have been conducted using self-talk as an anxiety management strategy.

Self-instructional strategies were looked into by Meichenbaum (1977) and suggest that "statements addressed to oneself influence individuals attentional and appraisal processes, thus regulating behavioural performance" (Hatzigeorgiadis et al., 2011, p. 348). According to Meichenbaum self-statements give an indication of an individual's beliefs, which may play a mediational role in behaviour and performance. Within the sporting context these strategies are more commonly known as self-talk interventions (Hatzigeorgiadis et al., 2011). When athletes use self-talk, it helps them to control and organise their thoughts and is key to performing at their best and it is recommended that it be included in psychological training (Hardy et al., 1996). It has been suggested that self-talk is used by, cricketers to help them achieve the appropriate "frame of mind" when used prior to and during performances in competition (Thelwell & Maynard, 2003).

In a critical review of self-talk literature, Hardy (2006) explored self-talk in terms of (a) definitions of self-talk; (b) the nature of self-talk; and (c) applicable theories to self-talk. There are many definitions of self-talk, but he suggests that a working definition of self-talk be defined as: "(a) verbalizations or statements addressed to the self; (b) multidimensional in nature; (c) having interpretive elements associated with the content of statements employed; (d) is somewhat dynamic; and (e) serving at least two functions; instructional and motivational, for the athlete" (p. 84).

He proposed six aspects in terms of the nature of self-talk which are: "(a) self-talk's valence (i.e. positive–negative self- talk); (b) overtness (i.e. covert–overt self-talk); (c) frequency; (d) how self-determined the self-talk is; (e) (directional and intensity) motivational interpretations of self-talk; and (f) the functions that self-talk can serve for the athlete" (Hardy 2006, p. 84). The valence of self-talk is regarded as either positive or negative and is probably one of the more focused of areas of self-talk (Hardy, 2006).

2.7.2.4.1. Functions of Self-talk as Instructional or Motivational

The focus of the current study is on self-talk as an anxiety regulation strategy, which include two types of self-talk. Instructional self-talk was used in combination with motivational self-talk, as defined and discussed below.

Instructional Self-Talk (IST) refers to "statements related to attentional focus, technical information, and tactical choices", whereas Motivational Self-talk (MST) refers to "statements related to confidence building, effort input, and positive moods" (Hatzigeorgiadis, Zourbanos & Theodorakis, 2007, p. 240). Instructional Self-Talk, also known as cognitive function is related to the technical aspects of a sport, in which the individual participates. IST is further divided into two more categories, namely cognitive specific, which assists an athlete to learn and execute individual skills and cognitive general, which assists an athlete to learn and execute individual strategies (Hardy, Hall, & Hardy, 2004).

Motivational Self-Talk is divided into three specific functions, namely arousal, mastery and drive functions (Hardy, Hall & Hardy, 2005). The motivational arousal function is to help an athlete "psych" themselves up, relax or control his/her arousal (Hardy et al., 2005). This function related to mental toughness, focus, confidence and mental preparation is known as the motivational mastery function and the motivational drive function helps athletes to keep on track to achieve their goals (Hardy et al., 2005). According to Hardy, Gammage, and Hall (2001) the motivational function can act as a motivational arousal function (psyching-up, relaxation or arousal control), a motivational mastery function (building confidence and mental preparation), and a motivational drive function (regulating drive and effort).

These two types of self-talk are in line with the "why" in the study conducted by Hardy, et al. (2001), where they looked at where, when, what and why athletes make use of self-talk. While participating in sports (when), athletes use self-talk at sports venues (where). The content of self-talk, the "what" aspect, was categorised into five different areas, namely nature, structure, person, task instructions and miscellaneous. Why athletes use self-talk was suggested as being cognitive (instructional purpose for skill development and skill execution) and motivational, of which both could further be divided into specific and general levels.

A study conducted by Hatzigeorgiadis, Theodorakis and Zourbanos (2004) looking at the effect of instructional and motivational self-talk on the occurrence of interfering thoughts and performance on two water-polo tasks had interesting results. They found that performance in the precision task improved for both groups who used motivational and instructional self-talk, although instructional self-talk was used more. On the other hand for the power task, only the motivational self-talk group showed an improvement in performance.

The results showed indications that participants who used self-talk experienced an enhancement in concentration and that self-talk also reduced the amount of thoughts not related to task execution. This study showed insight into the underlying mechanism of self-talk, in this case attention and how an increase in attention can facilitate performance. It is stressed in this study that self-talk should be in line with the task to be performed, depending on whether or not it is a gross or fine motor task and that appropriate cues should be used. This is in line with the study by Theodorakis,Weinberg, Natsis, Douma, and Kazakas (2000) where they suggest that instructional self-talk be used for precision tasks to help facilitate attention on technical aspects of the task. Motivational self-talk should be used for tasks that require strength and endurance, in order to focus more on effort in the execution of the task to be performed (Theodorakis et al., 2000).

2.7.2.4.2. Self-talk effectiveness and underlying functions of self-talk

It is evident that self-talk can be an effective cognitive strategy that facilitates performance, assists in improving skill acquisition and enhances athletic performance in, from novice to elite athletes (Perkos, Theodorakis & Chroni). What is regarded as important by Hatzigeorgiadis (2006) is to look at why self-talk is effective and the underlying functions of self-talk. In a study conducted by Hatzigeorgiadis (2006) he assessed five self-talk functions, namely attention, effort, anxiety, confidence and automaticity. The aim was to investigate perceived functions of self-talk of twenty six physical education students, who took part in an intervention study that involved a swimming task.

Results of this study found that participants experienced more attention, especially with a novel task. It was also found that different types of self-talk served different functions, depending on the content of the self-talk used. Related specifically to the current study, Hatzigeorgiadis (2006) found that the anxiety control cue had a greater impact on anxiety control than the attention self-talk cue. Effects for attention, effort, confidence and automaticity were similar when using anxiety cues and attention self-talk cues (Hatzigeorgiadis, 2006).

In a follow up study by Hatzigeorgiadis et al. (2007) female swimming students were tested on an experimental water polo precision task. Results showed evidence that some self-talk cues can be more effective than other self-talk cues in certain tasks. Self-talk can serve different functions depending on the content of self-talk and the nature of the performed task (Hatzigeorgiadis et al., (2007). There are also differing theories about the effects of self-talk and whether is it is beneficial is aiding an athlete to enhance attentional focus and direct attention to a specific task and whether it helps to improve confidence or control anxiety (Hatzigeorgiadis et al. 2007).

A study by Hatzigeorgiadis, Zourbanos, Mpoumpaki and Theodorakis (2009), which looked at the mechanisms of self-talk-performance relationship, showed that self-talk can enhance self-confidence and reduce cognitive anxiety. Participants included national and international level tennis players that were randomly divided into a control and experimental group. As in the current study, the CSAI-2R was used for the assessment of anxiety and self-confidence. Overall, it was found that self-talk had a positive effect on task performance, increased self-confidence, reduced cognitive anxiety, and that changes in task performance were related to changes in self-confidence. In other words, self-confidence is the mechanism through which self-talk aids an increase in performance.

Studies mentioned above show evidence for the effectiveness of using self-talk to enhance performance and reduce anxiety in various physical activity setting, like water-polo, swimming and physical education. A qualitative study conducted specifically on cricket batting performance was conducted by Miles and Neil (2013). They investigated the use of self-talk by conducting semi-structured interviews with the aim to promote recall through self-confrontational interviews, using video footage. Table 2.2 represents a summary of types of self-talk and functions of self-talk used by the batsmen at each critical incident.

Table 2.2

Types of Self-Talk and Functions Of Self-Talk Used By Batsmen At Each Critical Incident

Critical incident	Type of Self-talk	Function
Walking out to bat	Instructional and motivational	Strategy, self-regulation and confidence
Poor shot execution	Instructional and motivational	Strategy, attention and confidence
A change of bowler	Instructional	Strategy, skill execution and self-regulation
Premeditating a bowler's delivery	Instructional	Strategy and confidence
Following dismissal	Instructional	Reflection and strategy

These results provide evidence for the fluctuating use of self-talk and the varied use of motivational versus instructional self-talk throughout cricket batting performance. Interestingly is that motivational self-talk is incorporated as well suggesting the need to enhance self-efficacy and focus, whilst reducing performance anxiety. It is suggested that motivational self-talk is used to help to increase effort and as a form of thought-stopping, in order to remain confident in performance, redirect attention and reduce anxiety. It was particularly highlighted that self-talk is used as a continual narrative, depending on the state of the game, how many points there is potentially and the threats a batsman might face.

2.8. Conclusion

From the above literature review, it is evident that there is a reasonably vast amount of theoretical and empirical evidence to suggest that self-talk strategies, whether motivational or instructional, improve performance and assist athletes to function at an optimal level. How anxiety and self-confidence impacts on performance is also quite clear. The studies above also show a link between how anxiety regulation strategies work to manage, mostly decrease anxiety and increase self-confidence, in order to perform optimally. However, only a few studies have looked at self-talk interventions, in isolation, to determine what the impact is on performance, specifically looking at how exactly does self-talk impacts on anxiety and self-confidence.

An increase in levels of confidence and attention has also been shown to reduce anxiety and thus also aid in enhanced sporting performance, however the link between these two variables have also not always been made clear. More specifically, there is very little evidence on how anxiety, self-confidence and an anxiety regulation strategy affects a batsman, in cricket and more specifically shot accuracy and coincident anticipation timing. The literature reviewed in this chapter makes it clear that there are links between anxiety, self-confidence, coincident anticipation timing and batting performance, in cricket. This study aims to better understand how and to what extent this occurs. In the chapter that follows I discuss how these concepts are combined into a theoretical framework that was used to guide the study intervention.

CHAPTER 3
THEORETICAL FRAMEWORK AND DESCRIPTION OF THE INTERVENTION

3.1. Theoretical Framework

3.1.1. Introduction

Zervas, Stavrou, and Psychountaki (2007) identified that research should examine the relationships of self-talk to other psychological constructs such as anxiety, concentration, and self-confidence, as these could serve as potential mechanisms through which self-talk facilitates performance. In line with this, according to Theodorakis, Hatzigeorgiadis, and Chroni (2008) who presented a multidimensional approach of self-talk functions they identified five distinct functions of self-talk. They suggested that self-talk can serve to enhance attentional focus, increase confidence, regulate effort, control cognitive and emotional reactions (i.e. managing anxiety), and trigger automatic execution (Theodorakis, et al., 2008). It is regarded essential by Mamassis and Doganis (2004) to look at the specific demands of each sport, in this case cricket, as the importance of each of these can differ. The current study focused specifically on anxiety, attention and self-confidence and how it impacts on performance in cricket batting and coincident anticipation timing.

According to Zinsser et al. (2006), it was claimed that the use of instructional self-talk aids in enhancing attentional focus and directing attention, whilst the use of motivational self-talk assists athletes to build confidence. In the current study the aim of the motivational self-talk cues were focused on motivating an individual and managing anxiety. The assumption here is that self-talk used as a function of controlling cognitive and emotional reactions i.e. anxiety, would in turn increase self-confidence. It could be said that anxiety and self-confidence have an inverse relationship. The same can be said for anxiety and attention. Instructional self-talk increases attention and in turn decreases anxiety. According to Hardy, et al. (2001) self-talk can be used for different functions depending on the task at hand. Therefore it could be argued that if the function of self-talk is to decrease anxiety and increase self-confidence and attention, this will lead to an increase in level of optimal performance.

Landin proposed that self-talk can be used to enhance attentional focus, whereas Nideffer indicated that self-talk can be an effective strategy for directing or redirecting attention to task relevant cues. Finn (1985) and Zinnser, Bunker, and Williams. (2006) suggested that self-talk can serve to regulate effort and enhance self-confidence, whereas Hardy et al. (1996) argued that self-talk can also be effective in controlling anxiety and triggering appropriate action.

Research on the effectiveness of self-talk has examined and compared the effects of different types of self-talk in experimental tasks. Theodorakis,Weinberg, Natsis, Douma, and Kazakas (2000) speculated that instructional self-talk should be more beneficial for fine tasks (tasks placing greater demands on accuracy and precision), whereas motivational self-talk should be more beneficial for gross tasks (tasks placing greater emphasis on strength and endurance). In general, even though the evidence is not conclusive, these findings suggest that different types of self-talk may have different effects on task performance based on the nature of the task and the type of self-talk that is used. It is for this reason that motivational self-talk and instructional self-talk was used in combination, depending on the individual's preferences and needs. Also, in the game of cricket, based on the above, cricket can be considered as a strength and endurance task, as well as an accuracy and precision task, depending on the game.

Figure 3.1 depicts how self-talk can impact on performance via the underlying cognitive mechanisms as well as the theories linked to each, which will be discussed below.

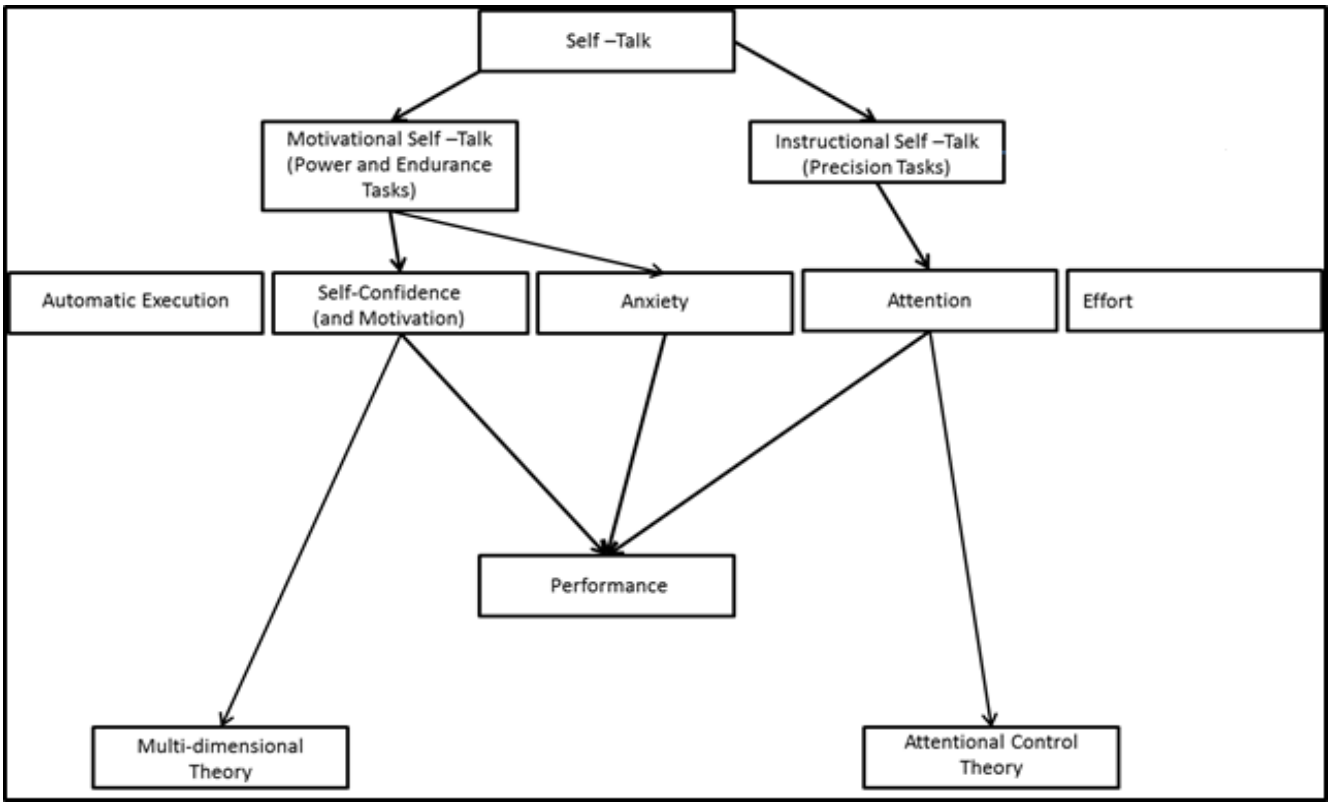

Figure 3.1. Link between self-talk, underlying mechanisms and performance

3.1.2. Anxiety and Attention Control Theory

One of the most well-known theories of anxiety and cognitive performance, based on insights from cognitive psychology is that of the Attentional Control Theory (ACT) (Eysenck, Derakshan, Santos, & Calvo, 2007). It was derived from Eysenck's (1992) earlier Processing Efficiency Theory. These theories are based on the assumption that there is a "distinction between performance effectiveness (quality of performance) and processing efficiency (the relationship between performance effectiveness and use of processing resources), and that anxiety impairs processing efficiency more than performance effectiveness" (Derakshan & Eysenck, 2009, p. 168). Anxiety is said to impair the efficiency of the central executive component of the working memory system (Derakshan & Eysenck, 2009).

he ACT theory suggests that individuals who are anxious allocate attention to threat-related stimuli, whether internal (e.g., worrisome thoughts) or external (e.g., threatening task-irrelevant distractors) (Eysenck., et al, 2007). Anxiety decreases the influence of the goal-directed attentional system, away from task-relevant stimuli, which in turn increases the influence of the stimulus-driven attentional system, towards task-irrelevant stimuli (Eysenck, et al., 2007). The goal-directed attentional system is managed by knowledge, expectations and current goals, whereas the stimulus-driven attentional system is regulated by significant stimuli (Coombesa, Higgins, Gambleb, Cauraugh & Janelle, 2009). Top-down control of attention is linked to the goal-directed attentional system and bottom-down attentional control is linked to the stimulus-driven attentional system (Coombesa et al., 2009).

The result of this is reduced attentional control and impairment of the inhibition and shifting functions. Another component of the central executive is that of the updating function (Derakshan & Eysenck, 2009). However, this function is linked to memory rather than attention and therefore is said not to be impacted on by anxiety (Derakshan & Eysenck, 2009). According to Derakshan and Eysenck, (2009, p.168) attentional control theory "assumes that anxiety impairs the efficiency of two types of attentional control: (1) negative attentional control (involved in inhibiting attention to task-irrelevant stimuli); and (2) positive attentional control (involved in flexibly switching attention between and within tasks to maximize performance)".

According to Miyake, Friedman, Emerson, Witzki, Howerter and Wager (2000) inhibition is defined as "one's ability to deliberately inhibit dominant, automatic, or prepotent responses when necessary" (p. 57). This means controlling attentional control in order to resist disruption from task-irrelevant stimuli (Eysenck et al, 2007). The definition given for shifting is "shifting back and forth between multiple tasks, operations, or mental sets" (p. 55). This entails adapting changes in attentional control based on task demands (Eysenck et al, 2007). According to Derakshan and Eysenck, (2009) there have been over 30 studies looking at the anxiety-attention relationship. They confirm that there is strong evidence to support the ACT and that anxiety impairs processing efficiency more than performance effectiveness (Derakshan & Eysenck, 2009). They also confirm that anxiety impairs the inhibition and shifting functions of the central executive (Derakshan & Eysenck, 2009).

3.1.3. Anxiety and Self-Confidence

The need to view arousal as a multifaceted construct made up of both cognitive and physiological components is emphasized by Gould and Udry (1994). In other words, if we link it to the current study how a cricket batsman performs in terms of shot accuracy and quality of interception, as well as on the coincident anticipation task, will be impacted on by anxiety. Two of the cognitive components measured by the CSAI-2R in this study were that of somatic and cognitive anxiety and self-confidence. What is regarded important to look at is the link between these variables and that of self-talk, whether it motivational or instructional.

Hardy (2006) based on the premises of the self-determination theory (Deci & Ryan, 1985) suggested that the use of self-determined self-talk cues may have positive motivational influences. The individualization process that was implemented in the present study may have increased participants' interest in the strategy, their commitment in using it, and maybe their belief for its effectiveness. However, it was also reported by Hatzigeorgiadis et al. (2011) that training of self-talk could be considered as the strongest moderator of its effectiveness. One could argue that this is also linked to the length of time taken to develop self-talk as an effective strategy. It is suggested then that the belief in using self-talk as an effective strategy and the implementation thereof, would increase the levels of self-confidence, which in turn would decrease levels of anxiety.

If we look at this interaction in terms of the Cusp Catastophe model, according to Burton, (1988) cognitive anxiety (the central tenet of which is concerned with the consequences of failure) has been found to have a negative linear relationship with performance. Self-confidence (a separate cognitive component) has been found to have a positive linear relationship with performance (Burton, 1988). Finally, somatic anxiety (physiological symptoms) has been found to have an inverted-U shaped relationship with performance (Burton, 1988). Therefore linked to the current study, it could be suggested that if self-confidence increases and anxiety decreases, then performance will increase.

3.1.4. Conclusion

In this section I have outlined the theoretical framework for understanding how anxiety, self-talk, self-confidence, attention and performance may be related. This has been linked to the current study where batting performance (shot accuracy quality of interception) and coincident anticipation timing were measured. In the chapter that follows I outline the intervention that was tested to try and assist cricketers to improve their batting performance.

3.2. Description of the Intervention

3.2.2. Purpose of the Intervention

The purpose of the intervention was to assist cricketers in reducing their levels of anxiety and, in turn, increasing their levels of confidence, during performance in a batting performance test and coincident anticipation timing test. The intervention consisted of an individual assessment of the current use of self-talk, which was done using the pre-test self-talk questionnaire (see Appendix F) prior to each testing set (batting performance and coincident anticipation timing tests). Participants were then required to learn and/or refining the specific technique of self-talk, which incorporated both motivational and instructional self-talk. This was done on a continuous basis throughout the testing periods and cricket practice sessions. The purpose of the intervention was to increase attention to the task at hand, decrease task-irrelevant thoughts, increase self-confidence and decrease cognitive and somatic anxiety. This would in turn increase performance.

3.2.3. Targeted clients

The intervention was targeted at male university club cricket players. Their ages were between 18 and 26 years old. They played in a competitive club cricket league.

3.2.4. Space needed

A quiet space that did not have too many disturbances, like a classroom facility, was needed for assessment, use and preparation of the self-talk techniques. As confidentiality is vital and personal struggles related to batting performance, anxieties and self-confidence was discussed, it was necessary for the sessions to be conducted in a space where one-on-one sessions could be held, without interruptions.

3.2.5. Equipment needed

Equipment needed in terms of teaching the self-talk technique comprised of pens, paper and the Informed Consent Form (see Appendix A). The rest of the intervention was done at cricket practices, where cricket practice specific equipment was used, including helmets, ball and cricket bats etc.

3.2.6. Additional Personnel

The Self-talk facilitator (the researcher in this case) was needed in order to conduct the introduction phase, as well as the training, development and implementation phase. Cricket Coaches were also consulted during the training, development and implementation phase, particularly for advice on instructional self-talk, where technique and skill of the individual was vital to consider.

3.2.7. Details of the Intervention

Once the pre-tests were completed, only the experimental group participated in the intervention. Seven participants from the experimental group took part in the intervention over three weeks. The intervention was implemented using two of the same principles used in the study by Hatzigeorgiadis, et al. (2014) which were, one, the implementation of appropriate and adequate training in using self-talk, and two, that athletes be facilitated to develop their own self-talk plans. Cricket players in this study used two of the three weeks to become familiar with the use of self-talk and then the last week was used to develop their own self-talk plans. The self-talk intervention consisted of two phases. Firstly, an introductory, psycho-education session was held, on an individual basis, with each participant. Secondly, a training, development and implementation phase was completed with the cricket players.

3.2.7.1. Introduction Phase

Eight cricket batsmen, comprising the experimental group, attended individual introductory sessions to discuss the concept of self-talk, how it is used and implemented of it in sport. The participants were given a short presentation on it. This aimed to answer questions like "what is self-talk", how do we implement self-talk" and positive versus negative self-talk. The difference between motivational and instructional self-talk was also explained. The details of the intervention were described to the participants. They were explained to and shown how to effectively use this technique. The aim of this phase was to assist batsman in enhancing their understanding of self-talk strategies and to get acquainted with the use of this technique. The importance of attending all sessions and practices for the next three weeks was also stressed to the participants. It was stressed that in order for the intervention to be successful, it is vital to attend all the sessions and practices. The difference between motivational self-talk and instructional self-talk was explained to the participants and some examples (for swimming) taken from Hatzigeorgiadis et al., (2014) study was given.

APPENDIX
Example of a Personal Daily Training Self-talk Card

WEEK 5 – MOTIVATIONAL AND INSTRUCTIONAL SELF-TALK

	What	When	Why
Motivational self-talk			
All styles	Let's go Strong Power legs Give it all	Just before the start of each repeat During the push after each turn	To boost effort
Instructional self-talk			
Freestyle	Elbow	On releasing the arm for recovery	To keep the elbow high
Backstroke	Deep	When entering the arm in the water	To take the arm deep enough for the catch
Breaststroke	Ankles	When completing the leg stroke	To continue the move until the ankles come together
Butterfly	Chin	Just before the exit of the head	To keep the chin close to the surface

Figure 3.2. Example of personal daily training self-talk card

3.2.7.2. Training, Development and Implementation Phase

The second phase was the training, development and implementation phase. At practice, which occurred twice a week, for a period of three weeks, participants were consulted individually to assess the use and implementation of self-talk, as an anxiety regulation strategy. These individual sessions were based on a similar intervention done in a study by Hatzigeorgiadis et al. (2014), where they developed their self-talk intervention during training. Individuals, with some guidance developed their own self-determined plans and training was done using implementation of self-determined self-talk strategies at practice and batting in the nets. Each practice included a two min individual briefing session that was given before going to practice batting and a two minute debriefing session after completion of their batting skills practice. Both briefing sessions were vital in order to assess, discuss and remind the participants about the use and implementation of self-talk. The use of the self-talk in-between balls or during was also discussed. The Self-Talk facilitator consulted at each practice, with the coaches of the players, in order to guide them in specific ST cues which might be beneficial to the individual player. In the three weeks of batting practice batsmen were required to train, develop and implement self-talk while batting in the nets at practice.

A combination of motivational and instructional self-talk cues used in the study by Hatzigeorgiadis, et al., (2014), was integrated into the intervention used in the current study. In line with the study by Miles and Neil (2013) where it was also found that batsmen used both instructional and motivational self-talk for different functions. Since batting can at times be regarded as a precision, as well as endurance task, depending on the shot at the time, it was also vital for batsmen to learn both self-talk strategies in order to make use of what they needed at the time and based on their individual needs. For the first week of practices, the batsmen practiced motivational ST cues. In cooperation with the coaches, technical aspects of each individual was assessed and for the second week the batsmen were required to practice instructional ST cues, based on these.

For the third week, the batsmen were required to use a combination of motivational and instructional ST cues, based on their preferences and from this they were able to develop their own ST plan. This ST plan was then practiced in the last week of the intervention, during batting practice sessions in the cricket nets. The practices looked as follows:

Table 3.1

Description of Self-Talk Cues for Each Practice

Week	Practice number	Type of self-talk
1	Practice 1	Motivational ST cue
	Practice 2	Motivational ST cue
2	Practice 3	Instructional ST cue
	Practice 4	Instructional ST cue
3	Practice 5	Own ST plans
	Practice 6	Own ST plans

In a study conducted by Hardy, et al. (2005) they included aspects of self-talk like nature (valence), overtness and structure. Hardy (2006), in his critical review of self-talk literature, added to these to also include the frequency and functions, among others. The individual ST plans had the following requirements:

Table 3.2

Requirements for Self-talk Cues

Valence	Positive
Overtness	Internal
Structure	Single word or phrase
Frequency	Repeat times 3
Functions	Motivational and Instructional

Presented below is an example of a Personal Daily self-talk plan that each cricket player was required to fill out throughout the practices in the intervention phase:

Cricket Batting Personal Daily Training Self-talk Card

Name:_____

	WHAT	WHEN	WHY	Repeat
Week 1 – Motivational ST Cue				
	1. E.g. Power Arms	E.g. As I hit the ball	E.g. Increase the distance	X 3
	2.			X 3
Week 2 – Instructional ST Cue				
	1. E.g. Chin	E.g. As the bowler approaches	E.g. To Increase vision	X 3
	2.			X 3
Week 3 - Both				
Motivational ST Cue	1. E.g. Power Arms	E.g. As I hit the ball	E.g. Increase the distance	X 3
	2.			X 3
Instructional ST Cue	1. E.g. Chin	E.g. As the bowler approaches	E.g. To increase vision	X 3
	2.			X 3

Figure 3.3. Example of a "Self-Talk Plan Card"

3.3. Conclusion

Implementation of the intervention occurred twice a week at each practice. Problems encountered included being able to have an individual session with each batsman before going into bat in the nets, as practice sessions were structured and followed a certain routine. Debriefing of whether or not the self-talk cue was effective at the time and if it should be changed or altered, between each shot was difficult to assess.

Due to the small sample sizes of this study, it can be considered to be a pilot study of the intervention, rather than as a controlled trial of the effectiveness of the intervention. Therefore it is recommended that the study be repeated with a larger sample size. Based on my experience of implementing this pilot intervention, I would suggest that the following improvements could be made to the intervention:

- A longer initial session with the cricket players for psycho-education of the use and implementation of self-talk. Studies that show evidence of self-talk being an effective anxiety regulation strategy and how this is linked to underlying cognitive mechanisms, such as attention and self-confidence would be vital. Coaches would also be required to attend this session.
- As training of self-talk could be considered as the strongest moderator of its effectiveness, a course on how to train and market strategies, as well as convey information could be beneficial.
- Individual sessions with each cricket player needs to longer as well as conducted on a deeper level. A questionnaire for this purpose could be developed, as a starting point for discussion, in order to acquire more knowledge about individual struggles with anxiety, self-confidence and attention.
- The implementation of the intervention would be more suited to an indoor cricket net facility or variation of both indoor and outdoor.
- A list of previously used self-talk cues, used by experts in the field could be given, as not all participants were easily able to come up with their own cues. More research into this would be required.

CHAPTER 4
RESEARCH METHODOLOGY

In this study I made use of a mixed between-group and within-groups research design to test the hypotheses that an intervention comprising of the use of self-talk will decrease levels of anxiety and increase levels of self-confidence experienced by cricket players. The result of this will be an increase in batting performance, specifically shot accuracy and quality of interception, as well as an increase in the level of performance for coincident anticipation timing.

The research aims and of this study was to pilot an intervention to investigate the effect of self-talk as an anxiety and self-confidence regulation intervention on batting performance and coincident anticipation timing in cricket. The objectives of this study were firstly, to look at the effect of a self-talk intervention on the anxiety levels and self-confidence of cricketers. Secondly, it was hypothesised that there would be an impact on the batting performance of cricketers when implementing a self-talk intervention. The final hypotheses to evaluate the effect on performance of cricketers in a coincident anticipation timing test after they made use of self-talk as an anxiety and self-confidence regulation strategy. The methodology that was used in the current study is described in detail in this chapter.

4.1. Research Participants and Selection

Fifteen participants took part in the research study. Participants were all intermediate level cricketers playing in a competitive club cricket league in the Boland. After receiving ethical clearance from the university's Ethics Committee, participants were recruited from the club, through the Sports Science Department, based on team and individual availability as well as verbal and later written consent to take part in the study. The available research participants were randomly assigned, to the experimental group (n=7) and the control group (n=8). This was done according to availability of the players and the ability to commit to taking part in the study.

Research participants' ages and specialities in Table 4.1

Table 4.1

Age and Speciality of each Cricket Players

Participant no and group	Age	Batsman	Bowler	Wicket Keeper	All Rounder
1(experiment)	20				X
2 (experiment)	22	X			
3 (experiment)	18	X			
4 (experiment)	23				X
5 (experiment)	22	X		X	
6 (experiment)	22	X			
7 (experiment)	19	X			
8 (control)	20	X		X	
9 (control)	19				X
10 (control)	22	X			
11 (control)	20		X		
12 (control)	25	X			
13 (control)	20		X		
14 (control)	21		X		
15 (control)	23				X

To summarise, the participants initially included the following:

Experimental Group: 5 batsmen, 1 wicket keeper and 2 all rounder's

Control Group: 3 batsmen, 3 bowlers, 1 wicket keeper and 2 all rounder's

Additional Personnel included in the study performed the following functions, which were vital to the study:

- Bowling machine operator
- Assessment of shot accuracy and quality of interception by cricket expert
- Batting performance test administer
- Recording of each trial of the Batting Performance Test (BPT)
- Bassin Anticipation Timer operator
- Anxiety regulation strategy trainer
- CSAI-2R and STQ administrator

4.2. Research Design

Due to the availability of the cricket players and the timing of the cricket season, the study was conducted over two months, from the beginning of January to the beginning of March 2015. Both groups, the experimental and control underwent pre-testing, post-testing and three weeks later underwent a retention test. Prior to each testing period participants from both groups were required to fill out a Competitive State Anxiety Questionnaire (Second Revised) and a Self-Talk Questionnaire. This was in order to establish their changes, if any, in anxiety levels and their use of self-talk, respectively. Participants took part in the coincident anticipation timing test and the batting performance test.

The current study is a quantitative study where the researcher collects data and then makes use of statistical types of data analysis (Terre Blanche, Durrheim & Painter, 2010). This was found to be the best form of research for this particular study, because firstly it involved two questionnaires, an "anxiety" and "self-talk use" questionnaire. Secondly, scoring of batting performance and coincident anticipation timing was done with the use of numbers, which uses statistical types of data analysis.

The design of this study meant that once pre testing was completed, only the experimental group took part in the intervention. This consisted of a three week programme, where the cricket players learnt how to use and implement self-talk plans, which was used as an anxiety regulation strategy. The intervention was set-up in a way that suited the cricket player's availability and was according to when they attended cricket practice. This was twice a week, on a Tuesday and Wednesday. The study followed a reversal design in that the experimental group received the intervention after the pre-testing and the control group did not. However, the control group was offered the intervention after the retention testing had been completed by both groups.

The aim of the study was to see if there were any significant differences between the experimental group and control group, at the pre-, post- and retention stages. Significant changes could have also occurred within the experimental and control groups, over time, between pre to post to retention testing stages and this was analysed separately (see Table 4.2).

Table 4.2

Comparisons Between Groups and Within Groups

Experimental Group		Control Group
Pre-testing	→	Pre-testing
Intervention		NO Intervention
Post-testing	→	Post-testing
Retention testing	→	Retention testing

4.3. Measuring Instruments and Materials

4.3.1. Assessment of Anxiety

The original CSAI-2 used to measure anxiety should take no longer than 5 minutes to complete (Martens et al., 1990). The purpose of the CSAI-2 is to the "assess cognitive and somatic components of competitive state anxiety and self-confidence in relation to competitive sport performance" (Ostrow, 1990, p.50). The CSAI-2 is a 27-item self-report test that contains three subscales: cognitive anxiety, somatic anxiety, and self-confidence, each of which consists of nine items (Martens et al., 1990). The test uses a Likert scale, ranging from 1(not at all) to 4 (very much so) (Martens et al., 1990).

According to Ostrow (1990), the CSAI-2's Cronbach alpha reliability coefficients (across three samples of athletes) for the cognitive A-state scale ranged from .79 to .83, for the somatic A-state scale from .82 to .83, and for the state self-confidence scale from .87 to .90, making it a reliable assessment tool. According to Martens et al. (1990), the CSAI-2 demonstrates acceptable concurrent validity. More assessment is however needed in terms of criterion validity (Cox et al., 2003). However, according to Wilkinson et al. (2013), some reliability and validity problems were picked up in various studies and therefore the CSAI-2 was revised (the CSAI-2R) by Cox et al. (2003).

The revised version was shortened to contain 17 items across three scales, which results in better reliability and validity, tested by Cox et al. (2003), was used in this study. Each item is set to a 4-point Likert scale as in the original CSAI-2. The CSAI-2R contains identical subscales to that of the original, each consisting of 7 items for somatic anxiety and 5 items for cognitive anxiety and self-confidence. Subscale scores are obtained by summing the scores, dividing by the number of items and multiplying by 10. This gives a score that is ranged between 10–40 units for each subscale. If an athlete fails to respond to an item, then the score is summed and divided by the items answered.

Reliability of the CSAI-2R for measuring anxiety was calculated for the coincident anticipation timing test and the batting test, in the current study. The Cronbach alpha reliability coefficient for the coincident anticipation timing test was calculated at .87 and for the batting test it was calculated at .88. The closer the Cronbach's alpha coefficient is to 1.0, the greater the internal consistencies of the items in the scale are. These two scores thus show that using the CSAI-2R is a suitable assessment tool, in terms of reliability, to measure anxiety, in the coincident anticipation timing test and in the batting performance test.

4.3.2. Assessment of Self-Talk

The use of self-talk was recorded during the pre-test, post-test and retention test. In the pre-testing phase all the participants in the control group and the experimental group were informed that athletes frequently say things to themselves while performing in sport. In the study by Hatzigeorgiadis, et al. (2014) the participants were asked during each supervised training set to indicate on a 10 point Likert scale, the degree to which they used the self-talk cues, already agreed on. Because the intervention in the current study included an assessment of which self-talk cues were best suited to the individual (motivational or instructional) and self-cues were varied at times, it was only necessary to establish if the cricket player made use of self-talk cues prior to the intervention. This resulted in a pre-test questionnaire being developed for this purpose, which only asked if the batsman made use of a self-talk cue and what the self-talk cue was.

The post-test and retention-test that was administered was an adapted version of the self-talk questionnaire used in the study by Hatzigeorgiadis, et al. (2014). The first item was changed to assess whether or not the batsman even made use of self-talk at all, instead of just asking whether or not it was from his self-talk plan. If the batsman answered "no" to not using a self-talk cue from his self-talk plan, it could imply that he was not using self-talk at all, hence the need for this to be clarified. The second item was changed to ask if the self-talk cue used was from his self-talk plan. If another self-talk cue was used (not from the self-talk plan) then this could be introduced into the player's self-talk plan in the future. Item three remained the same and the last item was changed from a scale of 1 to 10 to a scale of 1-5 for ease of answering by the cricket player.

The control group was given exactly the same STQ as the experimental group, in the current study. This was different to that of the study by Hatzigeorgiadis, et al (2014), where the control group were asked to indicate (a) whether they systematically used any form of self-talk during the competition; (b) if so, what was that; (c) if so, to what degree 1 (not at all) to10 (all the time). The reason for this was that it was only necessary to assess the use, if at all, of self-talk by the control group and this could be done using the same questionnaire as the experimental group. Participants in the control group would simply answer "yes" or "no" to if they used a self-talk cue and would answer "no" for the question to indicate if the self-talk cue was from the self-talk plan.

Below outlines the pre-test, post-test and retention-test questions asked:

The scale of the revised version, for the **pre-test**, used in the current study, included the following questions where participants were asked to:

a) Indicate whether they used a self-talk cue
b) If so, what was the self-talk cue

The **post-test and retention-test** STQ included the following questions where participants were asked to:

a) Indicate whether they used a self-talk cue
b) Report whether they used any self-talk cues from their self-talk plans
c) If not, what these self-talk cues were
d) If so, the degree to which they used these other cues (which were not from their self-talk plans), where 1 indicates not at all and 5 indicates all the time. See Appendix E.

4.3.3. Batting Performance Test

The aim of the batting performance test is to determine the cricket batsman's ability to accurately strike a ball towards an intended target, particularly testing their coincident anticipation timing ability.

The batting performance test that was used is one adapted from the test used by Muller and Abernethy (2008), which they considered to be a valid and reliable measure for the assessment of the quality of bat-ball interception in cricket batting. The test was adapted firstly, on the amount of ball deliveries faced by the cricket player and secondly the ball machine was use instead of a bowler. This was due to time constraints, limited availability of the subjects and the limited use of the outdoor cricket facility. The test done in the current study was not filmed as in the study by Van Velden (2010).

In the original Müller and Abernethy (2008) test, the batsman faced 45 deliveries from a right arm leg-spin bowler that were full in length and of two variations (either a "leg-spinner" or a "wrong-un"). The test used in this study did not make use of a bowler, but instead used the Kanon bowling machine (see Figure 4.3) (Howard Manufacturing, Port Elizabeth, South Africa) and Kanon Dimple balls (see Figure 4.2), where no variations were done. The batsmen faced 10 ball deliveries for practice and then faced 24 balls, instead of the 45 deliveries in the previous study. The batsmen tried to play the appropriate shots to each delivery.

The original test was conducted in an indoor practice facility on a synthetic rubber pitch. The entire test was filmed using a video recorder for analysis at a later stage by a cricket expert. This is different to the current study, where the outdoor cricket net facilities were made use of, in order to replicate a real-life match situation. The batsmen were familiar with this environment and regularly attended their training at these facilities. The batting performance test took approximately 20 minutes per person. The test required the subjects to wear their full cricket attire and bat as if they were going in to bat in a game situation.

Scoring of the Batting Performance Test worked as follows. Both previous and current testing's made use of a trained observer who viewed the test during real-time performance and rated each bat-ball interception as either a "good contact," a "bad contact" or "no contact."

- Good Contact was defined by Müller and Abernethy (2008, p.550) as:

"When the ball was contacted with the blade of the bat (not the handle or gloves) and travelled in a direction post-contact that was consistent with the pre-contact plane of bat motion".

- Bad Contact was defined by Müller and Abernethy (2008, p.550) as:

"When the ball contacted the blade of the bat but deflected in a different direction to the plane in which the batsman swung the bat to execute a stroke".

- No Contact was defined by Müller and Abernethy (2008, p.550) as:

"When the ball did not make contact with the blade of the bat".

As in the study of Van Velden (2010) shot accuracy and quality of bat–ball contact served as the outcome measures of the interceptive task performance.

Shot accuracy was measured from the placement and trajectory of each shot executed. Points for accuracy were allocated at the time of data capture by the researcher and an experienced Sport Scientist whose focus sport is cricket. Each shot was scored according to the following criteria:

4 points for a shot that passed through the red zone (middle of the target zone) either on the ground or at a low trajectory (approximately, 30 cm off the ground)

3 points for a shot that passed through the red zone at an elevated trajectory (considered by the researcher to be a catchable height)

2 points for a shot that passed through the blue zone at a low trajectory

1 point for a shot that passed through the blue zone at an elevated trajectory

0 points for a shot that completely missed the accuracy zones.

Participants could therefore score up to a maximum of 96 points for the test, if all shots were of a low trajectory and directed between the red cones. Scores for accuracy were converted to a percentage out of 100.

Quality of ball interception was scored at the time of testing by the primary test administrator and an experienced technician whose focus sport is cricket. Quality of contact was scored using the simple system devised by Muller and Abernethy (2006, 2008) in which:

2 points were allocated for good bat–ball contact with the ball being projected in the intended direction

1 point if the ball hit the edge of the bat and the ball was not projected in the intended direction

0 points if no bat–ball contact was achieved.

Scores for quality of contact were then expressed as the percentage score achieved (from the maximum score possible, which is 48).

The Kanon bowling machine was set up in the same way as in the study by Van Velden (2010) where the angle of the bowling machines projection arm was set so that the length or area where the ball pitches is approximately 4m in front of the batsman's crease, which Woolmer, Noakes and Mofett (2008) identified as a "good length". The Kanon bowling machine was situated at the non-strikers end of the pitch. It was placed directly in line with the middle stump at the striker's end of the pitch. The point at which the ball emerges from the barrel was perpendicular to the bowling crease and did not extend beyond it. For subjects who bat right-handed, the projection arm of the Kanon bowling machine was swivelled slightly so that the ball pitched in the "corridor of uncertainty", which is a narrow line on and just outside of a right handed batsman's off stump. The same setup protocol was used for subjects who bat left-handed.

The Kanon bowling machine was set-up for cricket bowling according to the assembly instructions in the operating manual (p.2) provided with the Kanon bowling machine (Figure 4.3).

Figure 4.1. Kanon bowling machine set-up for cricket bowling.

Figure 4.2. Kanon dimple ball.

Additional research materials included the following:

Cricket bat	Data recording equipment
Kanon Dimple Cricket balls	Bassin Anticipation Timer
Protective gear	Paper
Kanon Bowling machine	Pen
Two sets of wickets	
Outdoor cricket facilities	

4.3.4. Coincident Anticipation Timing Test

The aim of the Coincident Anticipation Timing Test is to determine the ability of the cricket player to anticipate the arrival of a visual stimulus at a specific point in time. The Bassin Anticipation Timer is the standard instrument used for assessing coincident anticipation timing (see Figure 4.1) (Erikson, 2007; Gardner & Sherman). Even though this instrument is relatively old and has been in use for many years, it is still being used in research today (Reichow, et al., 2010). The Coincident Anticipation Timing Test took roughly 20 minutes per individual to administer and worked as follows: The batsmen were asked to stand at the end of the Bassin Anticipation Timer (BAT), with their left or right hand placed on it, depending on whether they were a right or left handed batsman. The placement of the batsmen's' bodies were required to be positioned in the same way as if they were about to face a cricket ball, while batting. The batsman was then required to make a simple finger press response to a visual stimulus travelling towards them (in the form of a series of LED lights) when they perceived the visual stimulus to be under their index finger.

A three second yellow warming light was illuminated to account for time a bowler would run towards the batsman. Thereafter lights were illuminated sequentially along the BAT to imitate a ball approaching the batsman. The batsman was then required to push a button as the light reaches the end of the BAT, as accurately as possible. In this study this was repeated 15 times for each speed, where 5 were for practice, to get used to the BAT and 10 times were recorded for analysis at a later stage. The test was conducted at different speeds, namely at 5, 10, 15 and 25 mph and varied throughout the actual test. The batsmen were made aware of the speeds at which the lights approached in the practice run and the actual test.

Absolute error was recorded, as well as whether their responses were early or late. Absolute error (AE) is defined by Magill (2003, p.24) as the "absolute difference between the actual performance on each trial and the goal". In other words it is the sum of all the trials irrespective of the direction or deviation (early or late). A low score would indicate that the batsman's coincident anticipation timing was measured as "accurate" (early or late) and a high score would indicate that the batsman's coincident anticipation timing was measured as "less accurate". In other words the closer the scores are to "zero", the better ability of the cricket player to anticipate the arrival of a visual stimulus at a specific point in time.

According to Magill (2003, p.24) "error measures allow us to evaluate performance for skills for which accuracy is the goal". This applies to the skill of cricket batting because the goal is ultimately to score runs by accurately hitting the cricket ball in a specific direction, into the field of play (Van Velden, 2010). AE provides the researcher with useful information about the "magnitude or error" a subject has made on a single trial or over numerous trials and the AE score provides the researcher with general index of accuracy for the subject (Van Velden, 2010). The implication is that a batsman that receives a low score for this test would be the more accurate batsman. The results of each trial, at each speed were recorded for later analysis.

Figure 4.3 Bassin Anticipation Timer (Lafayette Instruments, Lafayette, IN).

4.4. Research Procedure

The anxiety regulation intervention and the batting performance tests took place at outdoor cricket facilities. Coincident anticipation timing testing took place at the university gym. The anxiety regulation intervention, batting performance test and coincident anticipation timing test were jointly designed and administered by experts from these units. Fifteen student males, aged from 18 to 26 years old, at an intermediate skills level were invited to participate in this study.

The study followed a reversal design. This means that the control group was offered the intervention programme after the retention test data had been collected for this study. This was explained to the participants and they were required to complete an informed consent form (see Appendix A). The two tests, namely the Batting Performance Test and the Coincident Anticipation Timing Test were explained to the batsmen. As the design of the study was a mixed between-group and within-groups research design, the test process involved two randomly assigned groups, the experimental group and the control group. The experimental group consisted of seven players and the control group consisted of eight players.

4.4.1. Data Collection

Data collection took place over a period of two months from the beginning of January to the beginning of March 2015. Physical data was collected on recording sheets and transferred onto electronic data.

Informed consent sheets were given to each individual participant to complete (see Appendix A). These sheets covered the purpose of the study and the procedures included in the study were discussed. Participants consented to taking part in this study on a voluntary basis. The place of the study was provided in the consent sheet, as well as the methods and details of the study and the intervention included. The time period that participants were asked to commit to for the study was given. Potential risks, discomforts and benefits of being involved in the study were outlined. Participants were told that there would be no reimbursement for taking part in the study given and that information obtained in connection with the study would remain confidential. Participation and withdrawal from the study was discussed. Contact persons for the study were given in the informed consent sheets and participants were asked to sign and date these.

Once participants consented to taking part in the study data collection for the study proceeded. In order to analyse changes in levels of anxiety a **Competitive State Anxiety Inventory (Second Revised) (See Appendix D)** was completed by all participants prior to pre, post and retention testing, for the coincident anticipation timing test and the batting performance test.

Next, different **Self-Talk Questionnaires (See Appendix E)** developed uniquely for each testing period were completed by all participants prior to pre, post and retention testing, for the coincident anticipation timing test and the batting performance test. This was in order to analyse the usage and implementation of self-talk.

Raw data were collected firstly, during the **coincident anticipation timing test** and then secondly, during the **batting performance test**, both prior to the pre-test, post-test and retention test. This data was then collated onto an excel spread sheet for later analysis.

The following information was collected for the coincident anticipation timing test: number of trials, speed of trials and whether or not the participant scored “early” or “late”

The following information was collected for the batting performance test: ball number, quality of interception, shot accuracy, total points scored and points converted into percentage

Below are diagrams that illustrate the research procedure and series of events for each group:

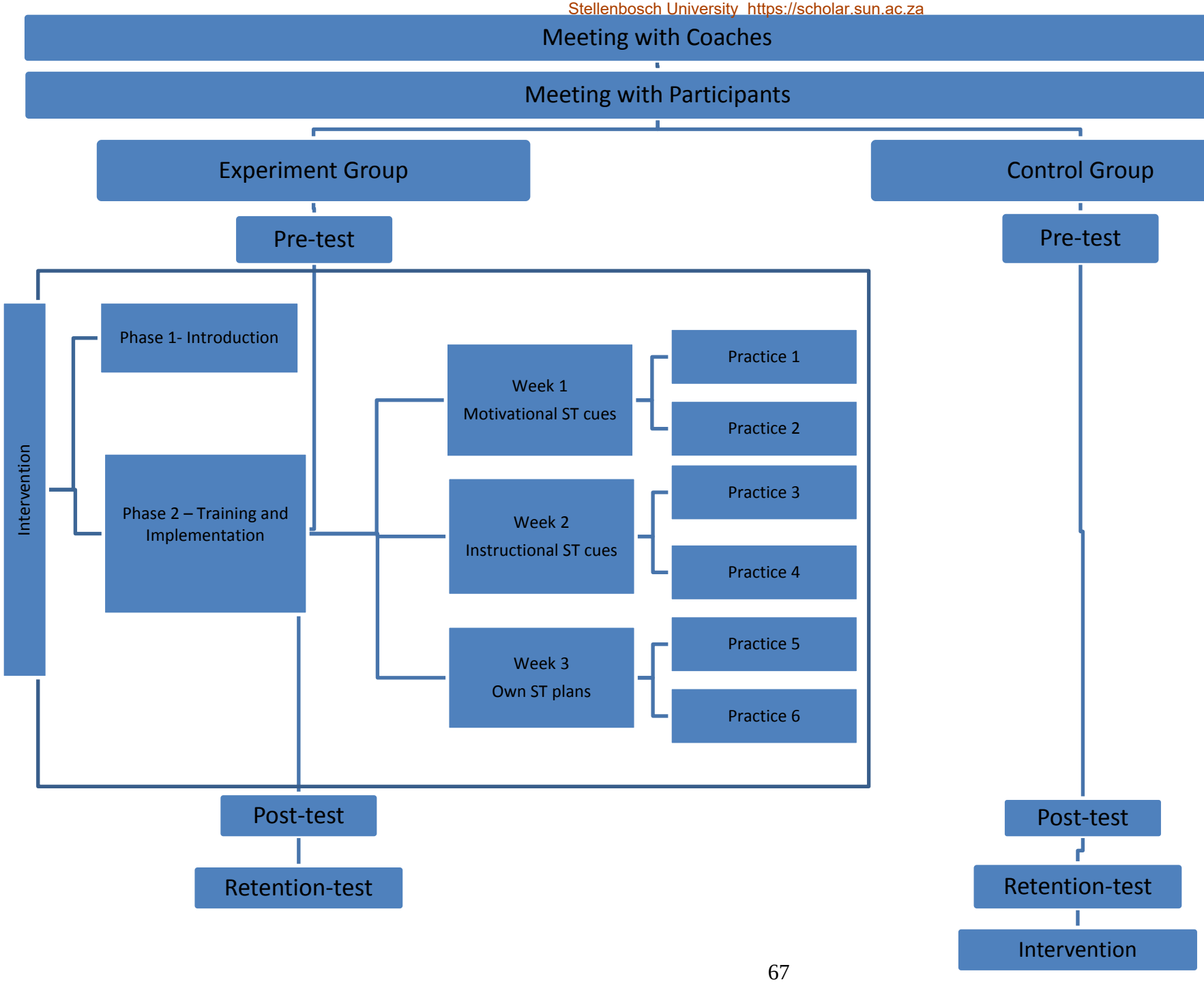

Figure 4.4. Flow diagram for series of events

							Time frame	Proposed Dates (2015)
Recruitment of Participants and explanation of study							1/2 Days	7 & 8 January
	Experimental Group				**Control Group**			
Pre-testing	Day 1	Fill in Informed consent forms and details			Day 1	Fill in Informed consent forms and details	2/3 Days	12 January
		CSAI-2R (Anxiety Questionnaire)				CSAI-2R (Anxiety Questionnaire)		
		Self-talk Questionnaire				Self-talk Questionnaire		
		Coincident Anticipation test				**Coincident Anticipation test**		
	Day 2 & 3	CSAI-2R (Anxiety Questionnaire)			Day 2 & 3	CSAI-2R (Anxiety Questionnaire)		14 & 16 January
		Self-talk Questionnaire				Self-talk Questionnaire		
		Batting Performance test				**Batting Performance test**		
Intervention	Phase 1	Introduction to Self-Talk (difference between Motivational and Instructional cues) done on an Individual basis			X		3 Weeks	19 January
	Phase 2	Week 1	Batting Prac 1	Motivational ST cue	Batting Practice			1) 20 January (Tues)
			Batting Prac 2	Motivational ST cue				2) 21 January (Wed)
		Week 2	Batting Prac 3	Instructional ST cue				3) 27 January (Tues)
			Batting Prac 4	Instructional ST cue	Batting Practice			4) 28 January (Wed)
		Week 3	Batting Prac 5	Own ST plan				5) 3 February (Tues)
			Batting Prac 6	Own ST plan				6) 4 February (Wed)

Figure 4.5 Diagram representing detailed series of events and timeline: Pre-testing and intervention form

	Experimental Group		Control Group		Time frame	Proposed Dates (2015)
Post-test	Day 1	CSAI-2R (Anxiety Questionnaire) Self-talk Questionnaire **Coincident Anticipation test**	Day 1	CSAI-2R (Anxiety Questionnaire) Self-talk Questionnaire **Coincident Anticipation test**	2/3 Days	9 February
	Day 2 & 3	CSAI-2R (Anxiety Questionnaire) Self-talk Questionnaire **Batting Performance test**	Day 2 & 3	CSAI-2R (Anxiety Questionnaire) Self-talk Questionnaire **Batting Performance test**		11 & 13 February
2 Weeks					2 Weeks	2 Weeks
Retention Test	Day 1	CSAI-2R (Anxiety Questionnaire) Self-talk Questionnaire **Coincident Anticipation test**	Day 1	CSAI-2R (Anxiety Questionnaire) Self-talk Questionnaire **Coincident Anticipation test**	2/3 Days	2 March
	Day 2 & 3	CSAI-2R (Anxiety Questionnaire) Self-talk Questionnaire **Batting Performance test**	Day 2 & 3	CSAI-2R (Anxiety Questionnaire) Self-talk Questionnaire **Batting Performance test**		4 & 6 March
END of Data Collection			END of Data Collection		**9 Weeks total**	
Debriefing and Communication of Results						
X			Shortened version of Intervention			

Figure 4.6 Diagram representing detailed series of events and timeline: Post-testing and retention test

4.4.2. Pre-test Administration

Prior to the pre-testing both groups were asked to complete the Competitive State Anxiety Inventory-2R (CSAI-2R) (Cox, Martens, & Russel, 2003), a revised version of the CSAI-2 (Martens, Burton, Vealey, Bump, & Smith, 1990), which is used to assess somatic and cognitive anxiety, as well as self-confidence. Both groups were assessed on their coincident anticipation timing using the Bassin Anticipation Timer (Lafayette Instruments, Lafayette, IN), as described below. Both groups were also asked to perform in the batting performance test, as described below.

A Self-Talk Questionnaire (STQ) was handed out to the cricket players, to complete before the pre-test and the post-test, as well as before the retention test. The questionnaire, like the one used in a study by (Hatzigeorgiadis, et al., 2014), indicated on a 10 point-scale, the degree to which the batsmen used the ST cues (see section 3.3.1.2)

4.4.3. Post-test Administration

The post-test repeated the pre-test protocol exactly, with each batsman assessed in terms of level of anxiety experienced, use of self-talk, performance on the Coincident Anticipation Timing Test and batting performance. The batsmen again completed the CSAI-2R as well as the STQ.

4.4.4. Retention test Administration

After two weeks the Batting Performance Test and Coincident Anticipation Timing Test protocols were again repeated, as a retention test.

4.5. Data analysis

Data were analysed under the guidance of the Centre for Statistical Consultation at Stellenbosch University. The analysis included the following:

- The raw data were collated on an excel spread sheet
- The raw data were reviewed for inconsistencies, completeness and outliers
- Comparisons between the experimental and control groups at the pre-, post- and retention stages on all the measured variables were done by using between-groups ANOVA's
- Comparisons within the experimental and control groups on all the measured variables between the pre, post and retention stages were done by using mixed model repeated measures ANOVA's

4.6. Ethical Considerations

Permission was obtained from the University of Stellenbosch, The Institutional Office and The Human Performance Centre at Stellenbosch University in order to conduct the study. Ethical clearance for the study was obtained from the University of Stellenbosch's Ethics Committee (Tel: 021 938 9657). Anonymity and confidentiality were ensured and informed written consent was obtained from all participants. The respondents were informed that participation was voluntary and that they could withdraw from the study at any time, without adverse consequences. The participants were also informed of what would be expected and what would be required if they took part in the study.

The welfare of the respondents was extremely important. If the assessments resulted in any emotional distress, provisions were made for the participants to be debriefed and/or referred for professional counselling at the university's Centre for Student Counselling. In the event of a minor or serious injury as a result of the testing process, students would be referred for the appropriate medical attention. During testing, particularly the batting performance test, cricket players were required to wear all safety equipment during the testing process and a first aid kit was also kept on site. However, the testing and training procedures constituted no more risk than those normally experienced by cricket players during their training sessions. The control group who did not receive the initial training were offered the intervention programme once the data collection of the study had been completed. The participants did not receive any remuneration for taking part in the study, as agreed upon in the informed consent form. Finally, feedback on the outcomes of the study will become available to the participants if they so wish.

CHAPTER 5
RESULTS AND DISCUSSION

5.1. Introduction

In this study I investigated the relationship between anxiety, self-confidence and performance, in order to test the effectiveness of a self-talk intervention and how this impacts on attention to the task at hand. The assumption between these relationships is that with decreased anxiety, there will be an increase in self-confidence and that this in turn will positively impact on performance. The results of the self-talk intervention are reported below in three subsections, namely (1) impact of the intervention on anxiety and self-confidence levels, (2) impact of the intervention batting performance (shot accuracy and quality of interception); and (3) impact of the intervention on coincident anticipation timing. This is followed by a discussion of the results for each section.

As discussed in Chapter 4, the data were analysed by using a mixed model repeated measures ANOVA, with group as the between-group factor and time as the within-group factor. In the presentation of the findings I have used the term “Group*time” to denote the analysis of the interaction effect, to test the hypothesis that the change (if any) over time is the same for each group (Table 5.1). I have also reported the changes in dependent variables over time. I have used the term “Time” to refer to the analysis of the change in performance for both groups, over time, from pre to post to retention testing (Table 5.2).

A summary of all the results for the interaction effect for anxiety levels, self-confidence, shot accuracy and quality of interception and coincident anticipation timing, is shown in Table 5.1. Another summary of all the results for the time effect for anxiety levels, self-confidence and coincident anticipation timing, shot accuracy and quality of interception is shown in Table 5.2.

Table 5.1

Results for the Interaction Effect for Anxiety Levels, Self-Confidence and Coincident Anticipation Timing, Shot Accuracy and Quality of Interception.

Group*Time	*df*	*F*	*p*
Anxiety and Self-Confidence Levels in CAT test	2, 20	0.93	.41
Anxiety and Self-Confidence Levels in batting performance test	2, 18	1.10	.36
CAT Total	2, 17	0.32	.73
5 mph	2, 19	0.05	.95
10 mph	2, 19	2.40	.12
15 mph	2, 19	0.24	.80
25 mph	2, 19	0.11	.90
Shot Accuracy	2, 19	0.12	.89
Quality of Interception	2, 19	0.22	.80

Note. CAT Total: Coincident anticipation time for all speeds.

Table 5.2

Results for the Time Effect for Anxiety Levels, Self-Confidence and Coincident Anticipation Timing, Shot Accuracy and Quality of Interception.

Time	*df*	F	p
Anxiety and Self-Confidence Levels in CAT test	2,20	1.24	.31
Anxiety and Self-Confidence Levels in batting performance test	2,18	1.74	.20
CAT Total	2,17	3.30	.60
5 mph	2,19	0.31	.74
10 mph	2,19	0.21	.81
15 mph	2,19	2.85	.08
25 mph	2,19	6.40	.01 *
Shot Accuracy	2,19	10.2	.001 *
Quality of Interception	2,19	1.82	.19

Note. CAT Total: Coincident anticipation time for all speeds. * Denotes significant results.

5.2. The Effect of Self-Talk As an Anxiety Regulation Intervention on the Anxiety Levels and Self-Confidence of Cricket Players

Anxiety levels and self-confidence were measured using the CSAI-2R. The results below aimed to answer the question of what the effect of self-talk as an anxiety regulation intervention was on the anxiety levels and self-confidence of cricket batsmen. Results of the anxiety levels and self-confidence of the coincident anticipation timing test; as well the anxiety levels and self-confidence of the batting performance test will be reported. Results from the self-talk questionnaire for the batting performance test and the coincident anticipation timing test will also be conveyed.

5.2.1. Anxiety Levels and Self-Confidence in the Batting Performance Test and the Coincident Anticipation Timing Testing

5.2.1.1. Mean and Standard Deviation Scores for Anxiety Levels and Self-Confidence for the Batting Performance Test and the Coincident Anticipation Timing Test

The following scores for the mean and the standard deviation for anxiety levels and self-confidence for the batting performance test and the coincident anticipation timing test were recorded in the table below (Table 5.3):

Table 5.3

Mean and Standard Deviation Scores for Batting Performance Test

			BPT anxiety and Self-Confidence mean	**BPT anxiety and Self-Confidence standard deviation**	**CAT anxiety and Self-Confidence mean**	**CAT anxiety and Self-Confidence standard deviation**
group*time	experimental	pre test	28.13	6.94	28.50	7.07
group*time	experimental	post test	26.00	7.48	26.88	6.33
group*time	experimental	retention test	21.20	3.83	24.17	5.34
group*time	control	pre test	25.57	5.91	27.86	5.40
group*time	control	post test	23.75	3.20	25.00	6.52
group*time	control	retention test	24.40	6.70	25.80	8.17

Note. BPT = Batting Performance Test; CAT = Coincident Anticipation Timing Test

5.2.1.2. Results for the Degrees of Freedom, F-Value and P-Value in the Batting Performance Test and the Coincident Anticipation Timing Test

The following scores for degrees of freedom, F-value and P-value were recorded for the BPT and the CAT test and are presented in Table 5.4.

Table 5.4

Results for the Interaction Effect in the BPT and CAT test

Time	*df*	F	p
Anxiety Levels and Self-Confidence in Batting Performance Test	2,20	1.24	.31
Anxiety Levels and Self-Confidence in **CAT** test	2,20	1.24	.31

5.2.1.3. Interaction Effect for Group and Time for Anxiety Levels and Self-Confidence in Batting Performance Test and Coincident Anticipation Timing Test

The results and a graph for the interaction effect between group and time for batting performance are shown in Figure 5.1.

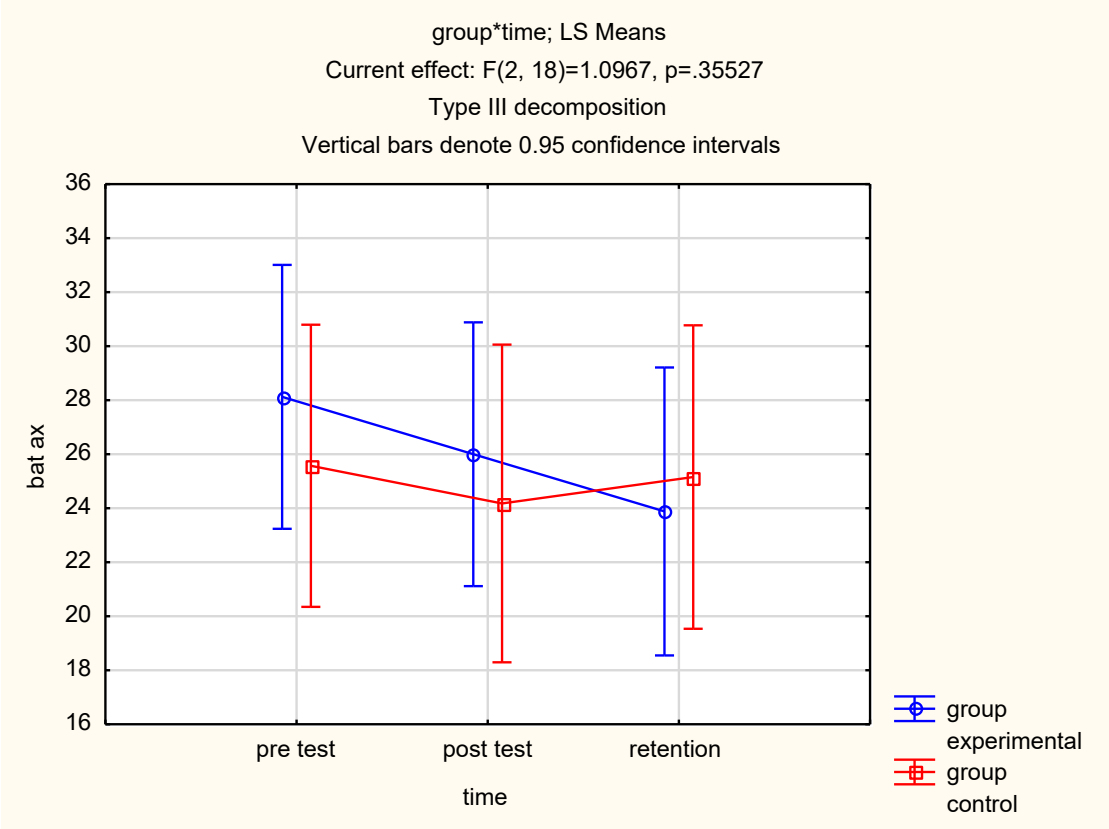

Figure 5.1. Anxiety levels and self-confidence in Batting Performance Test (BPT)

The interaction effect between group and time for Anxiety levels and self-confidence in BPT was not significant, with an F (2, 20) = 1.10, p = .36. This means that changes over time were not significantly different between the two groups. It can be seen in Figure 5.1 that both groups show a decrease in anxiety levels and an increase in self-confidence, from pre to post testing. The control group shows an increase in anxiety levels and a decrease in self-confidence from post to retention testing, where the experiment group show a decrease in anxiety levels and an increase in self-confidence from post to retention testing. However, the 95% confidence intervals clearly overlap, which indicates that the change over time for both groups is not statistically significant.

The results and a graph for the interaction effect between group and time for coincident anticipation timing are shown in Figure 5.2 below.

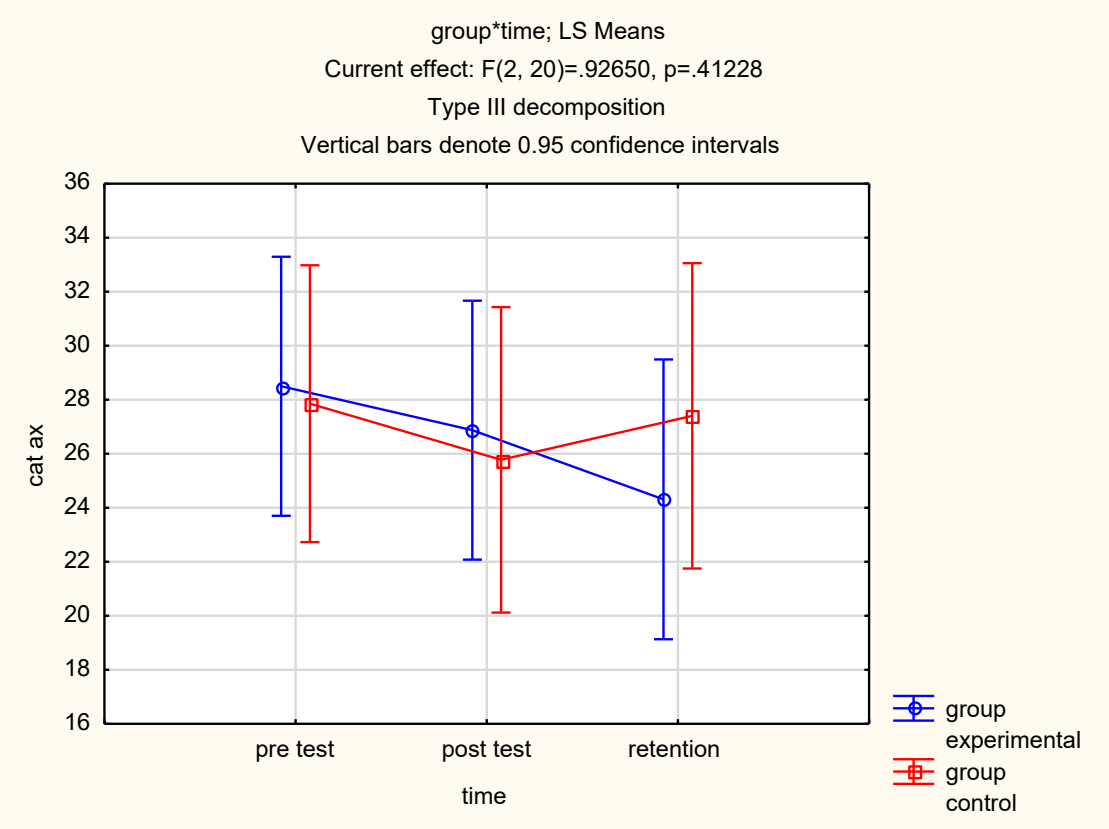

Figure 5.2. Anxiety levels and self-confidence in coincident anticipation timing (CAT)

The interaction effect between group and time for anxiety levels and self-confidence in CAT was not statistically significant, with an F (2, 20) = .92, p = .41. This means that changes over time were not significantly different between the two groups. It can be seen in Figure 5.2 that both groups show a decrease in anxiety levels and an increase in self-confidence, from pre to post testing. The control group show an increase in anxiety levels and a decrease in self-confidence from post to retention testing, where the experimental group show a decrease in anxiety levels and an increase in self-confidence, from post to retention testing. However, the 95% confidence intervals clearly overlap, which indicates that the change over time for both groups is not statistically significant.

5.2.1.4. Outcomes of Hypotheses for Anxiety Levels and Self-Confidence

The outcomes for the hypotheses for the anxiety levels and self-confidence for both the batting performance test and the coincident anticipation timing test will be discussed. This analysis aims to test hypotheses 1 to 3.

Hypothesis 1: There will be a significant difference in the pre-to-post-test levels of anxiety and the self-confidence, reported by cricket batsmen who have received an anxiety regulation strategy, namely self-talk, in the BPT and CAT test.

Outcome 1: The results from the pre-test to the post-test of the experimental group showed a decrease in anxiety levels and an increase in self-confidence, in the batting performance test and the coincident anticipation timing test. However there is no significant difference in the pre-to-post-test levels of anxiety for the experimental group. There was also no significant difference for the control group.

Hypothesis 2: There will be a significant difference in the levels of anxiety and self-confidence reported by cricket batters who have received an anxiety regulation intervention, namely self-talk and a control group of batters who did not receive the intervention, in the BPT and CAT test.

Outcome 2: Both groups show a decline in anxiety levels and an increase in self-confidence from pre-test to post test. The experimental group showed a further decline in anxiety levels and further increase in self-confidence, from post-test to retention test, however, the control group showed an increase in anxiety levels and a decrease in self-confidence for the BPT. In the CAT test results also showed a decline in anxiety levels and an increase in self-confidence. However, there were not significant. Since the interaction effect for both BPT and CAT test was not significant, there were no significant differences between the groups over time.

Hypothesis 3: There will be no significant difference between the post-test and the retention test in the levels of anxiety and levels of self-confidence of batters who received an anxiety regulation intervention, namely self-talk, in the BPT and CAT test.

Outcome 3: The anxiety levels of the experiment group declined for both BPT and CAT test and as expected self-confidence levels increased, but these differences were not significant.

5.2.2. Results from the Self-Talk Questionnaire

A summary of all the results for the self-talk questionnaire, for the batting performance test and coincident anticipation timing test is shown in Table 5.5 and Table 5.6, respectively, below. These results are important to note as it shows whether or not the cricket players, both in the control and experimental group were using self-talk cues of their own in the pre-testing. It also helps to establish if the cricket players from the experimental group who received the intervention used the self-talk cues from their self-talk plan.

5.2.2.1. Self-Talk in the Batting Performance Test

A summary of all the results for the self-talk questionnaire, for the batting performance test is shown in Table 5.5 below.

Table 5.5

Results for the Self-Talk Questionnaire from the Batting Performance Test.

Group	Time	BAT Self-talk CUE NO	% NO	BAT Self-talk CUE YES	% Yes	Row Totals	BAT Self-talk PLAN NO	%NO	BAT Self-talk PLAN YES	%YES	Row Totals
Experimental	pre test	4	50%	4	50%	8	0		0		0
	post test	1	13%	7	88%	8	4	50%	4	50%	8
	retention	1	25%	3	75%	4	1	25%	3	75%	4
Experimental	**Total**	**6**		**14**		**20**	**5**		**7**		**12**
Control	pre test	4	57%	3	43%	7	0		0		0
	post test	2	50%	2	50%	4	4	100%	0	0%	4
	retention	4	100%	0	0%	4	4	100%	0	0%	4
Control	**Total**	**10**		**5**		**15**	**8**		**0**		**8**

Interpretation of the above table is as follows: The results from the batting performance test and self-talk questionnaire, in the pre-test showed that only 50% of the experimental group already used self-talk cues. The pre-test results of the control group showed that 43% used self-talk cues. For the post-test, there was a change of usage to 88% for the experimental group. However, only 50% were self-talk cues from their self-talk plan. The retention test for the experimental group showed that 75% of the group used a self-talk cue from their self-talk plan. However, the group size was decreased by half.

5.2.2.2. Self-talk in the Coincident Anticipation Timing Test

A summary of all the results for the self-talk questionnaire, for the coincident anticipation timing test is shown in Table 5.6 below.

Table 5.6

Results for the Self-Talk Questionnaire from the Coincident Anticipation Timing Test.

Group	Time	CAT Self-talk CUE NO	% NO	CAT Self-talk CUE YES	% Yes	Row Totals	CAT Self-talk PLAN NO	%NO	CAT Self-talk PLAN YES	%YES	Row Totals
Experimental	pre test	2	25%	6	75%	8	0		0		0
	post test	2	25%	6	75%	8	4	50%	4	50%	8
	retention	2	33%	4	67%	6	3	50%	3	50%	6
Experimental	**Total**	**6**		**16**		**22**	**7**		**7**		**14**
Control	pre test	5	71%	2	29%	7	0		0		0
	post test	4	80%	1	20%	5	5	100%	0	0%	5
	retention	3	60%	2	40%	5	5	100%	0	0%	5
Control	**Total**	**12**		**5**		**17**	**10**		**0**		**10**

From the results above of the pre-test scores, it is clear that 75 % of the experimental group had already used a self-talk cue and in the control group, only 29 % had used this before. This would suggest that any changes in performance could be due to the quality of the intervention (i.e. new usage of self-talk cue's), not an actual intervention teaching players about self-talk.

There was no increase in the usage of self-talk cue's for the experiment group post the intervention, although 50% of this group used a self-talk cue from their self-talk plan. The usage of the self-talk cues in the retention tests, showed to decrease by 2, however, 2 of the participants did not take part in the retention test. Overall it would seem that fewer of the control group had previous knowledge or used self-talk cues, whereas more of the experimental group did.

5.3 The Effect of the Self-Talk As an Anxiety Regulation Intervention and Batting Performance of Cricket Players

The results below attempted to answer the question of what the effect was of self-talk as an anxiety regulation intervention and batting performance of cricket players. The two aspects of batting performance that were measured were that of shot accuracy and quality of interception and these will be discussed.

5.3.1. Mean and Standard Deviation Scores for Shot Accuracy and Quality of Interception

The following scores for mean and standard deviation for shot accuracy were recorded for Shot Accuracy and Quality of Interception reported in the table below (see Table 5.7).

Table 5.7

Mean and Standard Deviation Scores for Shot Accuracy and Quality of Interception

			Shot Accuracy Mean	**Shot Accuracy Standard Deviation**	**Quality Of Interception Mean**	**Quality Of Interception Standard Deviation**
group*time	experimental	pre test	53.90	5.30	92.71	5.46
group*time	experimental	post test	59.38	10.21	93.49	4.08
group*time	experimental	retention test	67.50	4.49	97.08	1.87
group*time	control	pre test	48.51	14.61	92.56	4.31
group*time	control	post test	57.08	15.77	92.08	6.65
group*time	control	retention test	64.38	13.75	95.00	6.35

5.3.2. Results for the Degrees of Freedom, F-Value and P-Value for Shot Accuracy and Quality of Interception

The following scores for degrees of freedom, F-value and p-value were recorded:

Table 5.8

Results for Interaction Effect for Shot Accuracy and Quality of Interception

Time	*df*	F	p
Shot Accuracy	2, 19	0.12	.89
Quality of Interception	2, 19	0.22	.80

5.3.3. Interaction Effect for Group and Time for Shot Accuracy and Quality of Interception

Shot accuracy and Quality of Interception scoring are described in Appendix C. The results and a graph for the interaction effect between group and time for Shot Accuracy are shown in Figure 5.3, with a discussion. A short discussion for changes over time only are also give for Shot Accuracy as these were significant, however not part of the hypotheses of the study. Findings for these results of Quality of Interception are consistent with the findings found for the Shot Accuracy test, which is not unexpected. The results and a graph for the interaction effect for Quality of Interception, between group and time are shown in Figure 5.3, with a discussion.

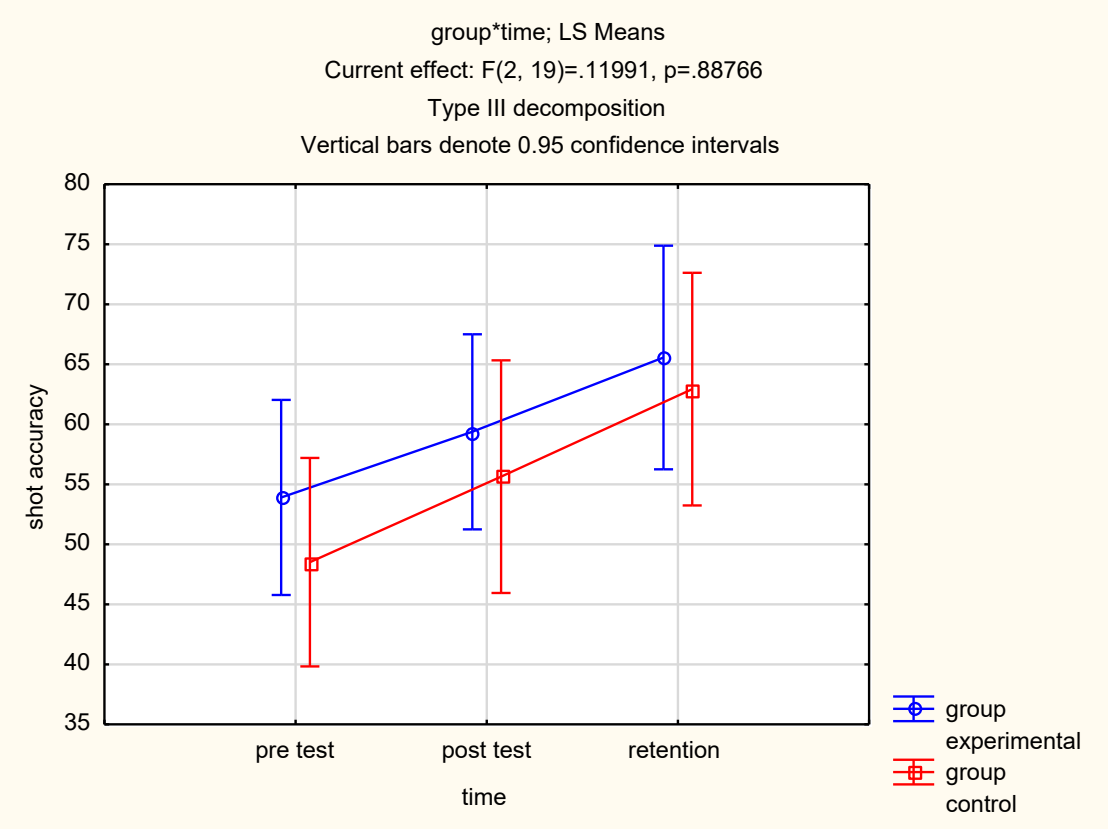

Figure 5.3. Shot accuracy

The interaction effect between group and time for batting performance (shot accuracy) was not significant, with a F (2,19) = .12, p = .89. This means that changes over time were not significantly different between the two groups. It can be seen in Figure 5.3 that both groups show an increase in batting performance (shot accuracy), which indicates an improvement in performance from pre to post to retention test. However, the 95% confidence intervals clearly overlap, which indicates that the change over time for both groups is not significant.

Changes over time only, specific to Shot Accuracy

Changes over time only, specific to Shot Accuracy do not form part of the hypotheses of this study, however due to the nature of the testing, this was measured and recorded. Significant results were found for Shot Accuracy specifically, as the cricket players improved in performance due to practice and a short discussion is given. The effect over time only for shot accuracy was significant, with an F (2, 19) = 10.2, p = 0.001. This means that the changes over time for the groups individually looked at were significant. Both groups over time indicated an improvement in performance from pre to post to retention testing. It can be concluded at 95% confidence levels, that there was a significant change.

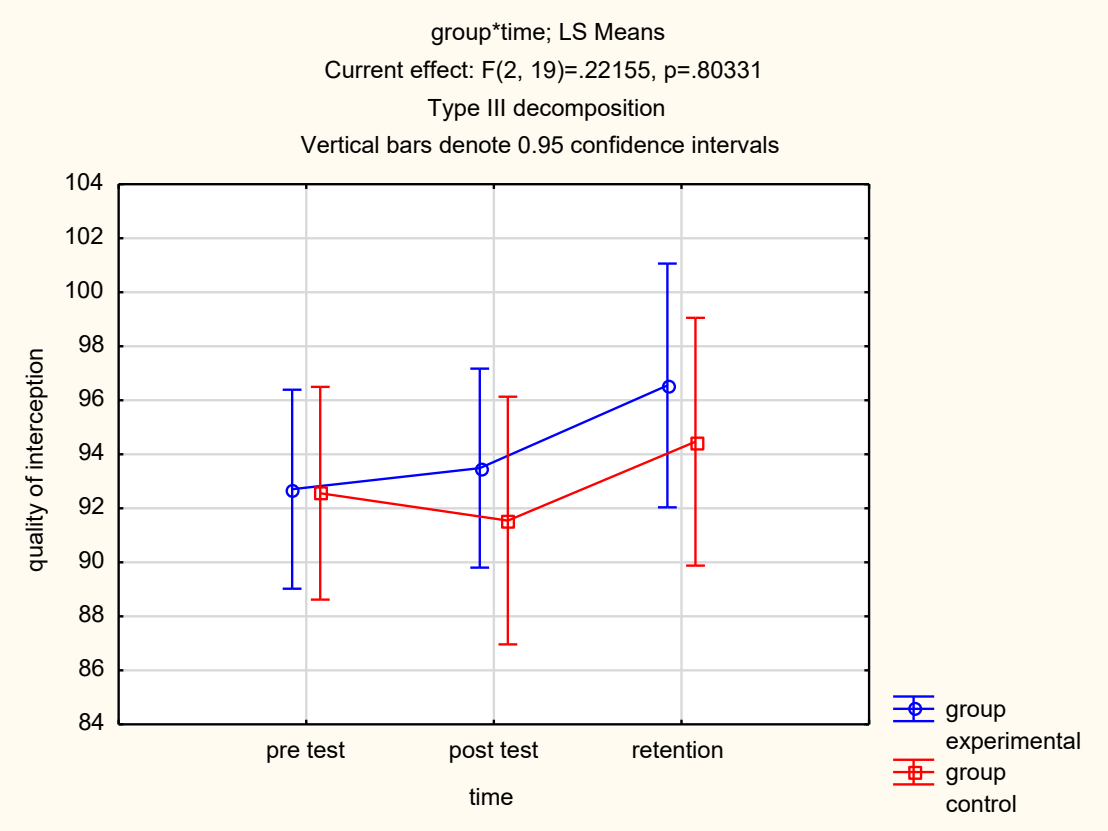

Figure 5.4. Quality of interception

The interaction effect between group and time for batting performance (quality of interception) was not significant, with an F (2, 19) = .22, p = .80. This means that changes over time were not significantly different between the two groups. It can be seen in Figure 5.4 that both groups show an increase in batting performance (quality of interception), which indicates an improvement in performance from pre to post to retention test. However, the 95% confidence intervals clearly overlap, which indicates that the change over time for both groups is not significant.

5.3.4. Outcomes of the Hypotheses for Batting Performance

The results of the analysis to test hypotheses numbers 4, 5 and 6 will be presented and discussed below. Batting performance includes both shot accuracy and quality of interception, unless stated otherwise.

Hypothesis 4: There will be a significant difference in the pre-to-post-test batting performance of a group of batters who have received an anxiety regulation intervention, namely self-talk.

Outcome 4: There is no significant difference in the pre-to-post-test batting performance for the experimental group. There was also no significant difference for the control group.

Hypothesis 5: There will be a significant difference in the batting performance of batters who have received an anxiety regulation intervention, namely self-talk, and a control group of batters who did not receive the intervention.

Outcome 5: Both groups appear to have improved from pre, post to retention testing, but these differences were not significant. Since the interaction effect was not significant, there were no significant differences between the groups over time. This trend is different from the results shown in the CAT testing, where the control group performed consistently better.

Hypothesis 6: There will be no significant difference between the post-test and the retention test in the batting performance of batters who received an anxiety regulation intervention, namely self-talk.

Outcome 6: Both groups showed an improvement, over time, but these differences were not significant as a result of the intervention

5.4 The Effect of Self-Talk As an Anxiety Regulation Intervention on the Coincident Anticipation Timing of Cricket Players

The last question to be answered by conducting this study was what was the effect of self-talk as an anxiety regulation intervention on the coincident anticipation timing of cricket players? Firstly the mean scores, standard deviation scores and the degrees of freedom, f-values and p-values are reported. Different scores for the total absolute error time (again the sum of all the trials irrespective of the direction or deviation (early or late)) and the results for each different speed, namely 5,10,15,26 mph are given. Secondly, the Interaction Effect for Group and Time for the CAT test is reported on. Total absolute error time and scores for each speed are depicted on a graph and results thereof will be discussed. Lastly, the outcomes of the analysis to test hypotheses 7, 8 and 9 will be interpreted.

Coincident anticipation timing was calculated by adding up all the scores (measured in seconds) for each speed and then adding up those scores, to get a total. An example of this is given in Table 5.9 below, for each different speed. The score of 2.06 below denotes the absolute error time.

Table 5.9

Example of how Coincident Anticipation Timing was Calculated

	Score										
	1	2	3	4	5	6	7	8	9	10	Totals
Speed											
5	0. 020	0.047	0.026	0.021	0.047	0.012	0.002	0.049	0.008	0.019	0.231
10	0.01	0.026	0.042	0.095	0.036	0.042	0.028	0.013	0.026	0.008	0.326
15	0.122	0.005	0.111	0.063	0.053	0.039	0.014	0.013	0.013	0.067	0.5
25	0.009	0.002	0.005	0.67	0.069	0.077	0.07	0	0.029	0.072	1.003
										Total	2.06

5.4.1. Mean Scores and Standard Deviation Scores for Coincident Anticipation Timing Test

The following mean scores for the coincident anticipation timing test were recorded in Table 5.10, for total absolute error time and for all the different speeds. Scores for standard deviation for the coincident anticipation timing test were recorded in table 5.11. This was also divided according to total absolute error time and the four different speeds of the CAT test.

Table 5.10

Mean Scores for Coincident Anticipation Timing Test

			CAT total absolute time	**CAT 5mph time**	**CAT 10mph time**	**CAT 15mph time**	**CAT 25mph time**
group*time	experimental	pre test	1.57	0.36	0.29	0.29	0.41
group*time	experimental	post test	1.56	0.36	0.42	0.42	0.43
group*time	experimental	retention test	1.35	0.35	0.35	0.35	0.33
group*time	control	pre test	1.56	0.33	0.31	0.31	0.40
group*time	control	post test	1.26	0.34	0.25	0.25	0.36
group*time	control	retention test	1.05	0.28	0.31	0.31	0.24

Table 5.11

Standard Deviation Scores for Coincident Anticipation Timing Test

			CAT total absolute time	**CAT 5mph time**	**CAT 10mph time**	**CAT 15mph time**	**CAT 25mph time**
group*time	experimental	pre test	0.89	0.20	0.17	0.17	0.23
group*time	experimental	post test	0.40	0.14	0.16	0.16	0.14
group*time	experimental	retention test	0.28	0.17	0.11	0.11	0.09
group*time	control	pre test	0.31	0.08	0.11	0.11	0.13
group*time	control	post test	0.11	0.17	0.08	0.08	0.15
group*time	control	retention test	0.24	0.73	0.18	0.12	0.03

5.4.2. Results for Degrees of Freedom, F-value and P-value for Coincident Anticipation Timing Test

The following scores for degrees of freedom, F-value and p-value were recorded for the absolute total error, as well as for each different speed (see Table 5.12).

Table 5.12

Results for Degrees of Freedom, F-Value and P-Value CAT test

Time	*df*	F	p
CAT Total	2,20	0.32	.73
CAT 5mph	2.19	0.05	.95
CAT 10mph	2.19	2.40	.12
CAT 15mph	2.19	0.24	.79
CAT 25mph	2.19	0.11	.90

5.4.3. Interaction Effect for Group and Time for the Coincident Anticipation Timing Test

The results and a graph for the interaction effect between group and time are divided into the total absolute error time and set of results for each speed, are shown in Figure 5.6 to 5.9. The reason for this is that different speeds of CAT impact on the cricketers in a different way. This is quite evident when we look at CAT at 25 mph. A discussion and interpretation of each graph is also given.

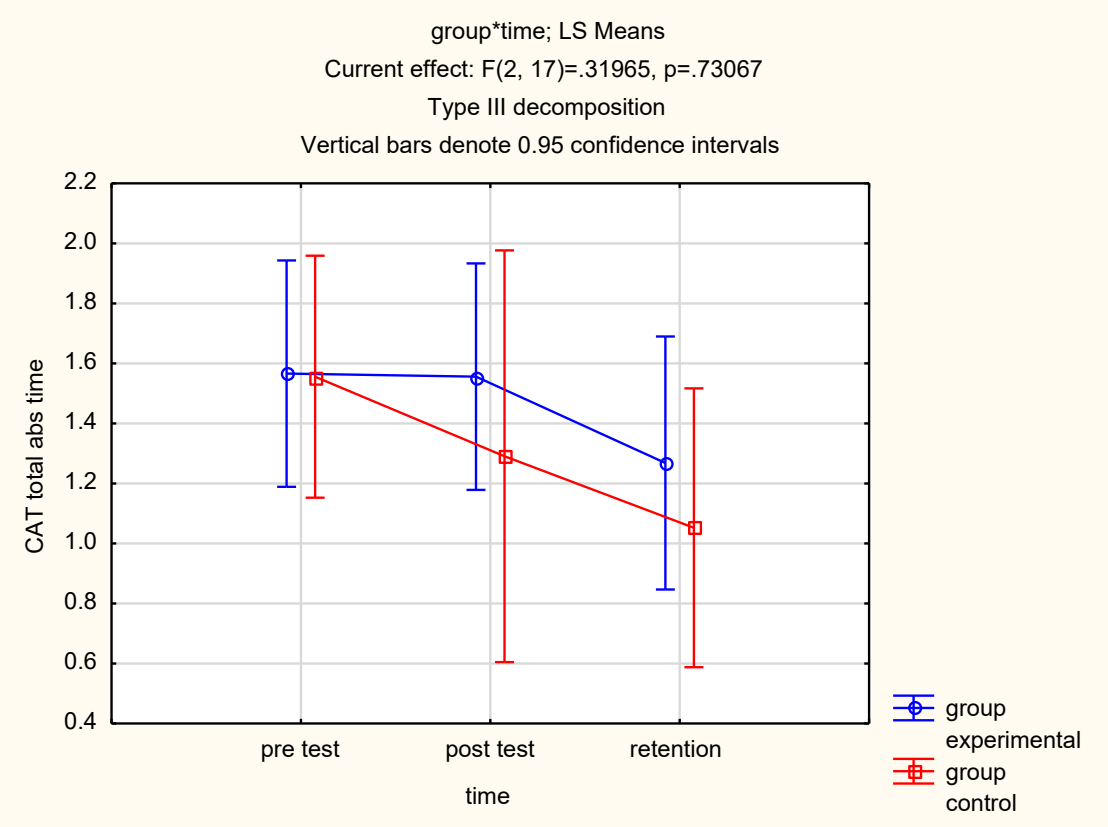

Figure 5.5 Coincident anticipation timing (CAT) total

The interaction effect between group and time for CAT total scores was not significant, with F (2, 17) = 0.32, p = .73. This means that the changes in CAT over time were not significantly different between the two groups. It can be seen in Figure 5.5 that both groups show a decrease in CAT Total, which indicates an improvement in performance from pre to post to retention test. However, the 95% confidence intervals clearly overlap, which indicates that the change over time for both groups is not significant.

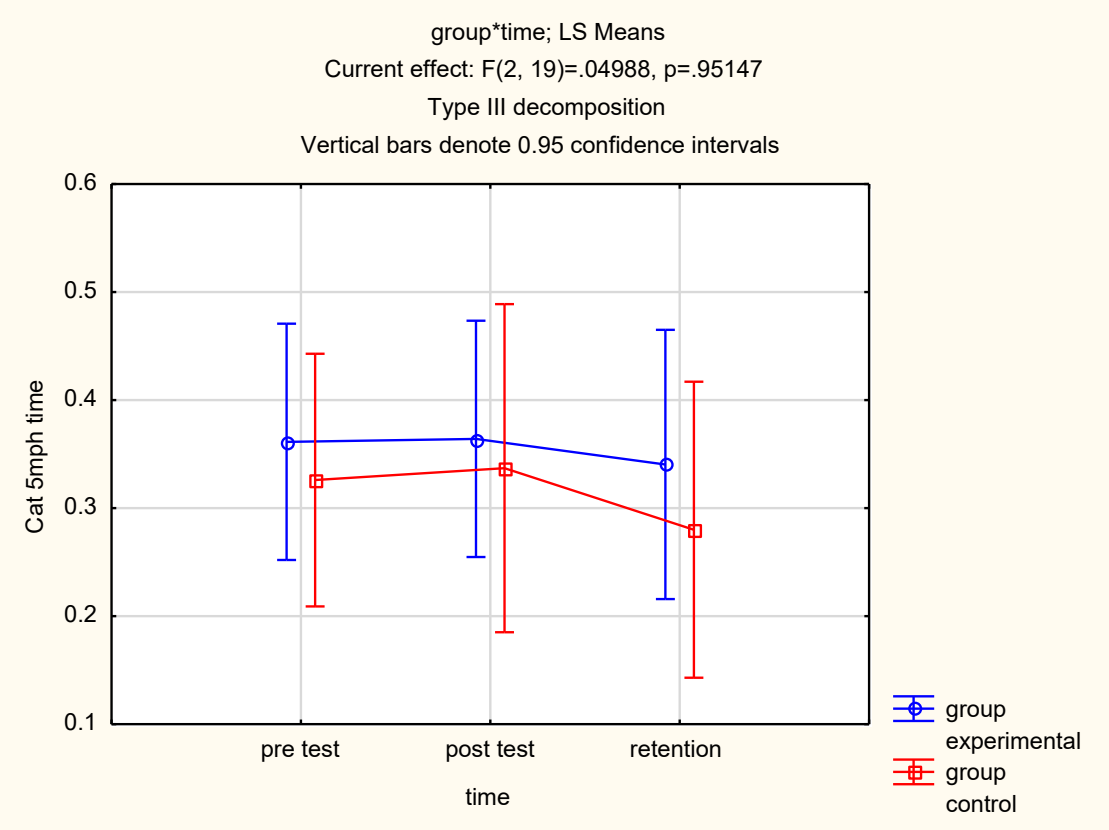

Figure 5.6. Coincident anticipation timing (CAT) at 5mph

The interaction effect between group and time for CAT at 5mph was not significant, with F (2, 19) = .5, p = .95. This means that the changes over time were not significantly different between the two groups. It can be seen in Figure 5.6 that both groups show a decrease in CAT at 5mph, which indicates an improvement in performance from pre to post to retention test. However, the 95% confidence intervals clearly overlap, which indicates that the change over time for both groups is not significant.

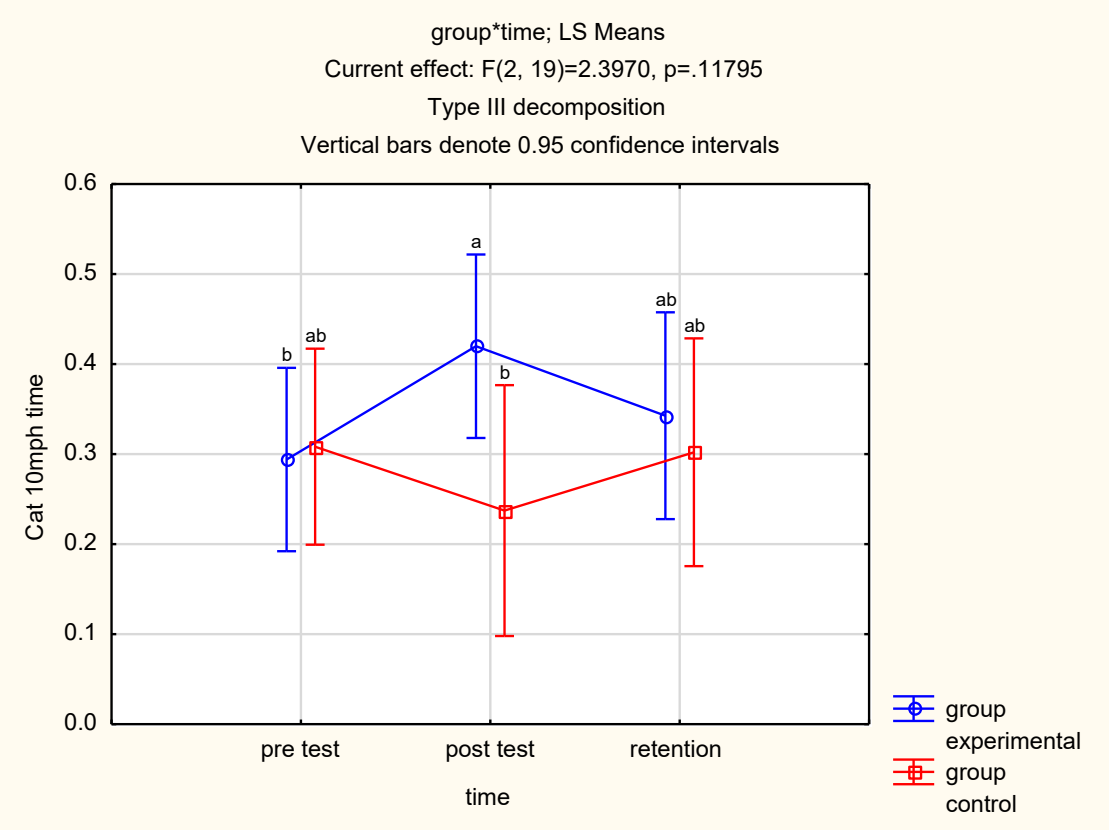

Figure 5.7. Coincident anticipation timing (CAT) at 10mph

The interaction effect between group and time for CAT at 10mph was not significant, with a F (2, 19) = 2.40, p = .12. This means that changes over time were not significantly different between the two groups. It can be seen in Figure 5.7 that the control group shows a decrease in CAT at 10mph, which indicates an improvement in performance from pre to post test. From the post to retention test the same group shows an increase, which indicated a decline in performance. The experimental group shows an increase in CAT at 10mph, which also indicates a decline in performance from pre to post testing. The same group shows a decrease in CAT at 10 mph, which indicates an increase in performance from post to retention testing. However, the 95% confidence intervals clearly overlap, which indicates that the change over time for both groups is not significant.

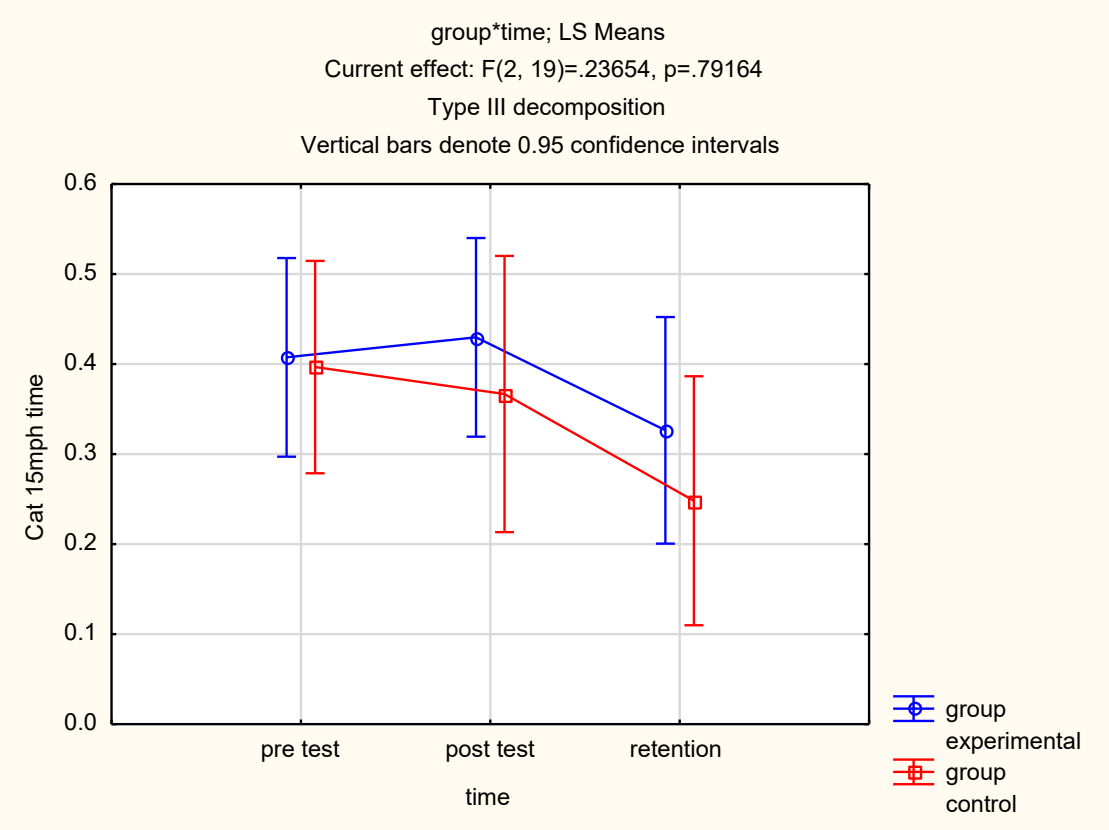

Figure 5.8. Coincident Anticipation Timing (CAT) at 15mph

The interaction effect between group and time for CAT at 15mph was not significant, with a F (2, 19) = .24, p = .80. This means that changes over time were not significantly different between the two groups. It can be seen in Figure 5.8 that the experimental group show an increase in CAT at 15mph from pre-test to post test, which indicates an improvement in performance. However, from post to retention testing, the experimental group shows a decrease in performance. The control group showed a decrease in CAT at 15mph from the pre to post to retention test, which indicates a decline in performance. However, the 95% confidence intervals clearly overlap, which indicates that the change over time for both groups is not significant.

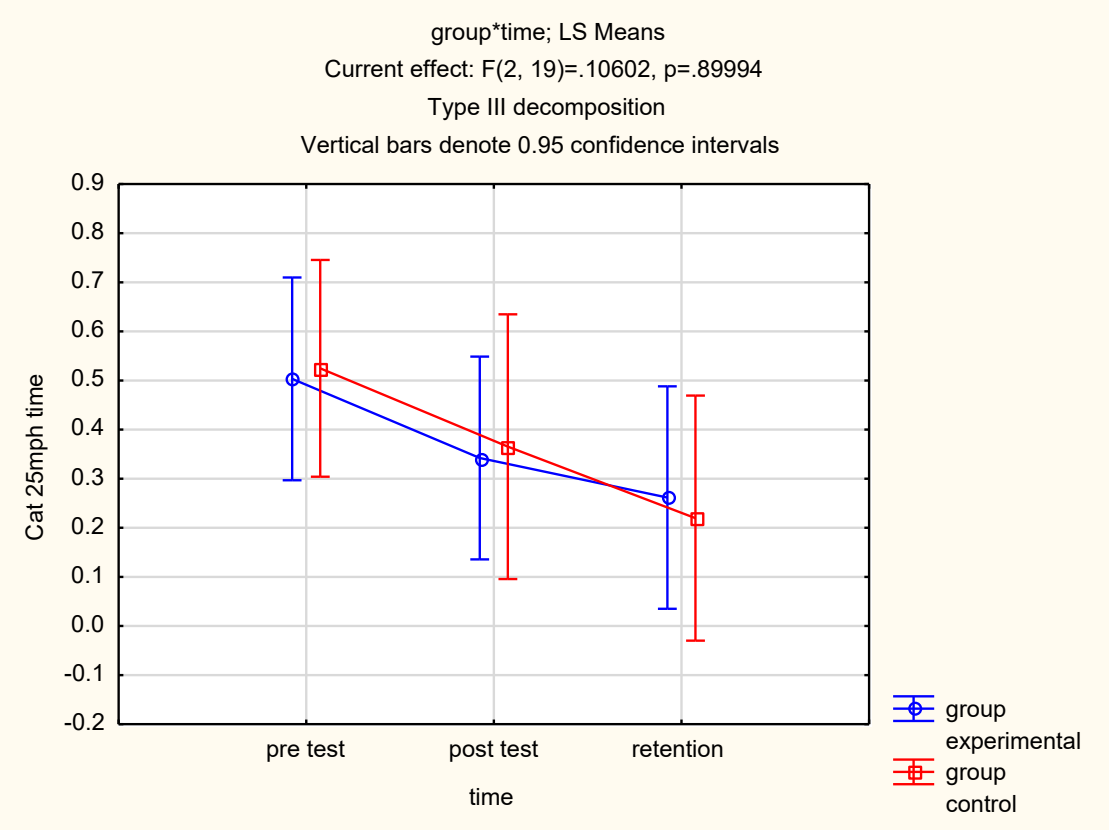

Figure 5.9. Coincident anticipation timing (CAT) at 25 mph

The interaction effect between group and time for CAT at 25mph was not significant, with a F (2, 19) = .11, p = .90. This means that changes over time were not significantly different between the two groups. It can be seen in Figure 5.9 that both groups show a decrease in CAT at 25mph, which indicates an improvement in performance from pre to post to retention test. However, the 95% confidence intervals clearly overlap, which indicates that the change over time for both groups is not significant.

Changes over time only, specific to 25mph

Changes over time only, specific to CAT do not form part of the hypotheses of this study, however due to the nature of the testing, this was measured and recorded. Significant results were found for CAT specifically testing at 25 mph, as the cricket players improved in performance due to practice and a short discussion is given. The effect over time only for CAT at 25mph was significant, with F (2, 19) = 6.40, p = 0.01. This means that the changes over time for the groups were significant. Both groups over time indicated an improvement in performance from pre to post to retention testing.

5.4.4. Outcomes of the Hypotheses for Coincident Anticipation Timing

Based on these results above for total absolute error time and each speed for the CAT test, the outcomes of the analysis to test hypotheses 7, 8 and 9 were as follows:

Hypothesis 7: There will be a significant difference in the pre-to-post-test coincident anticipation timing of a group of cricketers who have received an anxiety regulation intervention, namely self-talk.

Outcome 7: There is no significant difference in the pre-to-post-test coincident anticipation timing total scores for the experimental group. There was also no significant difference for the control group.

Hypothesis 8: There will a significant difference in the coincident anticipation timing of cricketers who have received an anxiety regulation intervention, namely self-talk, and a control group of batters who did not receive the intervention.

Outcome 8: Both groups appear to have improved from pre, post to retention testing, but these differences, as a result of the intervention, were not significant. Since the interaction effect was not significant, there were no significant differences between the groups over time. For the CAT test at 10mph specifically, from pre, post to retention testing, the experimental group declined in performance and then improve, but these differences were not significant. The control group appeared to do the opposite, where they improved in performance and then declined, but these differences were not significant. Since the interaction effect was not significant, there were no significant differences between the groups over time.

Hypothesis 9: There will be a significant difference between the post-test and the retention test in the coincident anticipation timing total scores of cricketers who received an anxiety regulation intervention, namely self-talk.

Outcome 9: Both groups showed an improvement, over time, but these differences were not significant, as a result of the intervention. For the CAT test at 10mph specifically, both groups showed an improvement and a decline in performance, different for each group, between pre, post and retention testing. These differences were however not significant.

5.5 Discussion of Results

The following section discusses the results in relation to previous research that has been done that was touched on in the literature review above. Linked to the sub-sections in the results chapter, the discussion is divided into three sections. Firstly, anxiety levels and self-confidence of cricket batsmen and self-talk as an anxiety regulation strategy and the effect of this on performance will be discussed. Batting performance and coincident anticipation timing results will be explored and how the results link to previous research, will form the other two sections of this discussion.

5.5.1. Discussion of Anxiety levels in Relation to Previous Research

As recommended in the study by Slogrove et al. (2002), it was found that because experiences of anxiety are personal and individualistic, working with batsmen on an individual basis seemed to be more practical and best suited for a study related to personal experiences of anxiety. This can be said to be true for self-confidence as well, if we look at the definition thereof mentioned in the literature review, it is one's own belief and therefore should also be dealt with on an individual basis. This focus of this study's intervention however was on the management of anxiety and therefor this will be the main focus of the following discussion.

The methodology used in the current study is consistent with Slogrove et al. (2002) recommendation. Results yielded from the current study showed that even when implementing the intervention on an individual basis, batsmen showed slight decrease in their anxiety levels, in both groups, but these results were not significant. The current study also showed that there is differing individual usage and experiences of self-talk techniques for improving batting performance. It was evident through individual sessions with the cricket players that the perceived value of self-talk differed from individual to individual. This is supported by the study by Slogrove et al. (2002) in that this type of intervention needs to be applied on a personal/individual basis.

In a further study, Slogrove et al. (2003) reconfirmed the idea of working on an individual basis. In addition they advocated rephrasing self-talk or self-instruction into positives and recommended making use of a general in-depth interview in order to analyse thought content, prior to the intervention. Qualitative data collection or analysis was not used in the current study and could account for the intervention not being effective, which in turn yielded results which were not significant.

A study by Thelwell et al. (2007) exploring sources of stress and strategies for coping with stress, revealed that one of the more common cognitive strategies was the use of self-talk, which was used to work on areas of motivation, arousal, relaxing and focus, for example. The current study used motivational and instructional self-talk cues, which is supported by the study by Thelwell et al. (2007), where self-talk was also used for the same functions. However, in the study by Thelwell et al. (2007), they identified a number of other strategies to overcome other sources of stress (like self-induced pressure, importance of game and emotional instability), not covered by the use of self-talk in isolation. This might have diluted the results.

In the study by Jooste et al. (2014) it was shown that batsmen had the lowest scores in mental preparation, self-confidence, concentration ability and relaxation ability, when compared to bowlers. These are all skills needed as part of this study. According to Humara (1999) the level of expertise of an athlete, also depicts the amount of self-confidence the athlete will have. Since the cricket players in the current study played at an intermediate level, the level of self-confidence they experienced would have impacted on anxiety and performance and could have been looked at in more detail.

In the current study, which involved mental preparation, the majority of the experimental group included batsmen. Based on Jooste et al's (2014) study a longer intervention programme, in the current study, with more time devoted to mental preparation might have yielded significant results. Jooste et al. (2014) showed a partial relationship between psychological skills scores and specialised roles in cricket. In the current study the intervention was not aimed at specialised roles and this could account for results not being significant.

In a study by Faggiani et al. (2005) the focus was on developing pre-performance routines (PPR) for acrobatic gymnastics. The implementation phase was run over a period of seven weeks and 30 minute sessions were held each week in the first four weeks. The study conducted on competitive performance in young swimmers, done by Hatzigeorgiadis et al. (2014) involved a self-talk intervention programme that ran for 10 weeks, as opposed to the current study's intervention programme which ran for 3 weeks. Results from the study by Hatzigeorgiadis et al. (2014) showed that self-talk strategies were effective in showing an improvement in performance with regards to the intervention group. The intervention in the current study ran over 3 weeks, with a retention test conducted 2 weeks later. More significant results might have been obtained in the current study by utilising the intervention over a longer period and with longer sessions.

The critical review done by Hardy (2006), supports that future mental skills should not be done in combination with other strategies, but that self-talk should be looked at on its own. In line with his recommendations, the current study makes use of self-talk strategies in isolation, as an intervention to regulate anxiety, as opposed to a mental skills package. Even though self-confidence is measured, the focus is on regulating anxiety in order to improve self-confidence, which would in turn improve performance.

5.5.2. Discussion of Batting Performance results in Relation to Previous Research

Lemmer (2004), in his study measuring batting performance suggested that it is not sufficient to only look at batting average. Other skills for example strike rate and consistency should also be included to more accurately measure batting performance. The current study measured both these factors, in measurement of shot accuracy and quality of interception.

Van Velden (2010), in his study on the effects of a visual skills programme, where used quality of interception and shot accuracy to measure batting performance, demonstrated no significant difference between the experimental group and control group. The findings of the current study are consistent with the study by Van Velden (2010). Van Velden's (2010) research indicated that when comparing a control and experimental group and their performance in batting performance and shot accuracy, that there are no significant differences between the groups, despite the experimental control group's participation in a visual skills programme.

In the study conducted by Vickery et al. (2014) significant results were found when they compared the physiological, movement and technical demands of cricket players with different types of training approaches. Battlezone training where batsmen are placed on the field, to simulate a real-life cricket match and traditional training which occurs in the nets and on the field were shown to be the most effective form of training. Training also occurred with real-life bowlers, as opposed to the current study. This study then indicated that real-life simulation is important to include in training. This could indicate that not including this into the current studies intervention phase would affect the strength of the implementation of anxiety regulation strategies during batting performance.

5.5.3. Discussion of Coincident Anticipation Timing in Relation to Previous Research

The current study used only one method of stimulus, where the target light was the final light in the series, to obtain the results for the CAT test. This was a valid choice for the assessment, as the previous study by Coker (2006) revealed that performance was not dependent on the method of the stimulus presented to the participants.

A related study done by Ripoll and Latiri (1997) focused on a comparison between experts and novices in table tennis, using a similar apparatus. They demonstrated that there was a significant difference in performance between experts and novices under decelerative conditions. However, under constant velocity conditions, there was no significant difference in the performance. In the current study testing was done under constant velocity conditions, although at a number of different speeds. The findings of the current research support those of Ripoll and Latiri (1997).

Ak and Kocak (2010) looked at coincident anticipation timing, using constant velocity, to evaluate the differences in performance between tennis and table tennis players and differences in performance between males and females. They showed that there was a significant difference in performance when comparing the table tennis and tennis players. Significant differences also resulted when comparing coincident anticipation timing of males and females. The current study, using similar apparatus and conditions, showed differences that were not significant. The inference is that this apparatus can be successfully used for this type of study, where the differences between the groups (as in Ak and Kocaks', 2010 study) or the effects of the interventions are relatively large.

These results from the coincident anticipation timing testing of the current study support the findings of the study by Van Velden (2010) where both studies used the Bassin Anticipation Timing apparatus, at constant velocity, at a number of speeds. Van Velden's (2010) research indicated that when comparing a control and experimental group and their performance in coincident anticipation timing, that there are no significant differences between the groups, despite the experimental control group's participation in a visual skills programme. Although the interventions were different in that Van Velden (2010) used a visual skills programme, the findings of this study and the current study were similar.

CHAPTER 6
SUMMARY, LIMITATIONS OF THE STUDY AND RECOMMENDATIONS FOR FUTURE RESEARCH

In this concluding chapter I present a summary of the study for the anxiety levels and self-confidence levels, as well as the batting performance (shot accuracy and quality of interception) and coincident anticipation timing of the cricketers. The limitations of this study are also discussed and I also present recommendations for future research in this area.

6.1. Summary of the Study

It can be concluded from the results of the CAT test and BAT test, using the group*time analysis that self-talk as an anxiety regulation intervention did not have a significant reduction on the anxiety levels of cricket batters.

Based on the results from analysis of group*time testing, it can be concluded that self-talk as an anxiety regulation intervention did not have a significant effect on the batting performance, specifically shot accuracy, of cricket batters. From the analysis of time testing, it can be concluded that there was a significant improvement in the batting performance, specifically shot accuracy, of cricket batters. Both the experimental and control group improved to the same extent, over the pre, post and retention test. This suggests that the improvement was not due to the self-talk/anxiety regulation intervention, but a variable not measured in this study. Based on the results from analysis of group*time testing, it can be concluded that self-talk as an anxiety regulation intervention did not have a significant effect on the batting performance, specifically the quality of interception of cricket batters

The overall group*time results indicate that within the parameters of this study, it cannot be concluded that self-talk as an anxiety regulation intervention, had a significant effect on the coincident anticipation timing of cricket batters. At a speed of 25 mph (the fastest speed used in this study, in the CAT test) there is a significant improvement in the performance of the CAT test, in the analysis of the time testing. However, since this improvement was evident in both groups, it cannot be ascribed to the self-talk/anxiety intervention.

6.2. Limitations of Study

It could be considered that one of the biggest limitations of this study was there was a limited number of participants that ended up taking part of the study and forming the experimental and control groups. This resulted in the participants for each group being small. This was due to that fact that the participation needed to be voluntary and participants needed to be available for the 9 weeks of the study period (3 weeks for the intervention, 6 weeks for pre, post and retention testing). Injuries are common when working with athletes and two participants were unable to complete all the tests, due to injury, which also contributed to the low number of participants. The participants that then took part in the study might not have been truthful in their answers to the Competitive State Anxiety Inventory Second Revised and the Self-talk Questionnaire. Participants in this study were all intermediate level experienced university-level cricketers, which mean that achieving statistically significant changes in their performance could be challenging, due to their amount of experience.

Although there was a need for research to be done on self-talk in an isolated fashion, as opposed to a combined fashion or mental skills package, the result is that this could then be considered as a limitation. There are many anxiety regulation strategies or interventions like arousal energising techniques, biofeedback techniques, relaxation response strategies, cognitive behavioural interventions, and mental preparation routines (Gould & Udry, 1994), but only self-talk was used in this study.

Parts of the study, for one the batting performance testing and was conducted outdoors and this meant that weather conditions were not always perfect or ideal for testing. The anxiety regulation intervention was also carried out at the outdoor cricket pitches and practically this was not always conducive to administration, discussions and debriefings.

Attention to the task at hand was not measured or controlled for as part of the study, although the assumption is, based on theoretical evidence that with a decrease in anxiety levels and increase in self-confidence, that attention levels will also increase.

6.3. Recommendations for Future Research

- Future research could look at anxiety regulation strategies, other than self-talk, for example arousal energising techniques, biofeedback techniques, relaxation response strategies, cognitive behavioural interventions, and other mental preparation routines.
- A combination of mental skills, put into a package, consisting of relaxation, imagery, goal setting, and self-talk could be used, specifically in the game of cricket.
- Studies could also be done to research the effects that a self-talk intervention has on concentration and focus or attention, since it is not always clear whether or not a decrease in anxiety is also due to an increase in focusing on a specific task.
- In the current study, an element of competition was not introduced, which in turn would increase anxiety and simulate a "real-life" competition. It would be useful in future sports research to include this aspect into the research.
- A study where groups are homogenous and on an individual basis will be useful to evaluate the effect of self-talk and to look at developing the technique.
- Technology is becoming a huge part of everyday life and therefore a study that uses an application to decrease anxiety would add the field of psychology.
- It is recommended that future studies use decelerative functionality, rather than constant velocity.

6.4. Conclusion

Based on the results, within the parameters of the study, the effect of self-talk as an anxiety regulation intervention in cricket could not be demonstrated. Using the batting performance test and the coincident anticipation timing test as indicators of performance, the overall results were found to be not significant.

It can be concluded from the results and the literature review, that self-talk as a mechanism for regulating anxiety was valid, but that there were a number of variables that impacted on the significance of the results and they were as follows:

- Sample size was limited
- Selection of participants
- Duration of the intervention
- Perceived expertise of the primary test administrator

Within the current study, the CAT test, under constant velocity conditions was not appropriate to measure the effect of the intervention. The participants' differing prior knowledge and perceived attitude towards self-talk negatively influenced the significance of the effect of the intervention, which suggested that a case by case, more individualistic approach is highly recommended.

Self-talk is a valid mechanism for regulating anxiety, however, used in isolation its effect was not demonstrated in this study. It can be concluded that batting performance cannot be improved by self-talk as an anxiety regulation strategy in isolation. It would require a more holistic approach.

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Appendix A

Presented below is an Informed Consent Form presented to each participant

UNIVERSITEIT•STELLENBOSCH•UNIVERSITY
jou kennisvennoot • your knowledge partner

Informed Consent Form

STELLENBOSCH UNIVERSITY

CONSENT TO PARTICIPATE IN RESEARCH

Name: …….. Surname: …….

Age: ……..... Specialisation: …….

Left or Right Batsman: ……..

THE EFFECT OF SELF-TALK AS AN ANXIETY REGULATION STRATEGY ON COINCIDENT ANTICIPATION TIMING AND BATTING PERFORMANCE IN CRICKET

You are asked to participate in a research study conducted by Rochel Seymour Hall (BPsych Hons.), from the Department of Psychology at Stellenbosch University. The results of the study will contribute to a Masters Research thesis. You were selected as a possible participant in this study because you fall into the inclusion criteria of the study, that being you are a male between the ages of 18 – 28 years, and you play cricket for Maties Cricket Club.

PURPOSE OF THE STUDY

The purpose of this study is to determine the effect of self-talk as an anxiety regulation intervention on coincident anticipation timing and batting performance in cricket.

PROCEDURES

If you volunteer to participate in this study, I would ask you to take note of following things:

Participants will be assigned into one of two groups after pre-testing and one group will receive a three week intervention program, whereas the other group will only receive the intervention after the post-tests. The effect of the different interventions on the coincident anticipation timing and batting performance of the participants will be analysed. Both groups will be advised not to participate in any additional training or activities above what they are currently doing.

Place of Study

The coincident anticipation timing test will be administered in the Innovation Centre at the SUSPI Gym, Stellenbosch University. The batting performance test will be conducted at the outdoor cricket facility at the Maties Cricket Club. The intervention training programmes will be administered at the Department of Sport Science, Stellenbosch University.

Methods of collecting data for the study

Coincident anticipation timing pre-testing will be conducted individually. Participants will be instructed as to how the test will be administered and how they should perform the test. There will also be an opportunity for the participants to ask questions if they are unsure about anything.

Batting performance pre-testing will involve the use of a batting performance test which will require the batsmen to hit balls that are bowled from a bowling machine. The data will be recorded on Microsoft Excel and all calculations will be done using Microsoft Excel.

Intervention

One of the groups will take part in a three week self-talk training programme. This will consist of two phases, including an introductory session and a training, development and implementation phase. The training session will involve a 2 times a week anxiety regulation strategy intervention. These sessions will take place in the specifically designated areas as mentioned previously. The training sessions will involve a combination of drills specifically designed to focus on coincident anticipation timing and cricket batting.

The second group will receive no training program and participants who fall into this group will form the control group for the study.

Post and Retention Test

After the three week intervention programme, the groups will be tested using the same protocols and methods as in the pre-tests. This data will then be compared to the data collected in the pre-tests using statistical procedures. After a two week period where no participants take part in any intervention programmes, a retention test will be conducted on all the participants to see whether there has been a change, if any, in their scores when compared to their post-test scores. This will give an indication as to whether the intervention programmes continued to have an effect after they ceased or not.

Overall, the participants will be involved in the study for approximately 9 weeks – within these weeks there will be three testing occasions as well as three weeks of self-talk training for the experimental group.

POTENTIAL RISKS AND DISCOMFORTS

Due to the nature of the intervention programme, there is a risk that some minor injuries may occur. Some common injuries associated with physical activity that may occur include twisted ankles, grazes, and contusions.

The risk of injury is minimised in the intervention programme because it is presented by the investigator to a small group of players (n=1 or 2) at a time. The activities can therefore be adjusted to fit the level of skill shown by the players.

The players will not be at any greater risk of general sports injuries that they may experience when playing their sport i.e. cricket. The testing and training procedures constitute no more risk than those normally experienced by cricketers during their training sessions. The investigator will provide a first aid kit that will be easily accessible at all times in case of any minor injuries. In the event that any serious injuries occur, the player will be taken to the appropriate hospital to receive treatment.

POTENTIAL BENEFITS TO PARTICIPANTS AND/OR TO SOCIETY

A potential benefit that the participants may experience includes an improvement in his coincident anticipation timing, which may potentially lead to an improvement in his cricket batting. It will also benefit cricket batsmen to be able to use and implement self-talk effectively, which in turn may improve performance.

This project will also benefit the scientific field of sport psychology and help to broaden the current body of literature surrounding self-talk and performance, specifically for cricket players. By providing guidelines as to what worked in the study or what did not work, this study will benefit coaches who are trying to get their athletes to improve their performance.

PAYMENT FOR PARTICIPATION

The subjects will not receive any payment for taking part in the study.

CONFIDENTIALITY

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law.

Confidentiality will be maintained by means of providing each participant with a unique 2-digit code that will correspond to his name. All participants' data will be recorded and processed according to their code. This code will be used on all documents or referencing to specific results that will be included in the final research project. The investigator will keep a master list of names and coded numbers in case the identity of a particular participant is necessary for later interpretation of the data. All data will be kept as a soft copy on the researchers personal computer, which is password protected, and as a hard copy in a locked drawer in the Innovation Centre at the SUSPI Gym, Stellenbosch University. The researcher and his study leader are the only people who will have access to the raw data.

PARTICIPATION AND WITHDRAWAL

You can choose whether to be part of this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may also refuse to answer any questions you do not want to answer and still remain in the study. The investigator may withdraw you from this research if circumstances arise which warrant doing so. Participants may be removed from the study if they miss more than one training sessions or any of the pre-, post-, and retention tests. This will be left up to the researchers' discretion.

IDENTIFICATION OF INVESTIGATORS

If you have any questions or concerns about the research, please feel free to contact the following research personnel: Rochel Seymour Hall (cell: 072 802 7220 or email:14900920@sun.ac.za), Mr G. van Velden (021 808 4722 or email: vision@sun.ac.za, Mr H. Steel (021 808 3463 or hrs@sun.ac.za) or Prof E Bressan (phone: 021 808 4682 or email: esb@sun.ac.za).

RIGHTS OF RESEARCH SUBJECTS

You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights or remedies because of your participation in this research study. If you have questions regarding your rights as a research participant, contact Prof E Terblanche at the Unit for Research Development.

SIGNATURE OF RESEARCH SUBJECT OR LEGAL REPRESENTATIVE

The information above was described to me

_____,by

_____in

[Afrikaans/English/Xhosa/other] and I am in command of this language or it was satisfactorily translated to me. I was given the opportunity to ask questions and these questions were answered to my satisfaction.

I hereby consent voluntarily to participate in this study and I have been given a copy of this form. I also give consent for the research to videotape the intervention specifically only for the use of this research study.

_____

Name of Subject/Participant

_____

Name of Legal Representative (if applicable)

_____

Signature of Subject/Participant or Legal Representative Date

_____ _____

SIGNATURE OF INVESTIGATOR

I declare that I explained the information given in this document to _____ [name of the subject/participant] and/or [his/her] representative _____ [name of the representative].

[He/she] was encouraged and given ample time to ask me any questions. This conversation was conducted in [Afrikaans/*English/*Xhosa/*Other] and [no translator was used/this conversation was translated into _____ by _____.

Signature of Investigator Date

_____ _____

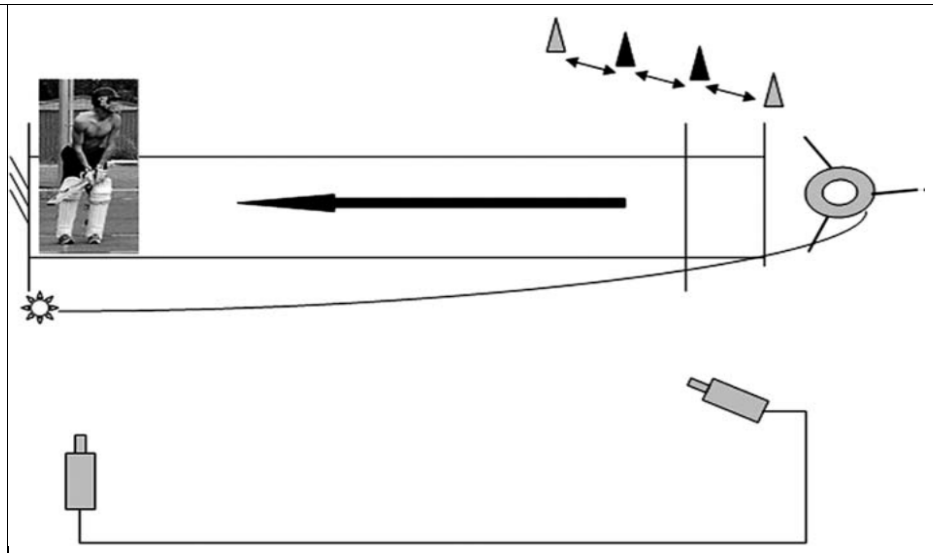
Appendix B

Presented below is a detailed explanation of the Cricket Batting Performance Test

Test/Test Item Protocol	
Name of Test	Cricket Batting Performance Test
Primary Test Administrator: Grant van Velden, Centre for Human Performance Sciences	
Purpose of the Test	To determine a cricket batsman's ability to accurately strike a ball towards an intended target, practically testing their coincident anticipation timing ability.
General Description	The Cricket Batting Performance Test has been adapted from Weissensteiner, Abernethy & Farrow (2011). This test involves a cricket batsman facing a series of deliveries at a set speed, line, and length. The objective for the cricket batsman is to accurately strike each delivery towards an intended target in order to accumulate points. Shot accuracy and the quality of interception for each shot will be scored to give an indication of the batsman's anticipation timing ability.
Targeted clients (age, sex, skill level, etc.)	University club cricket players, aged between 18-26 years, playing in a competitive club cricket league in the Boland.
Space needed	A turf cricket wicket on a cricket field

Equipment needed	Cricket Bowling Machine Cricket Bowling Machine Balls (approximately 30 balls) 50m extension cord 4 small traffic cones (2 x blue; 2 x red) 50m measuring tape Laptop or tablet (to record test data) Turf cricket pitch Informed Consent Form Athlete Information Form
Additional Personnel	1 x technician whose focus sport is cricket
Validity and Reliability	Validity and reliability of this assessment method are referenced from the following: Weissensteiner, J.R., Abernethy, B. & Farrow, D. (2011). Hitting a cricket ball: what components of the interceptive action are most linked to expertise?, Sports Biomechanics, 10:4, 324-338, Muller, S., & Abernethy, B. (2006). Skill learning from an expertise perspective: Issues and implications for practice and coaching in cricket. In J. Dosil (Ed.), The sport psychologist's handbook: A guide for sport specific performance enhancement (pp. 245–261). London: Wiley. Muller, S., & Abernethy, B. (2008). Validity and reliability of a simple categorical tool for the assessment of interceptive skill. Journal of Science and Medicine in Sport, 11, 549–552. Van Velden, G. D. (2010). The effect of a perceptual-motor training programme on the coincident anticipation timing and batting performance of club cricket players (Masters dissertation, Stellenbosch: University of Stellenbosch).

Details of the Test/Test Item	
Preparation:	A ball projecting machine rather than a bowler is used in order to maximize the consistency of ball velocity, flight, and bounce characteristics across the different participants and to avoid the workload issues that would arise from using a bowler or set of bowlers to deliver the volume of trials required. A ball machine positioned on the bowling crease opposite the batsman was used to deliver synthetic practice cricket balls to the batsmen. Synthetic cricket balls are routinely used in practice using bowling machines and provide flight and bounce characteristics similar to those of regulation, leather cricket balls, although their mass is somewhat less (134 g cf. 155–163 g). Balls will be projected at 100km/h towards the batsman. The projected balls must bounce in line with the stumps and at a 'good' length approximately 3m in front of the batting crease. This needs to be tested before any testing commences. The target zones need to be set up at the mid-on position. The centre gate is placed 2m apart from one another with another gate placed on either side of the centre gate, 2m apart from the centre gate. Three distinct target zones should now be visible. See the image below:

	
Directions to clients:	"You are required to wear your full cricket batting equipment that you would normally wear when facing a medium-fast bowler. A protective helmet is compulsory. You will take up your normal cricket batting stance in the crease. You will then receive a minimum of 12 balls and a maximum of 18 balls as a warm-up. You may indicate to me when you are ready to commence testing any time after you have faced the minimum of 12 balls and no more than 18 balls. Testing will then commence. The test will consist of you facing 24 balls which will be delivered at a consistent speed, line, and length. You will be required to direct each of these balls towards the target gates placed at the mid-on position by playing a normal cricket shot. The objective is to hit the ball through the middle gate, either along the ground or at a low trajectory. Testing is complete after you have faced you allotted 24 balls."

Scoring:	Shot accuracy and quality of bat–ball contact served as the outcome measures of the interceptive task performance. **Shot accuracy** will be measured from the placement and trajectory of each shot executed. Points for accuracy will be allocated at the time of data capture by the researcher and an experienced Sport Scientist whose focus sport is cricket. Each shot will be scored according to the following criteria: 4 points for a shot that passed through the red zone (middle of the target zone) either on the ground or at a low trajectory (approximately, 30 cm off the ground) 3 points for a shot that passed through the red zone at an elevated trajectory (considered by the researcher to be a catchable height) 2 points for a shot that passed through the blue zone at a low trajectory 1 point for a shot that passed through the blue zone at an elevated trajectory 0 points for a shot that completely missed the accuracy zones. Participants could therefore score up to a maximum of 96 points for the test, if all shots were of a low trajectory and directed between the red cones. Scores for accuracy will converted to a percentage out of 100. **Quality of ball interception** will be scored at the time of testing by the primary test administrator and an experienced technician whose focus sport is cricket. Quality of contact was scored using the simple system devised by Muller and Abernethy (2006, 2008) in which: 2 points were allocated for good bat–ball contact with the ball being projected in the intended direction 1 point if the ball hit the edge of the bat and the ball was not projected in the intended direction 0 points if no bat–ball contact was achieved. Scores for quality of contact will then be expressed as the percentage score achieved (from the maximum score possible, which is 48).

Interpretation of Scores/Report:	Test scores collected by the two assessors (the test administrator and technician) will be compared to determine agreement between the two assessors. In the case of a disagreement between the two assessors on a particular trial, the technician with specialist cricket background will be trusted and his interpretation of the trial will be taken as accurate. All participants test results will be kept confidential until the end of the research study. At the end of the research study, individual participant scores may be collected from the researcher by the individual participants for their own information. This feedback (if requested) will contain the participant's raw pre- and post-test results from the two testing occasions.

Appendix C

Presented below is a detailed protocol for the Coincident Anticipation Timing Test

Test/Test Item Protocol	
Name of Test	Coincident Anticipation Timing Test
Primary Test Administrator: Grant van Velden (Centre for Human Performance Sciences)	
Purpose of the Test	To determine an athlete's ability to anticipate the arrival of a visual stimulus at a specific point in time.
General Description	Athletes will be required to make a simple finger press response to a visual stimulus travelling towards them (in the form of a series of LED lights) when they perceive the visual stimulus to be under their index finger. Absolute & variable error will be recorded, as well as whether their response is early or late.
Targeted clients (age, sex, skill level, etc.)	University club cricket players, aged between 18-26 years, playing in a competitive club cricket league in the Boland.
Space needed	5m x 5m floor space 3m long table to place Bassin Anticipation Timer on Small table and chair
Equipment needed	Bassin Anticipation Timer (measuring of Coincident Anticipation Timing) Laptop (to record test data) Athlete Information Sheet Informed Consent Form
Additional Personnel	None

Validity and Reliability	Validity and reliability information available in the following references: Kirazci, S. (2013). Effects Of Verbal And Visual Feedback On Anticipation Timing. Social Behaviour & Personality: An International Journal, 41(7). Van Velden, G. D. (2010). The effect of a perceptual-motor training programme on the coincident anticipation timing and batting performance of club cricket players (Masters dissertation, Stellenbosch: University of Stellenbosch).

Details of the Test/Test Item	
Preparation:	Upon entering the testing venue, the participant is shown the Bassin Anticipation Timer. The apparatus, and the participants expected response, are then demonstrated prior to them undergoing the testing. The participant will then be required to fill in an Athlete Information Sheet and read through and sign an Informed Consent Form before testing can commence.

Directions to clients:	"The testing session will take place in 4 blocks, with a 2 minute break in between blocks. Each testing block will be at a different speed, starting at a slow speed and progressively becoming faster and faster as you progress from block to block. For example, Block 1 will be tested at 5mph, whereas Block 4 will be tested at 25mph. Each block will consist of four practice trials at the testing speed corresponding to that block (either 5, 10, 15 or 25mph). After you have completed your four practice trials, testing will begin. Each block will consist of 10 test trials at a set speed, with a 30 second break between each test trial. You are required to stand in your batting position at the end of the Bassin Anticipation Timer, with your leading arm outstretched, and your index finger placed on the white button (i.e. a right-handed batsman would use his left hand to perform the test). The yellow warning light on the Bassin Anticipation Timer will be illuminated for 3 seconds before the onset of each trial in order to simulate the bowler running in to bowl a delivery towards you; thereafter the lights will illuminate in sequence along the runway imitating the path of the ball travelling towards you. You are required to make a simple finger-press response of the white button to accurately coincide with the arrival of the light at the end of the runway. You are attempting to press the white button when you anticipate the arrival of the light under you index finger. Before the start of a new block, you will be told that the speed of the lights will be increased and thereafter you will receive your next practice trials and conduct the next block of testing. You are welcome to stop the testing at any stage if you feel discomfort or want to clarify a previous instruction given to you."

Scoring:	The result of each trial will be recorded and stored in a Microsoft Excel spread sheet for data analysis. Total absolute error time (seconds) for all of the trials across all of the speeds, and variable error time (seconds) between the different speeds will be calculated. For each trial, the degree of the response will also be noted i.e. whether the response was early or whether the response was late in order to give an Early to Late Ratio (Early: Late Ratio).
Interpretation of Scores/Report:	All participants test results will be kept confidential until the end of the research study. At the end of the research study, individual participant scores may be collected from the researcher by the individual participants for their own information. This feedback (if requested) will contain the participant's raw pre- and post-test results from the two testing occasions.

Appendix D

Presented below is the CSAI-2R Questionnaire

Anxiety Questionnaire

Revised Competitive State Anxiety–2 (CSAI-2R) Questionnaire

Name: _____ Test (circle): CAT or Batting

Age:_____

Specialisation (circle): Batsman Bowler All Rounder Wicket Keeper

Directions: A number of statements that athletes have used to describe their feelings before competition are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you feel right now – at this moment. There are no right or wrong answers. Do not spend too much time on any one statement, but choose the answer which describes your feelings right now.

		Not at all	Somewhat	Moderately so	Very much so
1	I feel jittery	1	2	3	4
2	I am concerned that I may not do as well in this competition as I could	1	2	3	4
3	I feel self-confident	1	2	3	4
4	My body feels tense	1	2	3	4
5	I am concerned about losing	1	2	3	4
6	I feel tense in my stomach	1	2	3	4
7	I'm confident I can meet the challenge	1	2	3	4
8	I am concerned about choking under pressure	1	2	3	4
9	My heart is racing	1	2	3	4
10	I'm confident about performing well	1	2	3	4
11	I'm concerned about performing poorly	1	2	3	4
12	I feel my stomach sinking	1	2	3	4
13	I'm confident because I mentally picture myself reaching my goal	1	2	3	4
14	I'm concerned that others will be disappointed with my performance	1	2	3	4
15	My hands are clammy	1	2	3	4
16	I'm confident of coming through under pressure	1	2	3	4
17	My body feels tight	1	2	3	4

Thank you for taking the time to answer this questionnaire ☺

Note: Original CSAI-2 item number is in parentheses along with factor classification. Each item is set to a 4-point Likert scale as in the original CSAI-2.

Scoring key:

Somatic anxiety: 1, 4, 6, 9, 12, 15, 17

Cognitive anxiety: 2, 5, 8, 11, 14

Self-confidence: 3, 7, 10, 13, 16

Subscale score is obtained by summing, dividing by number of items, and multiplying by 10. Score range is 10 to 40 for each subscale. If an athlete fails to respond to an item, merely sum and divide by items answered.

Appendix E

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jou kennisvennoot • your knowledge partner

13 May 2014

Ms Rochel Seymour Hall
Department of Psychology
Stellenbosch University

Dear Ms Hall

Concerning research project: ***The Effect of Self-Talk as an Anxiety Regulation Strategy on Coincident Anticipation Timing and Batting Performance in Cricket***

The researcher has institutional permission to proceed with this project as stipulated in the research protocol. This permission is granted on the following conditions:

- the researcher must obtain permission from the Director: Maties Sport before commencing with data collection,
- the researcher must obtain ethical clearance from the Research Ethics Committee,
- the researcher must obtain the participants' full informed consent,
- participation is voluntary,
- persons who choose not to participate may not be penalized as a result of non-participation,
- participants may withdraw their participation at any time, and without consequence,
- individuals may not be identified in the results of the study,
- data that is collected may only be used for the purpose of this study,
- the privacy of individuals must be respected and protected.

Best wishes,

Jan Botha
Senior Director: Institutional Research and Planning

Afdeling Institusionele Navorsing en Beplanning • Institutional Research and Planning Division
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Appendix F

Presented below is the Self-Talk Questionnaire for the Pre-test, Post-test and Retention test

Pre-testing ST Cue Questionnaire

NAME:

Coincident Anticipation Timing Test

Did you use a self-talk cue?	YES	NO
What was it?		

Batting Test

Did you use a self-talk cue?	YES	NO
What was it?		

Post and Retention testing ST Cue Questionnaire

NAME:

Coincident Anticipation Timing Test

Did you use a self-talk cue?	YES	NO			
Was it from your ST plan?	YES	NO			
If not, what was it?					
	Not at all	Slightly	Moderately	Mostly	All the time
If so, to what degree did you use the other one?	1	2	3	4	5

Batting Test

Did you use a self-talk cue?	YES	NO			
Was it from your ST plan?	YES	NO			
If not, what was it?					
	Not at all	Slightly	Moderately	Mostly	All the time
If so, to what degree did you use the other one?	1	2	3	4	5