A PSYCHOLOGICAL STUDY OF THE EFFECT OF A STRESS AND ANXIETY REDUCTION PROGRAMME IN AN ATHLETIC CONTEXT

by

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PLAGIARISM DECLARATION

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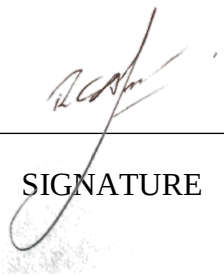

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ABSTRACT

Stress and anxiety are innate aspects of athletic competition, and often result in inhibited performance, and ultimately contribute to an unfavourable competition outcome. In order to perform optimally at high levels of competition, athletes need not only physical training, but mental training as well. However, in South Africa, professional intervention is not always available to these athletes in times of need, and in-game intervention is impossible. Thus efficient and practical psychological performance enhancement techniques demands elements of autonomy. Existing psychological skills training typically relies on consistent professional instruction, and subsequently lacks practicality in the South African context. The purpose of this study is to design a novel stress and anxiety reduction programme for athletes, and to evaluate the effect of the programme in an athletic context. The programme was designed with the intention of promoting autonomous use of the skills, and is comprised of coherent breathing, mindfulness, and visualisation techniques. A quantitative methodological framework was adopted for the study. The quantitative data was collected using the Mindful Acceptance Awareness Scale (MAAS), the Mental Skills Inventory (MSI), the Perceived Stress Scale (PSS), the Sport Competition Anxiety Test (SCAT), and the State-Trait Personality Inventory Form Y (STPI-Y). The sample consisted of 97 participants, spanning over 30 sporting disciplines. 30 participants did not complete the stress and anxiety reduction programme, while 67 did, creating a faux control group of 30 participants. The data was collected pre- and post-intervention to determine the effect of the novel stress and anxiety reduction programme. Significant differences were observed between pre- and post-test results for participants' dispositional mindfulness, perceived stress, competition anxiety, and state anxiety ($p<0.05$). The novel stress and anxiety reduction programme has proven effective at reducing stress and anxiety in an athletic context, to some extent. Recommendations are that the programme be used by athletes as an autonomous method of stress and anxiety reduction.

Key Terms: Stress reduction, anxiety reduction, athletic competition, athlete, mindfulness, coherent breathing, visualisation, sport psychology, autonomous performance enhancement

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CHAPTER 1: INTRODUCTION

1.1 Introduction

Stress and anxiety are innate aspects of athletic competition, and often result in inhibited performance, and ultimately contribute to an unfavourable competition outcome (Lewis, Knight, & Mellalieu, 2017). Many athletes report challenges during competition that are brought on by stress and anxiety (Sodhi, Luthra, & Mehta, 2016).These challenges include, but are not limited to, difficulty concentrating, inefficient decision-making, hazy thought, and reduced energy (Patel, 2013; Schlebusch, 2000; Smith, 2011; Sodhi et al., 2016).

The ramifications of stress and anxiety on athletes can be mentally debilitating and significantly impair their ability to perform optimally (Weinberg & Gould, 2014). In order to perform optimally at high levels of competition, athletes need not only physical training, but mental training as well. However, professional intervention is not always available to these athletes at all times of need, and in-game intervention is impossible. Thus efficient and practical psychological skills training demands elements of autonomy and independence, not only because of the virtue-enhancing properties of such a design (increasing self-efficacy and confidence) but also because in practice it requires real-time application (Bernier, Thienot, Codron, & Fournier, 2009; Gardner & Moore, 2004, 2006; Patel, 2013; Weinberg & Gould, 2014).

Stress and anxiety reduction programmes provide a powerful, and autonomous method for proven performance enhancement. Such programmes are postulated to be most significantly effective when incorporating elements of breath work (coherent breathing), mindfulness, and visualisation (Bernier et al., 2009; Creswell, 2017; Kabat-Zinn, 2007; Edwards et al., 2013; Streeter et al., 2017; Weinberg & Gould, 2014; Zaccaro et al., 2018). Research has indicated that attending to these components collectively, provides holistic, and wholly encompassing stress and anxiety reduction, which is beneficial in an athletic context (Bernier et al., 2009; Edwards et al., 2013; Mellalieu, Hanton, & Thomas, 2009).

This mini-dissertation documents research that explored the psychological effects of a novel stress and anxiety reduction programme, as it was deployed within an athletic context. The programme was deployed in an athletic context insofar that all participants, at the time of testing, compete in a sport at a social level or higher. Chapter one provides a synopsis of

information relevant to the research topic, the research problem, and the aims and objectives. Following which it provides an outline of the subsequent chapters of the dissertation.

1.2 Problem Statement

In the South African context, athletes' access to sport psychologists is limited at every turn, this is due to the lack of formalised training, and restrictive legislature (Schinke, Papaioannou, & Schack, 2016). As such, even the professional sportspeople often don't have continued access to a sport psychologist, ultimately putting the athletes at a disadvantage in international competition (Weinberg & Gould, 2014). In an effort to combat this, the University of Pretoria's sport club (TuksSport) expressed the need for the development of a simplistic psychological method to increase the performance of their athletes. Currently, the available training requires continued professional intervention, which has proved problematic, given the lack thereof in South Africa.

This research made the attempt to design such a programme for the athletes, and assess its effectiveness. With the South African context in mind, the programme made attempts to promote autonomy as far as possible, for the purposes of longevity. In consideration of the abundance of psychological models documenting the effect of stress and anxiety on athletic performance (Coetzee, 2011; Filaire, Bernain, Sagnol, & Lac, 2001; Weinberg & Gould, 2014), the research focuses primarily on these two attributes through the designed program and ultimately provides the athletes with psychological methods that can be used at their discretion, without professional intervention, for the purposes of controlling stress and anxiety.

The novel stress and anxiety reduction programme designed for this research focuses on coherent breathing, mindfulness, and visualisation as autonomous methods of stress and anxiety reduction (Creswell, 2017; Edwards et al., 2013; Kabat-Zinn, 2007; Piepiora, Witkowski, & Migasiewicz, 2017; Smith, 2019; Zaccaro et al., 2018). The teaching is done in such a manner that it allows for independent practice of the techniques as needed, as well as the cultivation of passive, innate virtues that are highly valuable in a competition setting and require no active initiation. The effect of this programme, while anticipated as highly positive, needs to be explored in an athletic context, as there are limited studies that currently exist, exploring and encouraging autonomic practice of the aforementioned collective psychological skills (Creswell, 2017; Edwards et al., 2013; Zaccaro et al., 2018).

The study identifies benefits in both the theoretical and practical sense. Theoretically, it aims to build a foundation of understanding, as the data collection has yielded information that has the potential to enhance and refine further research and application techniques for psychological skills training in an athletic context. Practically, it provided the athletes with simplistic and functional psychological techniques for performance enhancement that could be applied at their discretion. This holds practical value as stress and anxiety are fluctuating aspects of human behaviour, and as such require a real-time approach in order to provide the necessary performance assistance (Alhurani et al., 2018; Collins, Sorocco, Haala, Miller, & Lovallo, 2003; Dolan, 2007; Hanoch & Vitouch, 2004; Landers & Arent, 2010; Weinberg & Gould, 2014; Young, 2013).

1.3 Research Aim and Objectives

The primary aim of this study was to develop and evaluate a stress and anxiety reduction programme for athletes and to use psychological measurements to evaluate if it was successful or not. In order to explore this, the following research question was posed:

- What is the effect of the novel stress and anxiety reduction programme on athletes' stress and anxiety levels?

The following objectives were set to attain the aim:

- To determine athletes' baseline levels for stress and anxiety in pre-tests.
- Develop the intervention program using and adapting developed breathing techniques, mindfulness strategies, and visualization.
- Implement the program with the athletes.
- Have the athletes make use of the techniques on their own for a two week period.
- Execute the post-intervention psychological measurements of psychological skills, stress, and anxiety, immediately following the self-implementation.
- Assess the successfulness of the intervention using statistical analyses.

1.4 Structure of Dissertation

This dissertation comprises 5 chapters, the remainder of the dissertation will be structured as follows:

- **Chapter 2: Literature Review.** This chapter examines the relevant works of others in the field of arousal, stress, and anxiety and examines their existence in a sporting

context. Within this, the theoretical underpinnings of this study are discussed. The chapter then takes a look at literature surrounding the three techniques used in the stress and anxiety reduction programme (Coherent breathing, mindfulness, and visualisation).

- **Chapter 3: Methodology.** This chapter provides an in-depth exploration of the methodological considerations used in this study. It takes a look at the research design, the sampling technique, the sample, the measurement instruments used, the data collection process, the intervention, a deeper look at the data analysis, and lastly the ethical considerations.
- **Chapter 4: Results.** This chapter presents a summarized picture of the findings obtained from the data collection and quantitative analysis.
- **Chapter 5: Discussion and Conclusion.** This chapter provides an integration and discussion of the findings from this research study, and positions them in the context of the literature. The chapter also deliberates the limitations of the study, and the recommendations for future research.

1.5 Conclusion

Chapter one has provided a brief curtain-raiser to the research conducted, introducing the rudimentary intentions, and motives underlying the research project. The aim of the study was presented alongside the research question and the objectives. Finally the structure of the dissertation was presented, and the remainder of the dissertation will unfurl accordingly.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Stress and anxiety remain constructs in perpetual theoretical flux, due to the virtual cornucopia of theoretical perspectives from which they can be viewed, as well as the ever-shifting and often blurred conceptual boundaries afforded to their discussion (Hanoch, & Vitouch, 2004). Subsequently, the undertaking here is primarily to provide a theoretical and conceptual exploration of arousal, stress, and anxiety.

Chapter 2 aims to evaluate, organise, and synthesise the related work of others, in order to develop a coherent representation of the phenomenon in question. The exploration encompasses select current theoretical trends, and seminal work, surrounding the mentioned psychological phenomena. It then centres the scope for a more focussed examination of the manifestation thereof in a sporting context. Following which, a discussion is undertaken pertaining to the various intervention strategies used to reduce stress and anxiety, particularly those of coherent breathing, mindfulness, and visualisation, allowing for a clear delineation of the conceptual parameters of the study.

2.2 Arousal, Stress & Anxiety

While arousal, stress, and anxiety represent fundamentally distinct phenomena particularly in the realm of sport and exercise psychology, they lead into, and occur within the context of each other. Although arousal is worthy of mention, the brevity of the discussion is due to the overlap between arousal and stress, and because stress is a focal area of the study at hand, and it encompasses the same psychophysiological principles as arousal, it necessitates a larger discussion (Gould, Greenleaf, & Krane, 2002; Weinberg & Gould, 2014). A discussion of the uses and conceptualisations of arousal, stress, and anxiety within the realm of sports performance is undertaken here.

2.2.1 Arousal

Within the context of the study at hand, arousal can be defined as "…a general physiological and psychological activation, varying on a continuum from deep sleep to intense excitement" (Weinberg & Gould, 2014; p78). One of the most central aspects of the definition is that arousal is used to represent the combination of physiological and psychological activity in an individual, which provides the parameters necessary to understand arousal within the context of the research at hand. It also elucidates that, in and of itself, arousal is neither positive

nor negative as it can be the result of a positive or negative stimulus, an individual may be aroused by winning a competition, but may be equally aroused after learning of the death of a loved one (Weinberg & Gould, 2014).

2.2.1.1. Psychology of Arousal

In broad psychological discourse arousal speaks of the individual's state of responsivity, or the intensity of motivation at a particular moment (Weinberg & Gould, 2014). It effects the way in which the individual responds to their environment when exposed to the external stimuli (Pfaff, Martin, & Faber, 2014). Arousal can be thought of as a continuum, based on the intensity of the experienced emotions. For example, a low state of arousal is exemplified by a comatose individual (not at all aroused), while a heightened state of arousal is exemplified by a frenzied individual (completely aroused) (Gould, Greenleaf, & Krane, 2002).

2.2.1.2. Physiology of Arousal

Sympathetic arousal occurs in an assortment of different situations for a variety of reasons spanning from excitement to fear (Holtzhausen, 2017). The experience of being highly aroused is characterised physiologically by elevated respiration, perspiration and heart rate (Kolb & Whishaw, 2015). However, while arousal comes in many different forms, it is, in fact, the context in which the arousal occurs that provides the affective label (DeLamater, 2014). For example, the same form of sympathetic arousal occurs in fear and excitement reactions, however the former may be caused by fear-inducing stimuli (e.g. an armed intruder), while the latter would be the result of excitement-inducing stimuli (e.g. an athletic competition), thus the context in which the arousal occurred, provided the label of affect that was then ascribed to the arousal (Holtzhausen, 2017).

The combination of psychological and physiological activity seen as a result of arousal, is mirrored in response to stress. This is because the stress response to be discussed in 2.2.2.2 is a form of arousal, as such, the concept of arousal is expounded upon in section 2.2.2 as an intrinsic feature of stress.

2.2.2 Stress

In the context of sport and exercise psychology, stress can be defined as "… a complex psychophysiological process often resulting in emotional, cognitive and physiological changes to the internal milieu of the sports person" (Filaire et al., 2001; p236).

Despite the term stress being borrowed from engineering to describe the exertion of force on an object, it is most commonly associated with psychology. When applied to humans and other animals, a stressor is an external stimulus that triggers arousal and challenges the body's homeostasis (Kolb & Whishaw, 2015). One of the more perplexing aspects of stress, is that the stress itself often outlasts that which caused it (the stressor), and in other cases can even occur in the absence of an obvious stress-inducing incident (Kolb & Whishaw, 2015). An interesting physiological perspective on stress and arousal is put forward by Robert Sapolsky (2004), who argues that physiologically a hungry lion, and the zebra she is chasing down, both experience the exact same stress response. While there are unending explicit sources of stress (Berger, Pargman, & Weinberg, 2002), the fundamental notion remains that stress can come from the external environment (e.g. pressure from others, difficult deliverables), and from the internal environment (e.g. expectations, hopes, fears, beliefs) (Patel, 2013).

2.2.2.1 Psychology of Stress

Despite the discourse surrounding stress in everyday life, stress is not always maladaptive. It may offer motivation, affording opportunities for personal growth and development, and is undeniably an indispensable aspect of an athlete's existence (Selye, 1956; Weinberg & Gould, 2014; Young, 2013). The challenges that it not only surrounds, but often creates, provide for psychological and physiological stimulation, allowing for alertness, empowerment and the ability to achieve ones goals, provided that it remains at a helpful, and not a debilitating level (Dolan, 2007; Weinberg & Gould, 2014; Young, 2013). The above distinction was discovered decades ago, and the idea of stress as a positive sensation, was termed as eustress or positive stress, while negative and debilitating stress is referred to as distress (Dolan, 2007; Landers & Arent, 2010; Weinberg & Gould, 2014). While distress weakens the immune system, slows functioning, and fatigues the individual, eustress enhances both mental and physical functioning, motivates, energizes and excites the individual (Smith, 2011; Young, 2013). Thus, it can be seen why stress is a useful tool, but can also be very harmful to the individual. A balance between eustress and distress is difficult to obtain. Such a balance, however, is the crux of optimal performance. Stress that is energising rather than debilitating maximises performance, health and efficiency (Landers & Arent, 2010; Weinberg & Gould, 2014; Young, 2013).

One of the best illustrations of this concept in the field of arousal and performance is that of the Yerkes-Dodson law or the Inverted-U hypothesis depicting the relationship between

arousal/stress and performance (Yerkes & Dodson, 1908). The model posits that arousal and performance are not inversely related, nor are they directly correlated, but coexist in such a way that they form a bell shape on a graph. Essentially stating that peak performance is the result of a moderate amount of stress, too much and too little stress result in the same lack of performance (Diamond, Campbell, Park, Halonen, & Zoladz, 2007; Sodhi, et al., 2016). Likewise, recent research in the field of psychophysiology has seen a similar relationship between stress and performance, noting that too much or too little results in inhibited performance (Gjoreski, Lustrek, Gams, & Gjoreski, 2017; Rudland, Golding, & Wilkinson, 2020).

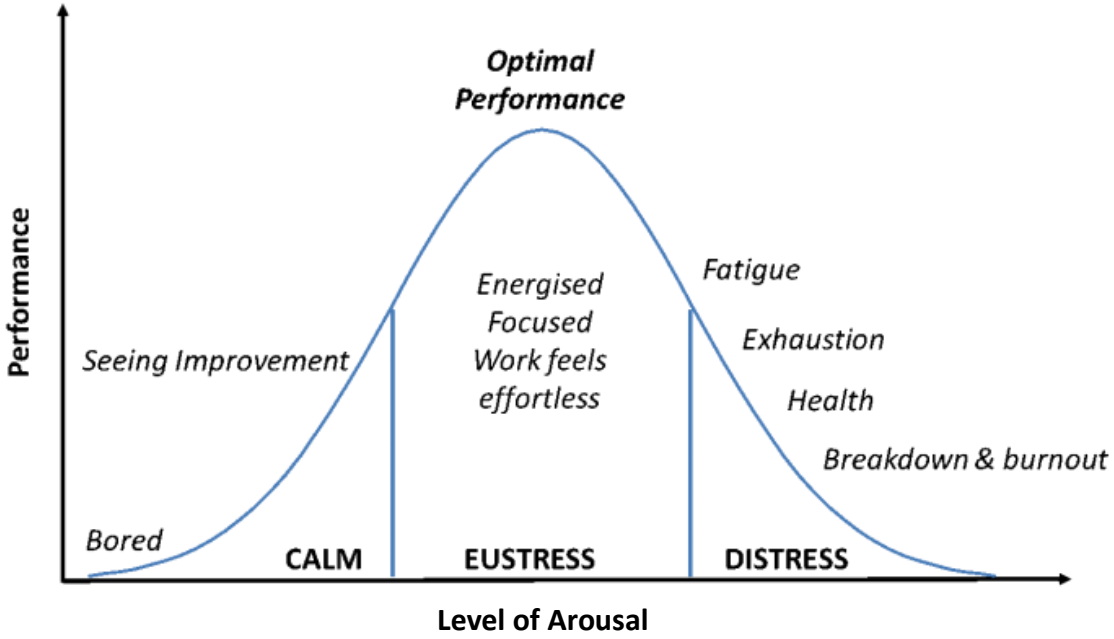

Figure 2. 1: The Inverted-U Arousal-Performance Relationship (Yerkes & Dodson, 1908)

In Figure 2.1, the left hand side of the graph exhibits a state of calm, a situation in which the athletes are either not sufficiently challenged or no performance is demanded. The right hand side of the graph is demonstrative of a state of distress, similarly to the third stage of the General Adaptation Syndrome (seen in 2.2.2.3.1). Individuals in this state feel overwhelmed and experience a lack of control as the demands exceed the resources, leading to feelings of stress and possibly burnout (Yerkes & Dodson, 1908).

The central area of the graph, a focal point in the study, exhibits a state of eustress, defined as beneficial stress (Landers & Arent, 2010). As mentioned above, eustress represents peak effectivity and performance, motivation is high and individuals are not overloaded nor at risk of reaching the abovementioned third stage of the GAS model, where athletes lack the

necessary resources to combat stress. It is at this stage that athletes would occupy a mental state of operation in which he/she is entirely immersed in the activity, encompassing this are feelings of focus, energy, and enjoyment. This is representative of a flow state (Csikszentmihályi, 1991; Sodhi, et al., 2016). In reference to the Yerkes-Dodson model, the state of flow would be achieved at the pinnacle of the inverted-U, constituting a state whereby the task is challenging based on athletic skill-level, but the athlete nonetheless remains confident that they have the necessary skills to meet the challenge (Csikszentmihályi, 1991). This position was asserted by recent research which showed an interaction between flow states and the Yerkes-Dodson model in competition settings (Sodhi, et al., 2016). The research findings noted that competitive tasks produced greater flow for easy tasks, and non-competitive conditions for difficult tasks, and that participants tended to underperform in conditions eliciting too much, or not enough stress, in support of the Yerkes-Dodson model (Sodhi et al., 2016).

The Yerkes-Dodson Inverted-U theoretical model will be the underlying assumption for the study, the idea that stress is not entirely negative, but needs to be moderated and controlled, and athletes need to be equipped with the necessary autonomous tools in order to take up the baton and mediate their stress levels as necessary. The ability to do this autonomously not only provides the athletes with the ability to use the techniques in real-time, but also inadvertently increases self-efficacy, another performance enhancement agent (Weinberg & Gould, 2014; Young, 2013). Although there has been lively debate surrounding the Yerkes-Dodson model, it is used in this study as a theoretical foundation, as it has proven to be the best in a psychophysiological sense.

The Yerkes-Dodson model and theory concisely illustrates that an individual functions optimally when positive stress is achieved, however, if the body experiences stress for prolonged periods of time it is at increased risk of developing significantly negative effects of stress (Young, 2013). Therefore, it behoves the athletes to attempt to manage his/her arousal levels appropriately during performance, and control the entries into the outer ends of the graph (significantly elevated, or significantly sunken stress), in order to avoid the persistent negative effects on psychology and physiology, and/or performance (Landers & Arent, 2010; Weinberg & Gould, 2014; Young, 2013). The stress reaction is normal, and it occurs rapidly and spontaneously with the fundamental intention of creating optimal performance in stress-inducing situations (Young, 2013). The ability to effectively utilise this response to ones benefit through stress management, maximises eustress and minimises the consequences of distress,

this results in increased positive stress behaviour, the pertinent outcomes of which, as proposed by Schlebusch (2000) include, but are not limited to:

- Increased Concentration;
- Maintaining a high standard of excellence and productivity;
- Effective Problem-Solving;
- Assertiveness/Clear and confident decision making;
- Better Coping skills;
- Clear thinking;
- High level of motivation;
- Improved self-confidence and self-esteem;
- Increased energy; and
- Realistic perceptions and self-expectations.

While it can be seen that there are copious adaptive qualities of stress, this typically applies to stress within a limited and controlled parameter, and only for concise periods of time (Sodhi et al., 2016). Thus, it is imperative to also consider the negative ramifications of stress in all contexts, because the symptoms of prolonged stress extend from psychological to physiological/health-related (Smith, 2011). Due to the stressful nature of everyday life, stress has become a very silent health-concern, and it goes largely unnoticed due to its far-reaching effects and symptoms often being attribute to other concerns (Smith, 2011; Young, 2013). This is because stress is of psychological origin, however, it has symptoms spanning both the psychological and physiological realm. As presented by Patel (2013), the contextually pertinent psychological symptoms of stress include, but are not limited to:

- Anxiety, worry or nervousness;
- Loneliness;
- Depression;
- Difficulty concentrating and retaining new information;
- Difficulty making decisions; and
- Decreased mental and physical performance.

The above symptoms presentation habitually leads to successful identification of stress as the primary concern, or successful diagnosis of a stress-induced disorder. The physical symptoms however, often present to the lay person as a health concern pertaining to an

overarching medical condition. The body's contextually pertinent physiological response to prolonged stress/distress can be briefly summarised from Patel (2013) as follows:

- Muscle tension and bodily aches;
- Back pain;
- Frequent colds or bouts of flu;
- Rapid heartbeat without exercising; and
- Heart and chest pain.

It has been continually identified throughout psychological enquiry that stress has a number of physiological implications, thus in attempting to understand and conceptualise stress it is vital to consider the cause of the physiological arousal, as well as the neuropsychological and psychophysiological processes underlying the stress response (Kolb & Whishaw, 2015; Smith, 2011).

2.2.2.2 Physiology of Stress

In attempting to understand stress within an athletic context, it is imperative to consider the physiological response of the body to stress (Weinberg & Gould, 2014). The body's physiological response to stress provides insight into the debilitating nature of distress within an athletic context, and is ultimately illustrative of why stress reduction is such a valuable tool in the athlete's arsenal (Csikszentmihályi, 1991; Weinberg & Gould, 2014).

According to Bright, Clow and Jones (2001), and as presented in 2.2.2.1, stress and anxiety, while fundamentally psychological, are equally significant in the physiological realm, particularly in bodily response and manifestation of the concepts. Psychology abounds with models of the physiological effects of stress and anxiety; however, the unanimously accepted biological model examines two major pathways along which the brain sends signals to the endocrine system, particularly in response to stress (Bhatnagar et al., 1993; Bright, et al., 2001; Weiten, 2014). The endocrine system consists of glands that secrete hormones into the bloodstream. These hormones control certain aspects of bodily functioning, and while the implications of this complex system are vast and far-reaching, it plays a pivotal role in bodily regulation during periods of heightened stress and anxiety. Although the endocrine system plays a notably impactful role, the driving force behind this process is the hypothalamus (Bhatnagar et al., 1993). The reasoning behind this is that the hypothalamus initiates the signals along the two pathways that are activated in response to stress (Kolb & Whishaw, 2015).

Contemporary psychology, as supported by Bright et al., (2001), and Bhatnagar et al., (1993), asserts that the first pathway (termed the fast-acting pathway) is routed through the autonomic nervous system (ANS). In response to stress, the hypothalamus activates the sympathetic division of the autonomic nervous system; this bodily response is used to mobilise the body's resources for emergencies (Card & Swanson, 2014). This is commonly termed the "fight, flight or freeze" response, as the parasympathetic division (rest and digest) is disengaged (Kolb & Whishaw, 2015). The most vital aspect of this response is the stimulation of the adrenal glands through the adrenal medulla as this causes the release of epinephrine (also known as adrenaline). The adrenal medulla receives neuronal input from the sympathetic division of the ANS in the form of acetylcholine, generating a release of epinephrine (Collins et al., 2003). This epinephrine surge prepares the body for sudden activity through the activation of the endocrine glands, body cells and the brain (Coetzee, 2011; Collins et al., 2003). The main reason for this consideration, within the context of the given research, is that the catecholamines produced by the adrenal glands produce the physiological changes seen in the activation of the sympathetic division of the autonomic nervous system (Bhatnagar et al., 1993). A brief summary of the abovementioned fast-acting pathway can be found on the left half of figure 2.2.

The HPA axis provides the second pertinent consideration in the neuropsychology of stress. The hypothalamic-pituitary-adrenal circuit (HPA) controls the production and release of hormones related to stress (Kolb & Whishaw, 2015). In this process the pituitary gland receives a signal from the hypothalamus, resulting in the secretion of adrenocorticotropic hormone (ACTH) (Coetzee, 2005; Coetzee, 2011; Kandel, Schwartz, & Jessell, 1995). ACTH circulates through the blood and stimulates the adrenal gland to produce cortisol. Cortisol, as secreted by the adrenal gland, is strongly associated with stress reactions (Kalat, 2007; Stöppler, 2003). It is also noteworthy that abnormalities in the HPA axis have been linked with depression, this is significant because it is indicative of how stress-related hormones have a far-reaching influence on overall cerebral functioning (Kolb & Whishaw, 2015). This impaired cognition can have widespread repercussions for athletes competing at a high level. A summary of the abovementioned slow-acting pathway can also be found on the right side of figure 2.2 below.

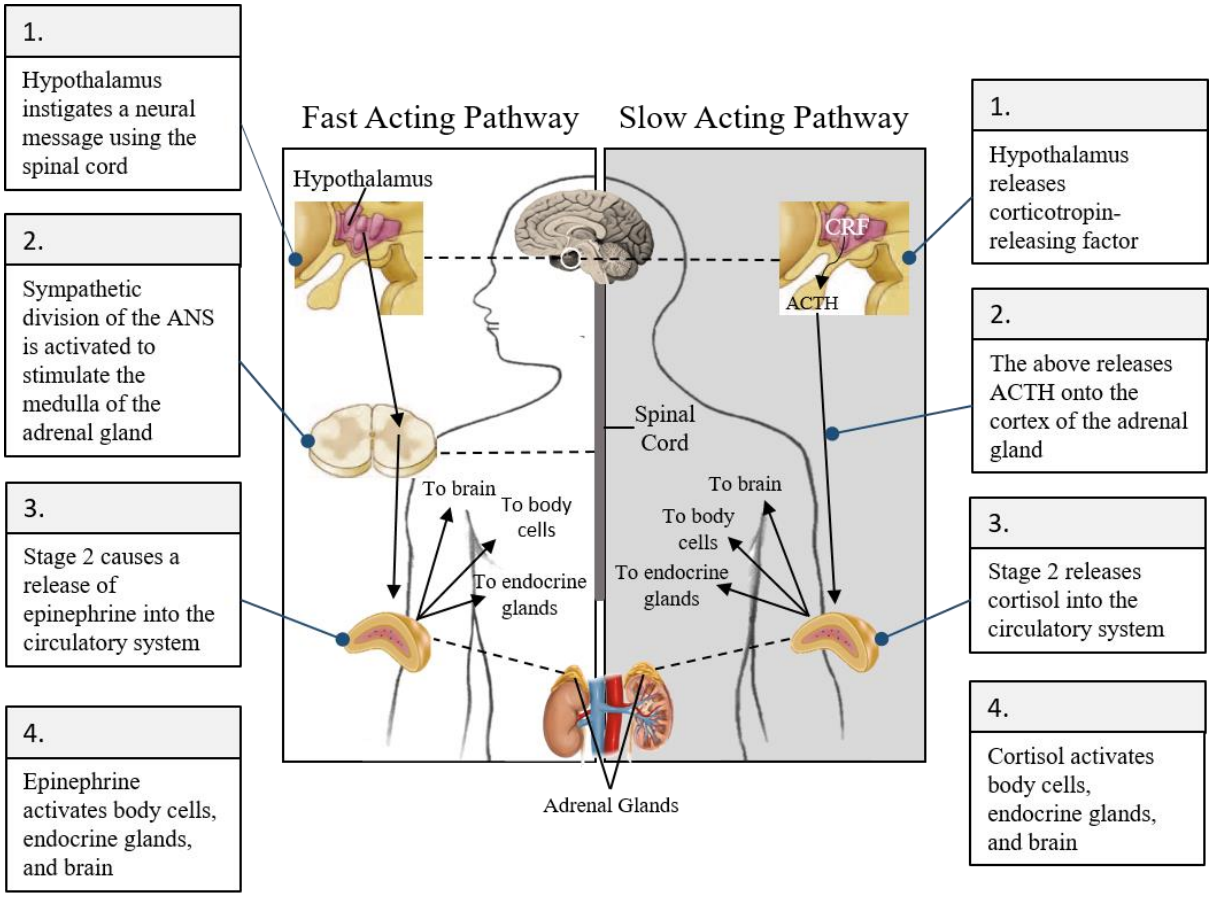

Figure 2. 2: The Fast and Slow Acting Stress Pathways (Adapted from Kolb & Whishaw, 2015)

The slow and fast acting pathways play a vital role in the individuals stress response. The fast-acting pathway acts to prime the body instantaneously to fight or flee for the purposes of dealing with the stressor (Coetzee, 2011; Collins et al., 2003). The slow-acting pathway on the other hand mobilises the bodily resources for the purposes of confronting a stressor, but furthermore assists with repairing the stress related damage that was caused by the response (Kolb & Whishaw, 2015).

As the above would suggest, in normal situations, the stress activation response is relatively brief. The body acts to mobilise its resources to deal with the stressor, deals with it, and then ends the response under the brains instruction (Kolb & Whishaw, 2015). However, if this stress response is not shut off, the body continues to mobilise energy unnecessarily, leading to the 3rd stage of the General Adaptation Syndrome, to be discussed in 2.2.2.3.1. In situations where the stress response is not turned off, it has been noted to cause hippocampal damage in a vicious cycle (Sapolsky, 2005). The hippocampus is one of the main proponents of turning off the stress response, this is due to the high density of cortisol receptors in the hippocampus,

as well as having its axons project to the hypothalamus (Kolb & Whishaw, 2015; Sapolsky, 2005). The hippocampus regulates cortisol levels, however if a stress inducing stimulus perpetuates, and cortisol levels remain elevated, cortisol eventually damages the hippocampus and can lead to perpetual hippocampal degeneration (Sapolsky, 2005). While this is a relatively uncommon and extreme example of the result of prolonged stress, it offers vital insight into the far-reaching and often overlooked results of stress on the human body.

2.2.2.3 Stress Experience

Stress was identified as far back as the 1940's by Hans Selye (Landers & Arent, 2010). Selye grappled with a definition of stress for years due to its multifaceted nature, but eventually a definition was provided by his seminal work as he posited stress to be "the nonspecific response of the body to any demand placed upon it" (Selye, 1956; p137). Stress was conceptualised by Selye to be the process of adjusting to or dealing with circumstances that disrupt or threaten to disrupt a person's psychological or physiological functioning, and was seen as a disruption of psychophysiological homeostasis (Monat, Lazarus, Reevy, & Duncan, 2007; Rosch, 2020; Selye, 1956).

(a) The General Adaptation Syndrome

The main reason for the continued study into stress is its far-reaching role in social, psychological and physiological health. One of the most reputable theories of stress reaction was developed by Hans Selye (1956), called the general adaptation syndrome (GAS). The GAS is a process that describes the physiological changes the body undergoes as it attempts to deal with stress. These responses are not isolated cases but rather represent a process that the individual goes through (Naylan, 1998). The process begins when an organism recognises the existence of a threat and is confronted with a critical situation. This stage is called the **alarm reaction stage** and refers to the initial reaction the individual's body experiences. The body responds by increasing the heart rate, releasing cortisol and increasing energy amongst other actions (Tsigos & Chrousos, 2002). In this regard, the hypothalamus' response to this event not only controls physiological responses (increased heart rate, respiration, and cortisol release amongst others), but also psychological responses (nervousness, mental haziness, and slowed mental functioning amongst others) to the environment (Card & Swanson, 2014; Coetzee, 2011; Patel, 2013; Smith, 2011). This response is in fact what triggers the complex physiological cascade of arousal mentioned in 2.2.2.2, the alarm reaction stage prepares the body for action following the identification of a threat, and this is accomplished through the

activation of the sympathetic division of the autonomic nervous system (Card & Swanson, 2014; Kolb & Whishaw, 2015).

The second stage of this model is called the **resistance stage.** After experiencing the initial shock, the individual attempts to deal with the stressor, this is typically accomplished through the use of coping techniques. Individuals will likely have varying personalised coping techniques, however they typically tend to fall into one of three styles, each with sub-techniques, the styles are: task-oriented, emotion oriented, and avoidance oriented coping strategies (the concepts presented in 2.3 are representative of a few emotion-oriented techniques) (Fish, 2018). Successful use of the coping strategies prevents descent into the exhaustion phase, the body begins to repair itself and physiological arousal stabilises (Fish, 2018; Montenegro, 2020; Singh, 2017). Despite this, the alertness level remains relatively elevated in this stage (Montenegro, 2020). Even though perceived stress will be lowered, the body's physiological readings will still illustrate elevated arousal, even if not as elevated as it is in the previous stage (Heitkemper & Woods, 2004). The prolonged existence of the resistance phase without hiatus will lead to the **exhaustion phase**.

The exhaustion phase is the last stage of the GAS and is the result of prolonged stress, due to constant heightened arousal. The body is lacking the necessary resources to effectively manage the stress. This may lead to feelings of hopelessness, muscle wastage, fatigue, inhibited release of growth hormones, suppression of the immune system, a reduced intake and processing of necessary nutrients, and ultimately burnout to name but a contextually pertinent few (Card & Swanson, 2014; Kolb & Whishaw, 2015; Sapolsky, 2005). All of these position the individual at higher risk of contracting an illness (Tsigos & Chrousos, 2002).

The GAS speaks predominantly about the environmental production of a stressor and the individual's subsequent reaction to the threat, however select environmental stressors will increase stress far more for some people than for others (Gomes & Teixeira, 2016). The difference between the two responses is the individual's inimitable cognitive appraisal, a process that provides explanation for how two individuals could react differently to the same environmental stressor (Alhurani et al., 2018).

(b) Cognitive Appraisal

A similarly relevant seminal consideration is that of stress and cognitive appraisal (Folkman & Lazarus, 1984). The model posits that stress is a two-way process, in that it involves the environments production of a stressor, and the response of the individual subjected

to the stressor. The environmental stressor, and the significance thereof forms the basis of primary appraisal, while the individuals response and availability of coping mechanisms form the basis of secondary appraisal (Seib et al., 2018).

Primary appraisal involves analysis of the significance of the stressor, including whether it is a threat or an opportunity (Gomes & Teixeira, 2016). For example, an Olympic netball player would view a local competition as much less stressful as would an up-and-coming young netball player. The factors taken into account in determining this are role-players in the individual's primary appraisal. In keeping with the example, an Olympic sportswoman might see a local competition as more of an opportunity to try new things in a more relaxed environment than she is used to, resulting in comparatively low stress levels. While the up-and-coming sportswoman would view the competitors and local competition as much more threatening, and subsequently would experience higher levels of stress (Weinberg & Gould, 2014).

Secondary appraisal refers to the individual's assessment of their ability to cope with the environmental stressor as it presents itself, regardless of the significance (Folkman & Lazarus, 1984). Dealing with stress-inducing scenarios requires certain resources, such as resilience, coping-mechanisms, and even skill-level (Seib et al., 2018). These resources reduce the perceived stress-level of an individual in response to a stressor, as such secondary appraisal refers to the individual's determination of whether or not they possess these necessary resources (Gomes & Teixeira, 2016). In keeping with the above example, the up-and-coming sportswoman may experience heightened stress as a result of the local competition (primary appraisal), however if she feels she possesses the necessary skill-level and stress-related coping mechanisms, she will likely experience a reduction in stress levels (secondary appraisal). Alternatively, if she feels she does not possess the necessary skill-level nor stress-related coping mechanisms, her already heightened stress levels are likely to increase further. As such, secondary appraisal can reduce the perceived stress caused by primary appraisal (as seen in the first scenario), or alternatively increase the perceived stress level (as seen in the second scenario), depending on the individuals appraisal of whether or not they possess the necessary resources (Gomes & Teixeira, 2016; Seib et al., 2018).

Cognitive appraisal and the GAS presented in 2.2.3.1 intertwine and work concurrently in an individual's stress response, as cognitive appraisal (both primary and secondary) effects the movement between stages of the GAS. For example, primary appraisal effects the

identification of a threat, which propagates the initiation stage of the GAS. The individual appraisal of an environmental stressor may mean that one person enters the initiation stage, while another does not, based off of their appraisal of the stressor as either a threat or an opportunity (Alhurani et al., 2018). Another example is how noticing that one has available resources (coping mechanisms, skill-level etc.), through secondary appraisal, could prevent the individual from reaching the exhaustion stage in a high-stress situation (Alhurani et al., 2018). While these are just a few microcosms of how cognitive appraisal can be used to move between the GAS stages, the co-existence of the two in stress response provides an understanding of the individual internalisation of stressors, and the individuality of stress responses. It is, therefore, important to also take into account the subjective interpretation of the environment by the individuals themselves (Folkman, & Lazarus, 1984; Weinberg & Gould, 2014).

The above discussion provides insight into how stress can be both a useful tool, and a debilitating condition. While this holds true, individuals who are predisposed to experiencing heightened stress reactions are also at high risk of experiencing increased anxiety (Weinberg & Gould, 2014). In contradiction to stress, anxiety is not as interpretively ambiguous as stress can be, it is more directional and as such is more of a fundamentally negative emotional state (Cheng, Hardy, & Markland, 2009).

2.2.3 Anxiety

Anxiety can be defined as "A state of uneasiness, accompanied by dysphoria and somatic signs and symptoms of tension, focused on apprehension of possible failure, misfortune, or danger" (Colman, 2015; p45-46). Anxiety is typically associated with physiological arousal and negative cognitions (worry and apprehension). Thus, anxiety is separated into its two main components: 1) cognitive state anxiety – this is the psychological component of anxiety and refers to the degree to which one has negative thoughts, and 2) somatic state anxiety – the physiological component, refers to the perceived physiological arousal (Cheng et al., 2009).

2.2.3.1 Psychology of Anxiety

When discussing the psychology of anxiety, a distinction is required between state and trait anxiety. Trait anxiety, as the name would suggest, is a stable trait within ones personality, it can be thought of as an acquired behavioural disposition that has ramifications in a multitude of behaviours (Weinberg & Gould, 2014). Trait anxiety influences individuals in such a way that they may perceive certain circumstances as threatening, when objectively they may pose no psychological or physical danger. Subsequently, the response from the individual is

disproportionate to the threat (Spielberger, 1966). Trait anxiety can be further sub-divided into three distinct sections, these are: 1) Somatic trait anxiety – the degree to which one typically experiences elevated physical symptoms; 2) worry trait anxiety – the degree to which one typically experiences elevated worry or self-doubt; and 3) concentration disruption – the degree to which one usually experiences disruptions in concentration (Weinberg & Gould, 2014).

Contrary to this, state anxiety is considered a fluctuating element of anxiety, a changing mood state. Similarly to what is mentioned above, it is conceptualised as arousal in the autonomic nervous system, coupled with subjectively perceived feelings of uneasiness and tension, and is a temporary, ever-changing emotional state (Spielberger, 1966). State anxiety is foundationally separated into two distinct components, these are: 1) cognitive state anxiety – the level of worry and negative thought prevalent; and 2) somatic state anxiety – this refers to the moment-to-moment changes seen in physiology (Spielberger, 1966; Weinberg & Gould, 2014). However, topical research also indicates the importance of considering a third regulatory component of state anxiety that is termed perceived control, thus indicating that in addition to the above two components, the extent to which one believes one has the necessary resources to deal with the challenge is an important aspect of state anxiety (Cheng et al., 2009).

2.2.3.2 Physiology of Anxiety

The somatic component of anxiety discussed in 2.2.3.1 forms the primary characteristic of the physiology of anxiety. In conceptualisation of somatic state anxiety, it is important to note that this term refers to the individual's perception of the physiological change, and not necessarily the physiological change itself (Kent, 2006). Therefore, somatic state anxiety would be increased when an individual feels threatened, and becomes increasingly aware of their physiological response to the threat (Colman, 2015; Kent, 2006). The physiological response of the body to anxiety is not dissimilar to that of stress seen in 2.2.2.2, both see increases in heart rate, respiration, and perspiration among others (Kolb & Whishaw, 2015). As such, for the sake of brevity, the physiological responses will not be reiterated here.

It can be seen that anxiety is a largely personalised process; two individuals could experience the same situation in two completely different ways (Spielberger, 1966). As such, while it is important to consider the response itself, it is imperative to also give consideration to both the individual and external context of the response.

2.2.4 Athletic Parameters

At any given point during social research, it is imperative to consider the environment in which the psychological reactions occur. The above provides an overview of arousal, stress, and anxiety, and the theories and concepts presented hold true in an athletic and competition setting. However, due to the volatile nature of athletic competition, there are a number of considerations that are germane to it alone. Thus, it is vital to also consider the psychology and physiology of stress and anxiety within the context of sporting and athletic competition, to hone in on specifics and provide an understanding of how the considerations exist therein, and therein alone (Smith, 2011).

In attempting to understand stress in an athletic context, it is essential to consider that the sources of stress for the athlete are unique, this pertains to both the situational/environmental sources, as well as the personal sources (Weinberg & Gould, 2014). For an athlete in competition, there are typically two main situational sources of stress that need to be considered, these are: 1) the event importance, and 2) the lack of certainty surrounding the event (Martens, 1987). It stands to reason that the more important an event, the more stressful it is for an athlete. However, although this is considered a situational source of stress, there is an undeniably personal component to it. This is that the appraisal of event importance is a fundamentally subjective experience, which fluctuates depending on a variety of criterion ranging from individual appraisal of the circumstance to skill level (Frey, 2007). For example, a seasoned netball player may experience a mundane, friendly match as being more stressful than expected if he/she is just returning from an injury, or if there are scouts watching. Thus it can be seen how the individual importance of an event is not always entirely defined by the situational factors (Weinberg & Gould, 2014). Secondly, uncertainty plays a major role in athlete stress. If an athlete is unaware of who he/she is going to be competing against, that would likely induce more stress than if the field was known to them (Noblet & Gifford, 2002). This uncertainty can be created by a number of variables from coaching staff to situations outside of the teams control (Noblet & Gifford, 2002).

Individual athletes view different situations with different weighting and as being more or less uncertain. Therefore each individual experiences the event differently based off of two main personal dispositions, these personal sources of stress are: 1) trait anxiety, and 2) self-esteem (Weinberg & Gould, 2014). Athletes with a lower self-esteem have shown a tendency to experience higher state anxiety than have athletes with a high self-esteem, and as would be

expected, athletes with heightened trait anxiety would perceive competitions as more threatening than athletes with low trait anxiety. However, an interesting take on this also suggests that an athlete with high trait anxiety may be more adapted in dealing with situations that induce heightened anxiety, and as such it is more likely that they have their own coping mechanisms in dealing with state anxiety within the competitive realm (Weinberg & Gould, 2014).

While this is illustrative of the psychological ramifications of a competitive environment for athletes, it is vital to also consider the physiological responses of the athlete in the realm of competition. As was noted in 2.2.2.2, that the bodily activation of a stress response is responsible for the physiological responses seen. In consideration of an athletic framework, and within the parameters of this study, the contextually pertinent physiological responses seen in athletes include, but are not limited to (1) increased secretion by sweat glands, (2) increased heart rate, (3) increased respiration, and (4) bronchial passages dilation (Lundberg, 2005). Alix-Sy, Le Scanff, and Filaire (2008) posit that these physiological changes seen in athletes gradually increase prior to the competition and reach a peak as the competition begins. These changes were of a significantly larger degree on days of competition than they were on non-training days, and as such it was concluded that the physiological responses seen in 2.2.2.2 (amongst others) can be used as a valid and reliable index of a participant's emotional response to competition (Alix-Sy et al., 2008). The resulting physiological changes have been unwaveringly tied in with the mental state of heightened stress and anxiety and as such have been stalwart examples of the mind-body connection, particularly within the realm of athletic performance and exercise psychology (Weinberg & Gould, 2014).

2.3. Stress and Anxiety Reduction

Sport is a multifaceted undertaking, while physical ability is arguably the most essential aspect, the defining factor between victory and defeat is often that of mental ability (Weinberg & Gould, 2014). Thematic analyses of post-match interviews have illustrated the importance of psychological skills training (PST), as a common and recurring theme is that the athletes either struggled to maintain concentration, or that emotional reactions played a part in the defeat (Lewis et al., 2017). As seen in 2.2.4, the most shared cause of this is a maladaptive response to the innate stress and anxiety experienced by the athlete, during athletic competition (Lewis et al., 2017). The research at hand focuses on stress and anxiety as a major component of inhibited performance, and as such in an attempt to deal with the core concern the focus of

the research is a programme directed at stress and anxiety reduction. The programme comprises three main intertwining techniques for the purpose of stress and anxiety reduction, these are coherent breathing, mindfulness, and visualisation.

2.3.1. Coherent Breathing

Breath control is widely regarded as the fundamental technique of achieving relaxation (Weinberg & Gould, 2014). This holds true across disciplines, from yoga (Scott et al., 2019) to a clinical medicine setting (Streeter et al., 2017). Controlled and intentional breathing has shown many advantageous properties, often even more so than expected (Scott et al., 2019). In an athletic setting, controlled breathing has shown to be one of the most effective psychological techniques, particularly in consideration of the ease with which it is accomplished (Weinberg & Gould, 2014). Within the context of this study, breath control forms the foundation of the stress and anxiety reduction programme. The thread of intentional breathing is found throughout the programme, and is included in the other techniques of mindfulness and visualisation. For the intentions set forth for this programme, and in order for the athletes to get the most benefit out of it, the specific technique to be used is that of coherent breathing (Smith, 2019).

2.3.1.1. Conceptual Understanding

Breath control and supplementary breathing techniques have become established practices in the fields of sport, and clinical psychology, particularly in the realm of arousal control, stress and anxiety reduction, and relaxation (Edwards & Beale, 2011; Edwards et al., 2013). Outside of formal scientific inquiry, breath-energy and breath control have existed cross-culturally for centuries; the Fijian *Mana*, the Zulu *umoya*, the Greek *pneuma*, and the Chinese *Chi*, are all some examples of the breath-energy relationship in African, European, and Eastern cultures (Edwards et al., 2013; Edwards & Sherwood, 2008). Modern day practice of breath control has shown empirical scientific evidence that a decreased breath ratio (5-7 breaths per minute) enhances autonomic nervous system balance and heart brain accordance (Edwards, 2012; Edwards et al., 2013). This is indicative that breathing is intimately linked with mental performance (Zaccaro et al., 2018). Numerous studies in the field of neuroscience have consistently proven the relationship between breathing techniques, neurophysiological parameters and psychological outcomes, noting reductions in anxiety levels (Yu et al., 2011), and improved heart rate variability (Lehrer & Gevirtz, 2014; Zaccaro et al., 2018) as the primary results.

While breathing practices have existed in Eastern and African cultures for decades, their introduction into Western culture wasn't until recently and primarily only for therapeutic aims (Zaccaro et al., 2018). Fundamentally in western science these breathing techniques have been separated into two main categories (particularly surrounding conversations of stress and anxiety), these are paced breathing (typically associated with well-being and relaxation), and fast breathing (typically associated with stress and anxiety) (Homma & Masaoka, 2008; Jerath, Crawford, Barnes, & Harden, 2015; & Zaccaro et al., 2018). In spite of this recent interest, western science has largely placed breath control in the middle child role, always losing attention to the elder sibling of meditation, and the youngest of focused attention and mental imagery (Zaccaro et al., 2018). The reason for this is that it is difficult to separate these constructs in scientific examination, as they are so closely intertwined. These similarities lie in the resulting mental and somatic effects (Thompson, 2009), and the many similarities in design and execution (Zaccaro et al., 2018).

It can be seen that breath control, even in ancient times, can take on many forms and attempts to achieve different purposes (Edwards & Sherwood, 2008). As such it is imperative to expound on coherent breathing as the technique of use in the study, in order to gain a grasp on its intentions and design, and how these are best suited to fill the role in an athletic context.

2.3.1.2. Stress and coherent breathing

The stress response discussed in 2.2.2.2 has a tendency to hold the autonomic nervous system in a sympathetic-dominant state, in which the hypothalamic pituitary adrenal axis (HPA) is releasing cortisol and related stress hormones into the bloodstream (Kolb & Whishaw, 2015). Typical breath control relies on switching the body from this stressed state, into a state of relaxation, inducing a parasympathetic-dominant state in the autonomic nervous system and reducing the stress hormone release (Kolb & Whishaw, 2015; Weinberg & Gould, 2014). Coherent breathing, however, does not induce a deeply relaxed parasympathetic-dominant response, but rather a balanced, fluid condition between parasympathetic and sympathetic conditions (Smith, 2019). This balance allows coherent breathing to be a valuable asset in the athletes psychological arsenal, as through training the switch between parasympathetic and sympathetic can occur quickly, and with ease, thus allowing for optimal and selective arousal in competition settings (Smith, 2019; Weinberg & Gould, 2014).

The design of coherent breathing is such that it is not fixed into a particular autonomic nervous state, but gently fluctuates between the two with slightly more sympathetic activity on

the inhale, and slightly more parasympathetic activity on the exhale (Smith, 2019). This fluctuation positively affects heart rate variability and positions the heart in a healthy and desirable condition (Smith, 2019; Streeter et al., 2017). The effect of coherent breathing on heart rate variability is one of the main arguments as to the physiological success of the technique, as such, it warrants further independent examination.

Stress breathing has a tendency to be sharp and inconsistent, the lack of consistency and rhythm has a negative effect on one's heartrate, reducing the heart rate variance (HRV) (Edwards et al., 2013). An increased HRV has been shown to have significantly constructive outcomes on physical and pulmonary health, while a diminished HRV has been tied to increased risk of mortality, and heart disease (Smith, 2019). This is what coherent breathing aims to remedy, as one of the most common results of breathing techniques is the positive impact that they have on heart rate variability (beats per minute) (de Paula et al., 2016; Larson, Chantigian, Van de Winckel, & Keller-Ross, 2019; Smith, 2019). In its efforts to resolve the arrhythmic breathing caused by stress, coherent breathing aims for a pendulum-like breathing, this slow, cadenced, and intentional breathing has positive implications for heart health and stress reduction (Larson et al., 2019). Coherent breathing has a tendency to slow the heart rate when exhaling, and increase the heart rate while inhaling with an average deviation of approximately 5 beats per minute (Smith, 2019). The stability of the breathing caused by the coherent breathing technique provides a healthy environment for heart function, and stress reduction (Edwards & Sherwood, 2008).

2.3.1.3 Coherent breathing in sport

Breath control is a powerful technique and can be used nearly anywhere, at any time, and once mastered is posited as a strong antidote from the everyday battle of stress. Once learned, it is simple to perform, swift to work, and immediately effective (Edwards et al., 2013; Smith, 2019).

The coherent breathing technique is a 9-step method, and centres around two chief components: (1) to relax both the mind and the body, and (2) to regulate one's breathing to approximately 5 breaths per minute (12 seconds per cycle), 6 seconds inhale, and 6 seconds exhale. While this is the focus of the technique, emphasis is placed on maintaining relaxation, over keeping count (Smith, 2019). When accomplished successfully, the balance in the autonomic nervous system provides a foundation of uninhibited opportunity for an athlete, unencumbered by the burden of anxiety or stress (Weinberg & Gould, 2014).

Coherent breathing induced relaxation is different from other relaxation techniques, in that instead of feeling completely relaxed (i.e. as you would with deep breathing to assist with insomnia), you achieve a feeling of inner calm, and clarity (Smith, 2019). This is not dissimilar to the typical experience of meditation, in fact the two go hand-in-hand quite comfortably. This is a desired state in the field of sport psychology as it aids in decision-making, problem-solving and enhanced physical performance (Creswell, 2017; Weinberg & Gould, 2014). This feeling is also one of the focal aims of mindfulness as a technique, and is one of the main reason these two are included together in this study, the complementary and intertwining nature of the techniques adds ease, simplicity and increases effectiveness for the athletes (Creswell, 2017; Edwards et al., 2013).

2.3.2. Mindfulness

Considering mindfulness as a relatively recent, but thriving area of exploration within the psychological realm is imperative in attempting a scientific understanding thereof, particularly given the Eastern and religious background from which it came. It is worth noting that there are considerable disparities in the description of mindfulness in the psychological literature (Steyn, 2013), resulting from rich scholarly dialogue surrounding the definition of mindfulness as a construct (Creswell, 2017). It is for these reasons that definitions have a tendency to display a want for solid grounding at a theoretical and an operational level. Subsequently, the aim of this theoretical understanding of mindfulness within the psychological realm is to uncover the main aspects of mindfulness that are the cause of its inclusion in a stress and anxiety reduction program for athletes and athletic performance, to further define it within the parameters of its operationalisation, and to examine how and why mindfulness is effective.

2.3.2.1. Conceptual Understanding

Stress and anxiety have far-reaching implications for the mind, in the realm of sporting competition these are magnified by the magnitude of the event and the miniscule margin for error (Weinberg & Gould, 2014). As noted in 2.2.2.1, stress and anxiety leads to difficulty maintaining focus, difficulty making decisions, and an overall decreased mental and physical performance (Patel, 2013). These are inhibitors that an athlete cannot afford. Mindfulness as a psychological skills technique offers not only a decrease in stress and anxiety (and subsequent decrease in the symptoms of stress and anxiety), but also a way to strengthen the very aspects

weakened by stress and anxiety (concentration, decision-making, mental/physical performance etc.) (Creswell, 2017; Kabat-Zinn, 2007; Ramsay, 2019).

Mindfulness can be viewed from a bounty of varying, but foundationally analogous, perspectives. Lay people often view mindfulness as a means by which they hope to gain short term relief from everyday stress, anxiety or depression or alternatively as a recipe for inner peace and enhanced concentration (Creswell, 2017; Kabat-Zinn, 2007). However, while the practice of mindfulness has often been used in aid of these social issues, the primary aim of mindfulness is not to achieve any of these (Ramsay, 2019).

In its humblest definition, mindfulness is the practice of being consciously aware and existing solely within the present moment, in a non-judgmental way (Brown, Creswell, & Ryan, 2015; Kabat-Zinn, 2007; Ramsay, 2019; Steyn, 2013). In delving a little deeper it refers to "receptive attention to and awareness of present events and experiences." (Brown, Creswell, & Ryan, 2007, p212). The act of present moment awareness, is in fact, in stark contrast with most of our daily lived experience, as we perpetually catch ourselves letting our mind wander (Killingsworth & Gilbert, 2010), or operating on autopilot (how often we arrive somewhere with little to no recollection of the drive there) (Bargh & Chartrand, 1999). Studies have concluded that people spend approximately 47% of their time with their mind wandering, and that a wandering mind was a strong predictor of unhappiness (Killingsworth & Gilbert, 2010), while contrastingly, mindfulness has been shown to increase daily well-being (Brown & Ryan, 2003; Creswell, 2017).

Mindfulness is also a process centring on self-knowing, entailing the active observation of one's own thoughts, emotions and perceptions (Baer, 2003; Kabat-Zinn, 2007; Steyn, 2013). It is a practice designed to train and strengthen the mind and one's cognitions, resulting in a state of heightened awareness, often out of necessity (Ramsay, 2019; Wylie & Simon, 2004). Mindfulness is a tumultuous process that often incorporates unpleasant feelings or sensations in its formal training (but not typically during trained practice). However, these are largely viewed as an important aspect of the psychotherapeutic process, as they help the individual understands the embodied experience of these reactions, they begin to take note of the temporary nature of these reactions, and learn to foster an objective understanding as to how they react to these feelings (Creswell, 2017). A common association in the minds of people, is that relaxation is the opposite of stress and anxiety, when in fact, this is not the case (Creswell, 2017; Creswell & Lindsay, 2014). While relaxation has shown to help, the mind often continues

to wander even when relaxed, this causes rumination which fuels anxiety. In this regard, mindful attentional awareness of everyday situations, prevents rumination and subsequently reduces experienced anxiety and increases mental capability and psychological virtues (Creswell, 2017).

Psychological skills operate coherently with mindfulness, and in a lot of ways, the two can be thought of as one of the same. Particularly, the skills of concentration, focus, and attention are the pertinent psychological skills that form the roots of the mindfulness practice, and that illustrate the necessity of employing this unique technique in the present study.

Concentration and attention are often used interchangeably in the field of sport and exercise psychology, owing to the fact that within the theoretical framework of the present study, the concepts represent fundamentally similar notions (Bond & Sargent, 1995). Concentration has been seminally defined as a restriction of perception, either introspectively or to the external world (Engler, 1984). The pervasive pattern of thought, positioning concentration as restriction of perception, surrounding the concept has led to concentration and mindfulness being viewed as representing fundamentally distinct concepts. However, research indicates that the two are more similar than prior thought would suggest, in fact Brown et al. (2007) compares mindfulness to a zoom lens and proposes that enhanced mindfulness provides the ability to shift between attentions selectively. This flexibility property allows for the capability of gaining a larger perspective on situations (clear awareness), as well as the ability to hone in on one situational detail (focused attention) (Brown et al., 2007). This shift is based on circumstances and necessity, and the transition between these states eases as mindfulness develops (Brown et al., 2007; Creswell & Lindsay, 2014). This unique aspect provides a concise and psychologically-relevant elucidation of the relationship between concentration and mindfulness.

While it can be seen that mindfulness has a significant impact on mental health and performance, it is vital to also consider why mindfulness is so effective. A clear and comprehensive elucidation of mindfulness as a concept, warrants not only the definition of what it is, but also a deeper look into the theories related to mindfulness efficacy.

2.3.2.2. Mindfulness Efficacy Theories

Within recent years, mindfulness has become a trendy topic of academic study, the number of publications has increased exponentially with largely positive results. Which begs the question: what makes mindfulness so effective? Two main complimentary streams have

been posited for the effectiveness of mindfulness, and serve as grounding for this study, these are: (1) the neurobiological mechanisms; and (2) the psychological mechanisms (Creswell, 2017). These theories form the foundation for this study in understanding the effectiveness of mindfulness interventions, and provide an account for the importance of its inclusion in the stress and anxiety reduction programme.

The effects of mindfulness interventions are categorically mediated by the brain, and as such neurobiologically-focused studies have employed structural and functional neuroimaging techniques in order to evaluate the neurological mechanisms germane to mindfulness (Tang, Hölzel, & Posner, 2015). The results have shown widely dispersed network of brain region activation, ranging from the insula, somatosensory cortex and putamen, to sections of the anterior cingulate cortex and prefrontal cortex (Hölzel et al., 2007; Tomasino & Fabbro, 2016; Zeidan et al., 2015). While other preliminary evidence suggests an increase in grey matter within the hippocampus as a result of mindfulness (Hölzel et al., 2011), little is functionally known about the neural ramifications linking the act of mindfulness with the outcome (Creswell, 2017).

With this in mind, Creswell and Lindsay (2014) posit a theory of mindfulness as a cushion against stress. This psychophysiological theory postulates that mindfulness training interventions act as functional neurological catalysts in two distinct but related ways. Firstly, by increasing the activity of prefrontal cortical regions that are important in top-down stress regulation, mindfulness reduces perceived-stress and the cognitive impairments stress often causes. Secondly, by decreasing activity in select areas, such as the subgenual anterior cingulate gyrus and the amygdala, mindfulness gates the fight-or-flight response (Creswell, 2017; Creswell & Lindsay, 2014).

This theory has been supported by further research into mindfulness as compared to standard relaxation training in unemployed, stressed adults (Creswell et al., 2016; Taren et al., 2015). Creswell et al. (2016), showed promising results in its attempt to neurologically elucidate mindfulness, by illustrating that, relative to a well-matched relaxation retreat sans mindfulness, mindfulness techniques have shown enhanced capabilities (Creswell et al., 2016; Taren et al., 2015). Specifically, the research showed that mindfulness resulted in an "…increased resting-state functional connectivity between the default mode network and the stress regulatory region of the dorsolateral prefrontal cortex…" (Creswell, 2017; p505). In conjunction with the above, mindfulness was also shown to "…decrease stress-related resting-

state functional connectivity between the amygdala and the subgenual anterior gyrus." (Creswell, 2017; p505). While the study indicated the above neurological implications immediately after the mindfulness intervention, it is also important to note that the above brain changes were linked with significantly reduced stress biomarkers (i.e. cortisol and related hormones) immediately following the intervention, and at a check-in 4 months post-intervention (Creswell et al., 2016; Taren et al., 2015). These results indicated the effectiveness as well as the physiological longevity of a mindfulness intervention.

While the above theory tackles a largely physiological aspect of mindfulness, other theories have looked principally at the psychological ramifications and their meaning within the context of mindfulness. Within recent years, psychological theories of mindfulness have spanned a wide range of concepts but the one aspect most commonly credited as the reason behind the effectiveness of mindfulness, is that of metacognitive awareness (Nitzan-Assayag, Aderka, & Bernstein, 2015). This realisation came through the understanding that mindfulness interventions foster a unique mental skill germane only to mindfulness and lacking from other relaxation techniques, this is the ability to more objectively observe one's moment-to-moment experiences (also referred to as metacognitive awareness or decentring) (Creswell, 2017). Metacognitive awareness involves the ability to objectively observe one's own experience as a third party, allowing for clearer problem-solving, cognitive capabilities and decision-making in the face of emotions, thoughts, and behaviours (Feldman, Greeson, & Senville, 2010; Golubickis, Tan, Falben, & Macrae, 2016; Papies, van Winckel, & Keesman, 2016). Metacognitive awareness allows the individual to lift the murky clouds of anxiety and stress from obscuring their decision making, allowing for clear and concise cognition despite tumultuous environments (Creswell, 2017). This process of decentring has shown promise in explaining the effects of mindfulness interventions, in areas that include recovered depressed patients (Teasdale et al., 2000), anxiety reduction in patients with generalized anxiety disorder (Hoge et al., 2013), and a decrease in depressive symptoms amongst patients at risk for a depression relapse (Bieling et al., 2012; Creswell, 2017).

2.3.2.3. Effects of Mindfulness

The seminal work of a mindfulness-based stress reduction (MBSR) programme, came from John Kabat-Zinn (1982), and was focused around reducing the pain felt by chronic pain patients who were unresponsive to traditional medical treatments. The research was startlingly

successful, and kicked-off a longstanding scientific interest in the application of mindfulness interventions for the treatment of physical health conditions (Creswell, 2017).

(a) Physical Health

Although fundamentally thought of as a treatment for psychologically-related conditions, Kabat-Zinn's (1982) research indicates the value of mindfulness in the domain of physical health. The majority of the interest and research on mindfulness and physical health has been guided by the philosophies that mindfulness interventions act to foster superior body awareness, improve stress management, foster stress resilience, enhance relaxation, and promote healthy coping skills (Creswell, 2017). These virtues noted by Creswell (2017), act to reduce levels of cortisol and other stress-related hormones that often cause physical health complications, the result is that mindfulness interventions act as a buffer against negative stress-related physical health consequences (Creswell, 2017; Creswell & Lindsay, 2014).

The positive effect of mindfulness interventions on physical health have been demonstrated on several occasions across multiple studies. For the purposes of this study, three main examples of the positive outcomes of mindfulness on physical health will be briefly explored, namely: its effect on immunity, clinical symptoms, and health behaviours.

- *Immunity*

  The immune system's role in protecting the body from infectious agents cannot be overstated, it is the heart of all bodily defence. However, chronic stress severely impairs the immune system's functional responses and capabilities, by inhibiting the body's ability to mount a successful antibody response (Segerstrom & Miller, 2004). Current research trends have indicated the possibility that mindfulness interventions modulate the negative stress-related outcomes on the immune system (Creswell, 2017). Mindfulness has shown its effectiveness on reducing pro-inflammation (Malarkey, Jarjoura, & Klatt, 2013), improving antibody response (Hayney et al., 2014) and even mediating changes in the CD4+ lymphocyte counts in HIV+ patients during and at a 9 month test post-intervention (Creswell, 2017; Creswell, Myers, Cole, & Irwin, 2009; Gonzalez-Garcia et al., 2014; SeydAlinaghi et al., 2012).
- *Clinical Symptoms*

  In studies conducted in the business and working environment, as well as the clinical environment mindfulness has started gaining fair momentum as a valuable technique in reducing clinical symptoms (Creswell, 2017). This is mainly due to the success mindfulness

has shown, in comparison to basic aerobics classes and relaxation techniques, in reducing the number of self-reported sick days needed, as well as the average duration of an illness over the course of a cold and flu season (Barrett et al., 2012). The studies indicated a total of 67 work days missed in the control group, 32 days in the group exposed to aerobic exercise, and a mere 16 days in the mindfulness group (Barrett et al., 2012). Mindfulness has also shown to reduce the length of illness, and improve the quality of life in patients with fibromyalgia (Schmidt et al., 2011), patients with IBS (Gaylord et al., 2011), and even in recovering breast cancer survivors (Carlson et al., 2013).

- *Health Behaviours*

  One of the more commonly noticed plights of stress is the increase in maladaptive responses to it in the form of health behaviours. To this point, stress is known to disrupt sleep and exercise, and to foster poor habits in smoking and diet, to name but a few (Creswell, 2017). These negative health behaviours have a large impact on physical health and illness recovery, and in an unkind twist of fate, often causes more stress (Creswell, 2017). While health behaviours and mindfulness are the subject of much scientific inquiry, the impact of mindfulness on these health behaviours is mixed. However, the majority of studies indicate that mindfulness interventions tend to reduce smoking in heavy smokers (Brewer et al., 2011), improve physiological and self-reported markers of sleep, and foster a more positive dietary outlook (Arch et al., 2016).

The above speaks to the physical health benefits of mindfulness, and in a number of the cases, the positive physiological outcomes seen are attributed to a more psychological reasoning. Therefore, in order to comprehensively understand mindfulness, it is vital to consider its outcome within the context of both physical and mental health.

(b) Mental Health

In consideration of the ramifications of mindfulness within the parameters of mental health and psychological disorders, an extensive aggregate of mindfulness research has continually been employed. Mindfulness has even been hailed as the third wave of therapeutic approaches to follow behavioural and cognitive-behavioural (Creswell, 2017; Hayes, Follette, & Linehan, 2004). The reasoning behind this is that the core components of mindfulness have been shown to assist individuals in recognising maladaptive thoughts and their individualised emotional reactions thereof that underlie the majority of mental health concerns (Creswell, 2017). Brief illustrations of mindfulness research in mental health provides an understanding

of how mindfulness has been used in a clinical setting. For the sake of brevity and pertinence, research within the fields of depression (as it relates to stress and anxiety) and anxiety will be expounded upon.

- *Depression*

  The ruminative nature of depression provides for a fruitful area of mindfulness prosperity (Teasdale et al., 2000). Across a number of studies, mindfulness has shown to significantly reduce the occurrence of depression relapses amongst at-risk population (3 or more prior depression relapses) when compared to the more typical treatment programme (Ma & Teasdale, 2004; Teasdale et al., 2000). The reason proposed for mindfulness' success in quelling depression pertains to its ability to foster open acceptance of ones thoughts, and the introspective property of observing one's own bodily and mental patterns when feeling acutely depressed or anxious (Creswell, 2017). This property of fostering introspection and open acceptance has been posited as capable of reducing the ruminative, judgmental, and lack of control aspects of depression and anxiety (Roemer & Orsillo, 2010).

- *Anxiety*

  Mindfulness in the field of anxiety and anxiety disorders has been a popular topic of scientific inquiry. This is largely owed to the success of mindfulness interventions on assisting individuals with anxiety (Strauss, Cavanagh, Oliver, & Pettman, 2014). A meta-analysis of studies on mindfulness interventions indicates that mindfulness significantly reduces anxiety amongst people with anxiety disorders (Creswell, 2017; Strauss et al., 2014; Vøllestad, Nielsen, & Nielsen, 2012). It was also found that patients with Generalised Anxiety Disorder and Post-Traumatic Stress Disorder experienced vastly reduced stress-based symptoms (short and long term) when exposed to a mindfulness intervention when compared to a stress-management programme (Hoge et al., 2013; Polusny et al., 2015).

In the realm of psychological research, the propagation of mindfulness as a topic of research really gained some steam when it was beginning to get compared to more traditional and tried therapeutic approaches, and coming out on top (Hoge et al., 2013; Polusny et al., 2015). The initial suggestions illustrated that mindfulness offered similar results, with additional long-term benefits, as well as more autonomy (Creswell, 2017). Autonomy in the field of psychology means that not only can the individual continue their journey on their own time, but also provides a sense of empowerment and increased self-efficacy (Strauss et al., 2014). This promotion of cognitive and affective outcomes is one of the most unique and advantageous aspects of mindfulness training, particularly within the context of this study,

where the treatment of clinical psychopathology is not the primary concern, but rather elevated cognitive performance and ability. As such, the effect of mindfulness on mental performance is a chief aspect of consideration, alongside that of mental health.

(c) Mental Performance

- *Cognitive outcomes*

  Mindfulness training that aims at enhancing cognitive and affective capabilities, focuses primarily on training the multiple aspects of focus and attention, e.g. noticing when the mind wanders, and returning back to focus using breathing (as does the designed mindfulness intervention germane to this research) (Ramsay, 2019). The above is posited for the main reason that mindfulness interventions have largely positive results on attention-related cognitive outcomes amongst samples of predominantly healthy adults (Creswell, 2017). Research has seen improvement caused by mindfulness in sustaining attention (Jensen, Vangkilde, Frokjaer, & Hasselbalch, 2012; Jha et al., 2015; Mrazek et al., 2013), problem-solving ability (Mrazek et al., 2013; Ostafin & Kassman, 2012), task switching (Creswell, 2017), and performance in working memory (Jensen et al., 2012; Zeidan et al., 2010). Overall research into mindfulness has shown significant benefit to participants in the areas of attention and focus (Jensen et al., 2012).

- *Affective outcomes*

  Mindfulness training differs from other typical therapeutic approaches in that it aims to grow the individual's ability to maintain an open and accepting attitude towards all experiences (Creswell, 2017). This skill has proved significant in regulating emotions and affective outcomes (Slutsky, Rahl, Lindsay, & Creswell, 2017). The reason posited for this is predominantly that the open and accepting attitude prevents the rumination that is inhibitive to both cognitive and affective outcomes (Slutsky et al., 2017). This proposition stands to research as Jain et al. (2007) showed that mindfulness interventions are significantly more effective than a somatic relaxation programme at reducing rumination and increasing a positive state of mind in students going through their final examinations (Creswell, 2017; Jain et al., 2007).

The ability to mediate ones cognitive and affective outcomes have shown significant mental performance enhancement (Jain et al., 2007). This is one of the main aspects of mindfulness, particularly in pertinence to the study at hand, and as such speaks to the value mindfulness contributes to any stress and anxiety reduction intervention (Creswell, 2017). The

skills bestowed by mindfulness intervention cannot be overstated in a context in which one has to work under pressure, make quick decisions, solve real-time problems, and establish a new course of immediate action (Mrazek et al., 2013). The ability to fine-tune ones mental capabilities for enhanced sport performance provides a foundation of unlimited potential for athletes. It is for these reasons that mindfulness holds a place of significance in intervention programmes designed for athletes.

2.3.2.4. Mindfulness in Sport

Utilising mindfulness in a sporting context developed as almost a logical progression within the field of sport psychology. This can be attributed to the numerous fundamental theoretical similarities and overlaps between mindfulness and sport-based psychological theories (Steyn, 2013). One such overlap is seen in Bernier et al. (2009), where optimal performance is described as a flow state, and according to the findings, this flow state shares significant similarities with select mindfulness and acceptance states (Bernier et al., 2009). This result for Bernier et al., (2009) does not stand in isolation and is mirrored in the research results of Csikszentmihályi and Jackson (1999). These researchers noted that a present moment focus is the crux of peak performance in a sporting context. Similarly, the essence of mindfulness can be summarised as a present moment focus (Creswell, 2017; Csikszentmihályi & Jackson, 1999; Kabat-Zinn, 2007). The shared characteristics between the studies conducted by Bernier et al. (2009), and Csikszentmihályi and Jackson (1999), and the notion of mindfulness, present a theoretically sound microcosm of how mindfulness training can ultimately elevate sport performance.

In examination of Bernier et al.'s (2009) paper, and its subsequent relevance of mindfulness to the study at hand; it is important to first look at the formulation of flow first operationalised by Csikszentmihályi (1990) and discussed in 2.2.2.1. The main feelings experienced by the athlete and arising from this state are that of focus, energy and enjoyment. Research conducted by Csikszentmihályi and Jackson (1999) on flow in relation to mindfulness, presented nine characteristics of flow state, namely:

1. *Challenge-skill balance*: a balance between the demands of the situation, and personal capability to meet the challenges.
2. *Concentration on task*: a feeling of focus on the task at hand.
3. *Merging of action and awareness*: a feeling of independence regarding actions.
4. *Clear goals*: a feeling of certainty regarding the plan of action.

5. *Unambiguous feedback*: Confirmation of everything going as planned is received and is clear.
6. *Sense of total control*: A feeling of control that exists without active, conscious effort.
7. *Time transformation*: Time seen as passing differently (faster or slower), or a complete lack of perception regarding time passing.
8. *Loss of self-consciousness*: A lack of concern regarding self-judgment or judgment from others, becoming one with the activity.
9. *Autotelic experience*: A feeling of pleasure derived simply from engaging in the activity, with no expectation of future reward/benefit.

Research conducted by Bernier et al. (2009), confirmed the existence of Csikszentmihályi and Jackson's (1999) characteristics. In one of two studies conducted, Bernier et al. (2009) observed that swimmers who had high levels of mindfulness, displayed five of the nine characteristics. These were challenge-skill balance, sense of total control, merging action and awareness, time transformation and loss of self-consciousness. This result is significant because it is indicative that mindfulness training has a tendency to increase the occurrence of flow in sportspersons (Bernier et al., 2009).

The second study conducted by Bernier et al. (2009), utilised golfers as the participants. The findings thereof have direct and pertinent implications that informed this study's design. It was discovered that when psychological skills training (PST) was combined with mindfulness training the resulting intervention was a potent performance enhancer (Bernier et al., 2009; Steyn, 2013). Bernier et al.'s (2009) research split the golfers into two groups; group one was exposed only to traditional PST, while group two was exposed to a combination of PST and mindfulness training. The results showed that group two far outperformed group one, lending to the idea that mindfulness in combination with PST is instrumental in peak performance (Bernier et al., 2009). This finding is furthermore corroborated by numerous other studies which have indicated a relationship between mindfulness and peak performance (Csikszentmihályi & Jackson, 1999; Gardner & Moore, 2004, 2006; Kee & Wang, 2008; Ravizza, 2002). In addition to these results, Gardner and Moore (2012) further noted that mindfulness training is essential for the development of focused attention and commitment to behaviours that would improve performance. Another psychological skill known for assisting athletes with the development of focused attention and commitment is visualisation, which will be discussed in the next section.

2.3.4. Visualisation

Visualisation, or mental imagery, has shown consistent and reliable benefit within the sporting realm when used by amateurs and Olympians alike (Murphy, Jowdy, & Durtschi, 1990; Weinberg & Gould, 2014). Visualisation arms the athletes with a creative and effective way to use their imagination as a tool to program their mind in order to perform to the utmost of their capabilities (Piepiora et al., 2017). The controlled and systematic nature of visualisation training surrounding sports performance leads to the development of pertinent and advantageous neuronal connections between the central nervous system and the athletes' muscles (Munzert, Lorey, & Zentgraf, 2009; Piepiora et al., 2017). Just like the actual movement, visualisation of performance leaves traces on the brain, as such the beneficial nature of these skills cannot be understated for both professional athletes, and all others who wish to perform at an above-average level (Piepiora et al., 2017).

2.3.4.1. Conceptual Understanding

In order to wholly conceptualise visualisation, it is important to bring under a microscope that which theorises its efficacy. A number of theories have been put forward to explain how visualisation accomplishes what it does, the most contextually pertinent of which have been summarised below, in order of their relevance to the study at hand.

(a) Psychoneuromuscular Theory

The psychoneuromuscular theory of visualisation effectiveness was put forward by Carpenter (1894), and is based on the ideomotor principle of visualisation. The basis of this theory is that vivid visualisation of performing a movement, uses the same neural pathways as those activated in the actual performance of the movement (Weinberg & Gould, 2014). The theory therefore posits that the neuromuscular activity patterns activated during visualisation facilitate the learning of motor skills.

The first scientific validation for this model was a study conducted in 1931 by Edmund Jacobson, who discovered that when the participants imagined bending their arm, small muscular contractions occurred in the flexor muscles of the arm. As was hypothesized by Carpenter (1894). These muscular contractions were significantly reduced from that of the actual practical activation, but were otherwise identical. Several decades later, Decety (1996) posited that the areas of the brain responsible for visual perception would become more active during visualisation since visualisation shares some neurological similarities with that of actual

vision. Murphy (2009) confirmed this notion when he discovered that the cerebral cortex is much more active when the participant is visualising the athletic activity than when they are resting (Decety, 1996; Weinberg & Gould, 2014).

(b) Psychological Theories

There have been a number of psychological theories posited as explanation of the success of visualisation. One notion that ties in with the aforementioned model of mindfulness is that of the attention-arousal set theory. This theory argues that mental imagery functions as a foundational grounding that aids in the pursuit of the optimal arousal level for performance (Weinberg & Gould, 2014). This position of the optimal level of arousal allows for efficient and mindful selective attention, as the athlete is capable of attending entirely to task-relevant cues, while screening out surrounding, unnecessary information (Goldstein, 2014).

A second theoretical stance that aims to explain visualisation effectiveness posits that imagery functions as a form of mental training (Goldstein, 2014). This training helps to build the necessary psychological skills that are vital to athletic performance enhancement (Weinberg & Gould, 2014). The theory also noted that because of visualisation, aspects such as confidence and concentration are increased, while anxiety is decreased (Goldstein, 2014).

Similarly, the third psychological theory posits that athlete motivation is heightened by visualisation, as the mental imagery assists the performer in focusing on the positive outcomes that could occur, rather than dwelling on previous situations in which the outcome was not favourable (Goldstein, 2014). This may occur because without visualisation, the unfavourable outcome is more than likely the most recent point of reference (Weinberg & Gould, 2014).

(c) Triple Code Model

The Triple Code Model bears theoretical ties to the previously discussed notion of cognitive appraisal, as it postulates that the meaning of the image to the athlete is a chief component of a successful imagery model (Ahsen, 1984; Singh, 2018; Weinberg & Gould, 2014). This model focuses on three core components needed for successful visualisation, namely (1) the image itself - the image requires a degree of sensory realism in order to function properly; the athlete should feel as though they are interacting with the real world (Ahsen, 1984); (2) somatic response - the visualisation should result in psychophysiological changes in the athlete's body (Ahsen, 1984; Lang, 1979; Weinberg & Gould, 2014) and lastly; (3) the meaning of the image - this focuses on the significance of the imagery to the athlete, as a set

of imagery instructions will never evoke the same experience for two different athletes (Singh, 2018; Weinberg & Gould, 2014).

The construct of vivid visualisation, put forward in the psychoneuromuscular theory, and the psychophysiological results thereof form the basis of the visualisation section of the designed stress and anxiety reduction programme for the present study. The visualisation techniques utilised in the programme were designed to elicit vivid visualisation, based on the primary components of the psychoneuromuscular theory. The core components of the triple code model were also included in the visualisation section of the stress and anxiety reduction programme. The visualisation technique aims for vivid, positive visualisation of the image itself, the relevant somatic response, and the meaning of the image.

While the above theoretical compositions speak to the efficacy of visualisation as a technique, it is also important to consider why an athlete would use visualisation as a technique, as well as what it hopes to accomplish. Within the paradigm of mental performance and athletic competition, a deliberation on the purposes of visualisation is undertaken below.

2.3.4.2. Purpose of Visualisation

Visualisation has assisted in providing athletes with marked improvement in both psychological and physical capabilities (Mellalieu et al., 2009). Visualisation has shown cross-situational efficacy in reducing stress and anxiety, and enhancing mental and physical performance (Kuan, Morris, Kueh, & Terry, 2018; Mellalieu et al., 2009; Ngo, Richards, & Kondric, 2017; Piepiora et al., 2017). The uses of visualisation span a multitude of cognitive and physical extents, and for the purpose of this study, the main uses pertain to the improvement of concentration, regulation of emotional responses, competition preparation, and the enhancement of problem-solving capabilities (Calmels, Berthoumieux, & d'Arripe-Longueville, 2004; Mellalieu et al., 2009).

- *Improving concentration*

  Visualisation acts as a mental training regime, which, if used effectively, can prevent the athletes mind from wandering during competitive situations (Mousavi, & Meshkini, 2011). This also has proven effectiveness during definably demanding cognitive tasks, such as taking a free throw in basketball, or maintaining step rhythm in pole vault. The imagery used is to reinforce the idea of composure and focus. A vivid visualisation of athletic acts has also shown to enhance the athletes' ability to integrate external stimuli, which assists to also prime the visual and perception system to help the athlete effectively attend to the

relevant and necessary stimuli without distraction (Blakeslee & Goff, 2007). Without the aforementioned capability and priming, the risk remains high for athletes to feel overloaded by the stimuli, which causes heightened levels of anxiety and a loss of concentration (Blakeslee & Goff, 2007; Calmels et al., 2004).

- *Regulating emotional response*

  An emotional balance for the purpose of sport competition is of the utmost importance. However, emotional flux is a natural part of the process, and an unspoiled state of emotional arousal is near impossible to create (Weinberg & Gould, 2014). Visualisation provides athletes with the necessary tools to regulate emotional responses. Thus, it can be used to increase the level of arousal if an athlete feels lethargic (arousal imagery), or to reduce anxiety if an athlete feels too stressed or overloaded (imagery to control arousal) (Mellalieu et al., 2009). This control, as opposed to one-dimensional visualisation, is important as research has shown that competitive state anxiety can be both facilitative as well as debilitative (Kuan et al., & Terry, 2018; Ngo et al., 2017).

- *Competition preparation*

  Athletic competition is a shared source of considerable anxiety amongst athletes. The focal source of this anxiety is the build-up, and the surprise caused by the absence of mental preparation (Proud, 2017). While athletes can use visualisation before, during, and after the practice or tournament (Hall, 2001), it is most common that visualisation occurs before competition for the purposes of preparation (Weinberg & Gould, 2014). This pre-competition visualisation has shown to reduce overall anticipatory anxiety (Proud, 2017), resulting in more control and a more likely position for positive performance outcomes (Hall, 2001; Weinberg & Gould, 2014).

- *Enhancement of problem-solving capabilities*

  Recent research into visualisation has shown that visualisation significantly increased problem solving capabilities (Osman et al., 2018). Often when players are having a specific, continuous performance concern, visualisation provides a space to solve the problems without the pressures of real-time competition. This allows them to critically examine all aspects of concern in their performance in order to determine the factor causing the performance concerns (Weinberg & Gould, 2014).

The above uses of visualisation have shown continued benefits amongst amateurs and Olympic athletes alike. In fact, the vast majority of athletes attribute numerous aspects of their success to elements of mental training and imagery (Piepiora et al., 2017). Within an athletic

realm, it is seen that visualisation has a vast scope of application, and can be performed at any time, with benefits spanning from concentration to problem-solving (Calmels et al., 2004; Mellalieu et al., 2009). It is for these reasons that visualisation holds a position in the study's designed stress and anxiety reduction programme.

2.4 Conclusion

The objective of chapter 2 was to peruse and present a broad overview of the relevant works of others for the purposes of developing a clear and coherent representation of arousal, stress, and anxiety. In addition, the reviewed literature provided reasons for the inclusion of controlled breathing, mindfulness and visualisation in the stress and anxiety reduction programme developed within the context of the present study. The following chapter will provide an overview of the research methodology that was adhered to in order to determine the effectiveness of the newly developed stress and anxiety reduction programme.

CHAPTER 3: METHODOLOGY

3.1. Introduction

The goal of the present study was to investigate the effect of a novel stress and anxiety reduction programme in an athletic context. To this end, a quantitative research design was used. This chapter outlines the research methodology used to obtain the objectives set out for the study. A description of the methodological framework is undertaken first, followed by a discussion of the actualised research design. A comprehensive discussion of the final sample ensued, providing demographic and sporting information for a clear and concise representation of the sample. An exploration of the measurement instruments is then undertaken, followed by a brief overview of the intervention programme. The chapter then concludes with a description of the data collection procedure, data analysis, and ethical considerations incorporated into the foundation of the study.

3.2 Methodological Framework

A quantitative methodological framework was adopted as the structure for exploring the effect of a designed stress and anxiety reduction programme within an athletic context. The primary reason for the use of this framework, is that the research attempted to define a cause and effect relationship between the novel stress and anxiety reduction programme, and athletes' stress and anxiety. A quantitative design best lends itself to studies with this objective (Gravetter & Forzano, 2018). At its core, the overarching aim of this quantitative research study was to present a systematic view of the effect of the stress and anxiety reduction programme. This was accomplished by defining the relationships between the programme and stress and anxiety of athletes, with the intention of explaining a reduction in stress and or anxiety for the athletes (Jordaan, 2017; Kerlinger, 1979). It is posited by Kendler, (1968, p249) that "It is the job of scientific enquiry to discover those conditions or factors that bring about, determine, or cause a particular event". This view is fundamentally quantitative in nature, and it is true across all scientific disciplines. A chemist may be concerned with explosions, a physicist with falling bodies, and a psychologist with the origin of anxiety, but the underlying nature of the scientific enquiry remains constant across these disciplines (Jordaan, 2017; Kendler, 1968). The foundation of a quantitative research design is a controlled empirical positivist grounding, the focus is not on the individual, nor on their experience, but rather on the programme, its effectiveness, and relationship with sampled stress and anxiety levels (Gravetter & Forzano, 2018; Jordaan, 2017). The proposed research is foundationally quantitative in design, insofar

that it attempts to, within reason, establish truth and objective reality through the use of the scientific method. However, it is important to note that the research still forms part of the psychological realm, and as such, it attempts to develop knowledge and understanding, rather than passively note down laws, and prioritises the idea of probability above that of absolute certainty (Crotty, 1998; Jordaan, 2017). Thus, in-line with the prescriptions of a post-positivist (logical empiricist) view of the world, the quantitative methodology to be employed aims at theory falsification, while recognising the possible error germane to social scientific techniques and researcher observations (Jordaan, 2017; Ponterotto, 2005).

3.3 Research Design

The particular set of procedures adopted for data collection and analysis at the outset of the study followed the quasi-experimental design of a one group pre-test post-test design (Gravetter & Forzano, 2018). This was due to the current landscape of COVID-19 restrictions in South Africa, which necessitated modest designs of data collection in order to ensure research integrity, a primary concern of this study.

However, following the online administration of the stress and anxiety reduction programme (the intervention), it was determined that some participants completed the programme, and others did not complete the programme. Subsequently, these participants were separated into two naturally occurring groups (participants who completed the stress and anxiety reduction programme, and participants who did not complete the stress and anxiety reduction programme), to ensure accurate results in assessing the value of the programme. This faux control group afforded the opportunity to make use of a non-equivalent control group pre-test-post-test design, and comparison between groups, an element that the previous design lacked. The considerable advantage of this is that the scores could be compared before and after treatment for the participants who completed the programme (exactly as was afforded in the original design), with the additional information of comparing the scores before and after for those who did not complete the programme, to assess for differences.

The two groups are non-equivalent in that the sample sizes of the groups differ (67 in one and 30 in the other), and the participants were not randomly selected and assigned to the groups. Therefore, differences in athletic discipline and duration were also notable, as the groups occurred naturally. However, the quasi-experimental design affords strengthening that minimises problems related to not having a comparison group, reduces the chances of a false

positive in the results, and provides for an in-depth analysis of the results, ultimately providing a clearer view of the effect of the stress and anxiety reduction programme in an athletic context.

3.4 Sampling

3.4.1 Sampling Technique

The participants in this study were recruited through a non-probability, purposive sampling method, based on the objectives of the study (Jordaan, 2017; Townsend, 2013). The design is fundamentally non-probability in nature, because not all members of the population had an equal chance of inclusion in the sample (Gravetter & Forzano, 2018; Jordaan, 2017).

The inclusion criteria used for the individual's inclusion in the study were based on three requirements. First, participants were required to compete in a sport at the time of testing, whether socially or professionally. This was included as selection criteria because the study aims to evaluate the effect of the designed stress and anxiety programme within an athletic context, and the programme was designed to be most effective and expedient for athletes. A second criterion was that all participants were required to be fluent in English. This was for two main reasons: (1) the stress and anxiety reduction programme was only available in English, and (2) the measurement instruments used were in English. As such, the language requirements were put in place to avoid any language-based confounding variables (Gravetter & Forzano, 2018; Jordaan, 2017). Lastly, participants were required to be students, between the ages of 19 and 24. The imposition of an age range ensures a degree of continuity. A primary concern of this study is measuring stress and anxiety, as such, the inclusion of a select sample of students of a certain age range ensures that stressors across participants remain relatively steady. Students of similar ages all experience relatively similar stressors, at the same time, reducing the occurrence of university related stress (e.g. exams) as confounding variables of stress measurements.

3.4.2 Sample

On the basis of the inclusion criteria, a sample of 134 participants, spanning over 30 sporting disciplines, were recruited. However, following the post-tests it was noted that 30 participants did not complete the stress and anxiety reduction programme, while 67 did. The other 37 had invalid or missing data, and subsequently had to be excluded from the study. The final sample consists of 97 participants, of which 67 have completed the programme, and 30 have not completed the programme. Both of these groups completed the pre-tests and post-

tests. These two distinct groups were analysed separately and compared, in order to provide a rich, and rigorous account of the effect of the stress and anxiety reduction programme.

3.4.2.1 Demographics

The sample of 97 participants was predominantly female, and consisted of 13 males (13.40%), and 84 females (86.60%), with no participants abstaining from providing their gender.

In terms of participant age, all participants were between the ages of 20 and 24 (mean age = 21.31 years old with a standard deviation of 1.02). The majority of the participants were 21 years old (n = 57), with the fewest participants 24 years of age (n = 2). Table 3.1 below provides a brief demographic overview of the sample who completed the stress and anxiety reduction programme.

Table 3. 1: Demographic breakdown: Participants who completed the programme

	N	**Percentage (%)**
Gender		
Male	10	14.93
Female	57	85.10
Undisclosed	0	0
Age		
20 Years Old	9	13.43
21 Years Old	42	62.69
22 Years Old	8	11.94
23 Years Old	7	10.45
24 Years Old	1	1.49

Table 3.2 below presents the demographic breakdown of the participants who did not complete the programme.

Table 3. 2: Demographic breakdown: Participants who did not complete the programme

	N	Percentage (%)
Gender		
Male	3	10.00
Female	27	90.00
Undisclosed	0	0
Age		
20 Years Old	4	13.33
21 Years Old	15	50.00
22 Years Old	5	16.67
23 Years Old	5	16.67
24 Years Old	1	3.33

3.4.2.2 Athletic Disciplines, Level, and Duration

The participants collectively compete in over 30 different sporting codes spanning from chess to rugby. The most popular sports amongst the participants were Athletics (n = 18), Netball (n = 16), and Swimming (n = 8) respectively. The most popular sports (3 or more participants) for participants who completed the programme will be further explored in table 3.3 below.

Table 3. 3: Athletic Disciplines: Participants who completed the programme

	N	Percentage (%)
Athletic Discipline		
Athletics	9	17.16
Swimming	4	5.97
Netball	11	16.42
Horse Riding	4	5.97
Dancing	6	8.96
Football	5	7.46
Tennis	3	4.48
Hockey	4	5.97
CrossFit	3	4.48
Other Disciplines*	18	26.87

* Sporting disciplines with fewer than 3 participants per sport: Aerobics, bodybuilding, boxing, chess, cricket, cycling, drum majorettes, golf, karate, mixed martial arts, parkour, rugby, target shooting, softball, volleyball, water polo, and weightlifting.

The most popular sports (3 or more participants) for participants who did not complete the programme are indicated in table 3.4 below.

Table 3. 4: Athletic Disciplines: Participants who did not complete the programme

	N	Percentage (%)
Athletic Discipline		
Athletics	9	17.16
Swimming	4	5.97
Netball	5	16.42
Horse Riding	3	5.97
Other Disciplines*	9	26.87

* Sporting disciplines with fewer than 3 participants per sport: Aerobics, bodybuilding, boxing, chess, cricket, CrossFit, cycling, dancing, drum majorettes, football, golf, hockey, karate, mixed martial arts, parkour, rugby, target shooting, tennis, softball, volleyball, water polo, and weightlifting.

The diverse nature of participants' sporting discipline allows for rich data collection and a generalizable understanding regarding the effect of the stress and anxiety reduction programme in an athletic context (Weinberg & Gould, 2014). This diversity was mirrored in the participants sporting level, ranging from social (n = 47), to national participation (n = 6).

This provides a fair representation of the sporting level of students, and this information is further discussed for participants who completed the programme in table 3.5 below.

Table 3. 5: Sporting Level: Participants who completed the programme

	N	Percentage (%)
Sporting Level		
Social	34	50.75
Club	12	17.91
Varsity	9	13.43
Provincial	8	11.94
National	3	4.48
Undisclosed	0	0.00

The sporting level for participants who did not complete the programme is presented in table 3.6 below.

Table 3. 6: Sporting Level: Participants who did not complete the programme

	N	Percentage (%)
Sporting Level		
Social	13	43.33
Club	5	16.67
Varsity	7	23.33
Provincial	2	6.67
National	3	10.00
Undisclosed	0	0.00

In consideration of the participants' athletic participation for the purposes of conducting research within an athletic context, it is also imperative to contemplate the duration of time for which the participant has played the sport. Given the variety of sporting levels, a range of 18 years is unsurprising, with a maximum of 19 years and a minimum of 1 year playing the sport. The average number of years played was 4.95 years, with a standard deviation of 5.06 years. Table 3.7 provides a summary of the relevant descriptive statistics.

Table 3. 7: Descriptive Statistics: All Participants Duration of Athletic Participation

Range	18
Minimum	1
Maximum	19
Mean	4.95
Standard Deviation	5.06
Median	2
Mode	1
Sum	480

3.5 Measurement Instruments

In order to explore the efficacy of the designed stress and anxiety reduction programme within an athletic context, this study employed primarily psychological tests via an online platform, in order to comply with COVID-19 restrictions. The study initially intended on using physiological measures as well, however COVID-19 restrictions made this infeasible.

3.5.1 General Instruments

Biographical questionnaire: A biographical questionnaire was used to measure the necessary biographical data, this included but was not limited to: age, gender, athletic discipline, duration of competitive participation, and whether or not they completed the online stress and anxiety reduction training programme.

3.5.2 Psychological Instruments

The study made use of a total five questionnaires for the psychological assessment of constructs. The questionnaires were collectively administered at pre-test and post-test phases, and assess stress, anxiety, and psychological skills.

3.5.2.1 Stress

For the purposes of stress measurement, the Perceived Stress Scale was used. The scale's primary purpose is to assess the degree to which select situations within one's life are appraised as being stressful i.e. uncontrollable, unpredictable or overwhelming (Cohen, Kamarck, & Mermelstein, 1983). The PSS is the most extensively used psychological instrument for the purposes of measuring perceived stress. It is a 10-item self-report instrument

in which the respondent answers how often they feel a certain way through the use of a four point frequency scale (from 1 = never to 4 = very often) (Cohen et al., 1983). The scale has shown usability in a South African Context (Hamad, Fernald, Karlan, & Zinman, 2008; Pau et al., 2007) and reports a respectable mean internal consistency (Cronbach's Alpha = .81) (Cohen, Williamson, Spacapan, & Oskamp, 1988; Hamad et al., 2008), and test-retest reliability (r>.70) (Lee, 2012). The test contains no sub-scales and is used as an overall stress score. The reliability rating when used in the current study was α = .43, however for scales with 10 items or less it is often difficult to get a decent Cronbach Alpha (Pallant, 2016). In that case it is better to report the mean inter-item correlation value, which when used in the current study was .23, indicating a satisfactory inter-item correlation using the Briggs and Cheek (1986) recommended optimal range.

3.5.2.2 Anxiety

For the measurement of anxiety the study made use of the Sport Competition Anxiety Test (SCAT) as its first questionnaire. The scale consists of 15 items and measures predisposition towards competition anxiety (Potgieter, 2009). The SCAT has proven to be a valid and reliable test as the test-retest reliability has been documented to range from r= .73 - .88, with an internal consistency of alpha = .95 - .97 (Martens, Vealey, & Burton, 1990). The scale contains no sub-scales and is scored as one entity. The reliability rating of the scale when used in the current study was α = .88.

The State-Trait Personality Inventory Form Y (STPI-Y) was the second measure to be used to determine anxiety. The STPI-Y consists of four subscales that measure anxiety, depression, aggression and curiosity at a state and trait level. State-based constructs are malleable, flexible and can fluctuate, these may arise due to the condition or situation in which the individual finds themselves. STPI-Y state items assess emotional disposition through the use of a four point intensity scale (from 1 = not at all to 4 = very much). A trait on the other hand is a characteristic remaining relatively stable over time, trait-based emotion is considered the foundation of a person's life (Du Plessis, 2014). STPI-Y trait items assess how often a feeling may occur through the use of a four-point frequency scale (from 1 = almost never to 4 = almost always) (Du Plessis, 2014). It is not sport-specific and measures how participants feel at any given time (Coetzee, Mostert, & Jooste, 2014). The Yerkes-Dodson Inverted-U Hypothesis posits that trait anxiety is one of the major influencers of how the arousal-performance model translates into practice (Diamond et al., 2007). As such, the STPI-Y

provides a reliable indication of trait anxiety and allows for accurate interpretation of findings. The STPI-Y reports a mean Cronbach Alpha of .82 in a South African study conducted by Du Plessis (2014). For the purposes of this study, the STPI-Y is used to provide a functional representation of the participants' state and trait anxiety, and subsequently only the state anxiety and trait anxiety sub-scales were used. Each sub-scale consists of 10 items. According to Du Plessis (2014), the state anxiety sub-scale showed a reliability rating of $\alpha = .84$, and the trait anxiety sub-scale showed a reliability rating of $\alpha = .80$ within the South African context. This result was mirrored in the current study, as the reliability rating of the state anxiety sub-scale was $\alpha = .87$, and the trait anxiety sub-scale showed a reliability rating of $\alpha = .89$.

3.5.2.3 Psychological Skills

To assess the psychological skills, the study made use of the Mindful Attention Awareness Scale (MAAS) and the Mental Skills Inventory (MSI).

The MAAS is a 15-item scale designed to assess awareness and attention to what is taking place in the present (dispositional mindfulness) (Brown & Ryan, 2003). The MAAS has the longest track record as a valid measure of mindfulness, and has shown to have a Cronbach Alpha of .89-.93, and a test-retest reliability of .32-.52 (Black, Sussman, Johnson, & Milam, 2012). The test contains no sub-scales and is used as one entity. The reliability rating of the scale when used in the current study was $\alpha = .88$.

The MSI (often referred to as the Psychological Skills Index or PSI) is a 40 item, South African instrument developed by Wheaton (1998). It is primarily used in an athletic setting to provide an overall measure of mental toughness. The MSI compartmentalises mental skills into six distinct sub-scales, however for the sake of this study, only three are contextually pertinent and therefore used, these are:

a. Arousal Control sub-scale. Defined as the ability to apply mental and physical skills in order to regulate performance anxiety. A test-retest reliability of .87 was reported for this scale (Van Niekerk, 2016; Wheaton, 1998). The sub-scale contains 6 items, and when used in the current study it reported a reliability rating of $\alpha = .78$.
b. Concentration sub-scale. Defined here as the players ability to focus their attention and process only relevant cues. A test-retest reliability of .91 was reported for this scale (Van Niekerk, 2016; Wheaton, 1998). The sub-scale contains 9 items, and when used in the current study reported a reliability rating of $\alpha = .76$

c. Mental Rehearsal sub-scale. Refers to the visualisation of strategies that improve skills during performance. A test-retest reliability of .84 was reported for this scale (Van Niekerk, 2016; Wheaton, 1998).The sub-scale contains 5 items, and when used in the current study reported a reliability rating of $\alpha = .93$

The sub-scales of Achievement Motivation, Goal Directedness, and Maintaining Self-Confidence were not analysed, as the stress and anxiety reduction programme does not include elements for the purposes of enhancing these virtues. The sub-scales of arousal control and concentration represent virtues enhanced by coherent breathing, mindfulness, and visualisation, while mental rehearsal ties in closely with the aspects of visualisation.

The inclusion of the MAAS and the MSI allow for an understanding of the effectiveness of the constructs within the stress and anxiety reduction programme. An improvement in scores from pre-test to post-test indicates a growth in mental skills and mindfulness. This allows for clear delineation as to whether the improvement in mindfulness and mental skills (gained through the programme) ultimately reduces stress and anxiety, the overarching intention of the designed programme.

3.6 Online Intervention Programme

The intervention for this study is a novel stress and anxiety reduction programme designed by the researchers (see Appendices A-C for full programme). The programme was disseminated to all participants in the form of videos of the researchers teaching the techniques, made available to them via Google Drive. The programme comprised three main techniques, designed to flow into each other and become one with practice, they are:

- Coherent Breathing;
- Mindfulness; and
- Visualisation.

The aim of these techniques was to reduce psychological arousal caused by stress and anxiety, and to provide the athletes with the necessary resources to autonomously reduce their stress and anxiety levels without continued professional intervention. The programme was also designed in such a way that these three techniques integrate into each other. Thus, while they are three, powerful psychological skills, the designed programme integrates them into one (see Appendices A-C). This requires less time, and provides a more sport-available technique that can be completed while doing a physical warm-up. These techniques also become more

effective with practice, as they cultivate innate virtues that do not need to be actively instigated, but become a by-product of the training already done. This allows real-time, in-game advantages without active thought or control. While an in-depth discussion of the techniques is undertaken in 2.3 above, a brief account will be provided here for specificity.

3.6.1 Coherent Breathing

Coherent breathing forms the foundation of the stress and anxiety reduction programme, it is the first technique taught to the athletes. It was incorporated into mindfulness and visualisation and used throughout the programme. The aim of this technique was to induce a balanced condition between parasympathetic and sympathetic activity, and prompt an overall feeling of relaxation through breath control without inducing a deeply relaxed parasympathetic response (Smith, 2019; Streeter et al., 2017).

The gentle fluctuation between parasympathetic and sympathetic states is beneficial to the athlete, because it does not eliminate arousal, but allows for arousal and heightened mental performance to coexist (Smith, 2019; Weinberg & Gould, 2014). Arousal is not entirely negative, as seen in 2.2.2.1, a balance of arousal/stress is where athletes experience optimal performance and a flow state (Gjoreski et al., 2017; Rudland et al., 2020; Sodhi et al., 2016). Coherent breathing aims for this balance rather than a parasympathetic-dominant, deeply relaxed state. Thus it provides benefits for athletic competition that are absent from other breathing techniques (Smith, 2019).

In practice, the athletes were taught coherent breathing through a 9-step process, over a period of 2 days, please refer to Appendix A for a detailed account of the coherent breathing training. The teaching focused primarily on the principles underlying coherent breathing, namely: relaxing the body and mind, and regulating breathing to five (5) breaths per minute.

3.6.2 Mindfulness

While mindfulness is usually attached to meditation practices, therapy, yoga and the like, the intention for this mindfulness training was slightly different. As seen in 2.2.3, mindfulness is a powerful tool, and when used correctly it can have significant and influential results in a wide sphere of activities (Brown et al., 2015; Creswell, 2017; Kabat-Zinn, 2007; Ramsay, 2019). In a sporting context in particular, aspects of mindfulness allow primarily for the growth of performance enhancing virtues (Weinberg & Gould, 2014). In development of the programme, mindfulness theory and practice was scoured, and aspects that pertain

particularly to sporting performance enhancement were hand-picked for this training. As such, this training focused on the following aspects:

- Overcoming distraction;
- Improving focus and concentration;
- Curating selective attention (the ability to tune out noise, and single-mindedly focus in on one selected aspect);
- Outlining a process of self-regulation;
- Tackling adversity; and
- Handling pressure/utilising pressure to thrive.

In practice, the athletes were taught mindfulness through a 7-step process, over a period of two days, please refer to Appendix B for a detailed account of the mindfulness training. The teaching took them through uncontrolled thought, the process of regaining control over the thought-process, objective observation of thought, regaining focus, and curating selective attention. It accomplished this through instruction and practical examples.

3.6.3 Visualisation

The foundational theory behind the tailored visualisation technique used in the programme, is that of the psychoneuromuscular theory, which posits that vivid and controlled mental imagery leads to the activation of areas of the brain that mimic brain activation during the execution of the sporting activity (Decety, 1996; Murphy, 2009; Weinberg & Gould, 2014). Subsequently, the core components of the visualisation technique were that of vividness and control. As with the other techniques, it has been designed specifically for athletes, and focused on the following core components:

- Improvement of concentration;
- Regulation of emotional responses;
- Mental training during off-time;
- Competition preparation; and
- Enhancement of problem-solving capabilities.

In practice, the athletes were taught visualisation through a 3-step process, over a period of two days (one day for teaching, one day for practicing). Please refer to Appendix C for a detailed account of the visualisation training. The training was sectionalised, to focus on

vividness and controllability through theory and practice. The athletes were given a blueprint explaining what should be in their own future visualisation scenarios in order to make them as effective as possible. A number of extra exercises were provided for practice, in the realm of vividness, controllability, and emotional regulation.

3.7 Data Collection

The data was collected using the instruments discussed in 3.4 and took place over a period of four (4) weeks. The data was collected using Google Forms, and links were sent out to all participants via email. The pre-test and post-test will each be discussed below.

3.7.1 Pre-test

The pre-test was conducted prior to any intervention, immediately following the identification of a suitable sample. The pre-test was done for the purposes of defining baseline scores of the participants, prior to any psychological skills training or implementation (Gravetter & Forzano, 2018). Baseline scores were determined for all participants across all psychological instruments discussed in 3.4. Following the baseline testing, the intervention was sent to the participants using Google Drive and distributed via email, it took 6-7 days to complete the programme in its entirety.

3.7.2 Post-Test

The post-test occurred immediately following the training on the stress and anxiety reduction programme. The post-test made use of the same instruments as the pre-test, discussed in 3.4. The purpose of the post-test was to determine the effect of the intervention on psychological skills, stress and anxiety, by providing post-intervention results for comparison against the pre-intervention results of the pre-test.

3.8 Data Analysis

Following data collection, the data was statistically analysed using Microsoft Excel 2013©, and SPSS Version 25©. The analysis made use of descriptive and inferential statistics. Descriptive statistics were used to analyse the sample and data, and inferential statistics were used to analyse the results. A Wilcoxon Sign Rank Test was used to determine if differences occur between the pre- and post-tests within groups. A Mann-Whitney U Test was used to determine whether differences occur between the participants who completed the stress and anxiety reduction programme, and those who did not.

3.9 Ethical Considerations

While issues of scientific validity and reliability are central to ensuring this research makes a valuable contribution to the scientific data on stress, anxiety and performance, the scientific demands of any study must rest in homeostasis with the ethical considerations of those involved (American Psychological Association, 2002). The following is an account of the ethical consideration germane to this study.

The researcher obtained ethical clearance from the Research Ethics Committee of the Faculty of Humanities at the University of Pretoria in November of 2019; ethics reference number: 14029252 (HUM019/1119). Please refer to Appendix D for a copy of the ethics clearance certificate.

A high ethical standard was upheld throughout the study. The basic rights of the participant to full informed disclosure, confidentiality, and absence of harm were maintained at all times. In order to ensure that participation in this study was voluntary, all participants were informed from the outset of the nature of the study, that their decision to participate was entirely at their discretion, that they may have withdrawn at any point, and that the results will in no way impact their academic positions. This ensured that the autonomy of all participants was respected (American Psychological Association, 2002). To ensure all participants were capable of volunteering for the study, all information pertaining to the aims, methods and procedures to be used in the study were outlined for participant perusal, this was accompanied by a consent form which was signed by all participants prior to data collection. As English fluency is a prerequisite for participation, the information provided ensures the informed consent of all participants.

A second vital aspect for consideration in this study was maintaining the confidentiality of all participants. In order to ensure privacy protection for all participants' confidentiality was considered at three main stages throughout the research. First, at the level of recruitment all biographical and required information of prospective participants was provided only to the researchers and only at the consent of each participant (Willig, 2008). Second, at data collection level all data was stored in a safe environment to which only authorised parties had access (American Psychological Association, 2002). Lastly, at the level of reporting all identifiable information was omitted from the results in order to minimise recognisability, and the athletes will not have access to each other's results (Hewitt, 2007).

A vital area for ethical consideration in 2020 in particular, is that of adherence to international and national COVID-19 regulations. The study at all times acted in-line with the regulations put in place by the South African Government throughout the year, prioritising social distancing and participant safety by moving all measures, and the intervention, to an online platform. The safety of the participant was the number one priority at all times throughout the study.

Following this process, the data collected from the study may be used for further research, permission for this was granted by the participants. The data will also be stored in the Department of Psychology at the University of Pretoria, room 11-24 for a period not less than 15 years. Access to this room is controlled and no unauthorised parties will be able to view or use the data. All participants were informed of this at the outset. All data was stored on a password protected computer for the duration of the study.

3.10 Conclusion

Chapter 3 provided a description of the quantitative research methodology and research design that was deployed in an effort to explore the study's aims and objectives. The chapter described the process by which the 134 participants were recruited, and provided a brief introduction to the final sample used. A comprehensive discussion was undertaken regarding the data collection procedure and the data analysis procedures. The chapter then concluded with the ethical considerations that were at the centre of the study. The next chapter will begin the analysis of the data collected.

CHAPTER 4: RESULTS

4.1 Introduction

As stated in 1.4, the primary aim of this study was to use psychological measures to assess whether the novel stress and anxiety reduction programme was successful or not in an athletic context. Quantitative data were collected, scored, and analysed. The groups were not equal in size, and therefore non-parametric statistics were used in the analysis. This chapter details the analysis of the data and the results yielded by it.

4.2 Descriptive Statistics: Mindful Attention Awareness Scale

The Mindful Attention Awareness Scale (MAAS) is a 15-item scale designed to assess the core characteristics of dispositional mindfulness (Brown & Ryan, 2003). A thorough discussion of the scale was undertaken in 3.4.1.3. The aim of the statistical analysis was to determine the extent to which the stress and anxiety reduction programme had an impact on participants' dispositional mindfulness. It is important to note that the mean MAAS score (a score between 1 and 6) was used in all analyses as recommended by the developers of the scale.

The scale is scored by computing a mean of the 15 items, a higher score reflects a higher level of dispositional mindfulness. The MAAS contains no subsets of data, and is scored in its entirety as one entity. Each item of the MAAS is a close-ended statement about everyday experiences and participants were required to indicate how frequently, or infrequently they currently have each of the experiences. The MAAS was the first questionnaire completed by the participants.

4.2.1 MAAS Descriptive Statistics: Participants who completed the programme

It is important to note once again, that of the 97 participants, 67 completed the stress and anxiety reduction programme, and 30 did not complete it. This is based on the result of a question posed to all participants following the conclusion of the programme. While these in no way represent equivalent groups, and subsequently are not interpreted as control or experimental groups, they provide insight into the data that otherwise would not exist. Participants were categorised into two groups: those who completed the programme and those who did not. This provides for a richer interpretation of the results and a more accurate analysis throughout. These groups were individually analysed for each test. Thereafter, they were compared to maximise accuracy and scientific integrity in the results and interpretation. The

results for the descriptive statistics of the MAAS, for participants who completed the programme are presented in table 4.1 below.

Table 4. 1: MAAS Descriptive Statistics: Participants who completed the programme (Pre- and Post-Tests)

				Statistic	Std. Error
Mindful Attention Awareness Scale (Participants who completed the programme)	Pre-Test	Mean		3.8746	.10209
		95% Confidence Interval for Mean	Lower Bound	3.6708	
			Upper Bound	4.0784	
		5% Trimmed Mean		3.8966	
		Median		3.8667	
		Variance		.698	
		Std. Deviation		.83561	
		Minimum		1.60	
		Maximum		5.33	
		Range		3.73	
		Interquartile Range		1.20	
		Skewness		-.302	.293
		Kurtosis		-.303	.578
	Post-Test	Mean		4.0677	.09428
		95% Confidence Interval for Mean	Lower Bound	3.8794	
			Upper Bound	4.2559	
		5% Trimmed Mean		4.0659	
		Median		4.0667	
		Variance		.595	
		Std. Deviation		.77168	
		Minimum		2.40	
		Maximum		5.73	
		Range		3.33	
		Interquartile Range		1.00	
		Skewness		-.016	.293
		Kurtosis		-.443	.578

Descriptive statistics of the MAAS for the participants who completed the stress and anxiety reduction programme displayed in Table 4.1 above, indicate that the mean for the pre-

test is 3.87 and standard deviation is .84. The mean for the post-test is 4.07 and standard deviation is .77.

4.2.2 MAAS Descriptive Statistics: Participants who did not complete the programme

Table 4. 2: MAAS Descriptive Statistics: Participants who did not complete the programme (Pre- and Post-Tests)

				Statistic	Std. Error
Mindful Attention Awareness Scale (Participants who did not complete the programme)	Pre-Test	Mean		3.9467	.16152
		95% Confidence Interval for Mean	Lower Bound	3.6168	
			Upper Bound	4.2765	
		5% Trimmed Mean		3.9762	
		Median		4.1333	
		Variance		.809	
		Std. Deviation		.89928	
		Minimum		1.93	
		Maximum		5.33	
		Range		3.40	
		Interquartile Range		1.33	
		Skewness		-.644	.421
		Kurtosis		-.385	.821
	Post-Test	Mean		3.9822	.15602
		95% Confidence Interval for Mean	Lower Bound	3.6636	
			Upper Bound	4.3009	
		5% Trimmed Mean		4.0353	
		Median		4.0667	
		Variance		.755	
		Std. Deviation		.86870	
		Minimum		1.53	
		Maximum		5.33	
		Range		3.80	
		Interquartile Range		1.13	
		Skewness		-1.098	.421
		Kurtosis		1.139	.821

Descriptive statistics of the MAAS for the participants who did not complete the programme displayed in Table 4.2 indicates that the mean for the pre-test is 3.95 and standard deviation is .90. The mean for the post-test is 3.98 and standard deviation is .87.

4.3 Wilcoxon Signed Rank Test: MAAS

A Wilcoxon Signed Rank Test was used to determine whether there were significant differences between the pre-test and post-test scores within both groups. The Wilcoxon Signed Rank Test is used to indicate whether there is a statistically significant difference in the mean scores for tests conducted at two separate times (Pallant, 2016). The results are presented in table 4.3 below.

Table 4. 3: Wilcoxon Signed Rank Test: MAAS

MAAS (Participants who completed the programme)	Z	-1.642
	Asymp. Sig. (2-tailed)	.043
	Effect Size	.20
MAAS (Participants who did not complete the programme)	Z	-.226
	Asymp. Sig. (2-tailed)	.821
	Effect Size	.04

The Wilcoxon Signed Rank Test revealed a statistically significant increase in mindfulness for participants who completed the programme, following the stress and anxiety reduction programme, p = .043, with a small to medium effect size (r = .20). No statistically significant difference in the mindfulness scores was seen for those participants who did not complete the programme, p = .821, with a small effect size (r = .04).

4.4 Mann-Whitney U Test: MAAS

A Mann-Whitney U Test was used to determine if significant differences occurred between the scores of those who completed the programme, and those who did not complete the programme. The Mann-Whitney U Test is used to determine whether there is statistically significant differences between two independent groups, in this case, participants who

completed the programme, and participants who did not complete it (Pallant, 2016). The results for the pre-test comparison between groups is presented in table 4.4 below.

Table 4. 4: Mann-Whitney U Test: MAAS (Pre-Test)

Total N	97
Mann-Whitney-U	1088.500
Asymptotic Significance	.514
Z- Value	.652
Effect Size	.07

A Mann-Whitney U Test revealed no significant difference in the dispositional mindfulness levels of those who did not complete the programme, and those who did complete the programme, prior to the implementation of the programme, p = .514, with a small effect size (r = .07). The results for the post-test comparison between groups is presented in table 4.5 below.

Table 4. 5: Mann-Whitney U Test: MAAS (Post-Test)

Total N	97
Mann-Whitney-U	1004.500
Asymptotic Significance	.997
Z- Value	-.004
Effect Size	.00

A Mann-Whitney U Test revealed no significant difference in the dispositional mindfulness levels of those who did not complete the programme, and those who did complete the programme, following the implementation of the programme, p = .997, with a very low effect size (r = .00).

4.5 Descriptive Statistics: Mental Skills Inventory Arousal Control Sub-scale

The Mental Skills Inventory (MSI), often referred to as the Psychological Skills Inventory, is a 40-item scale designed to assess mental skills. A thorough discussion of the scale was undertaken in 3.4.1.3.

For the purposes of this study, the focus remained on the arousal control, concentration, and mental rehearsal sub-scales. The aim of the statistical analysis was to determine the extent to which the stress and anxiety reduction programme had an impact on participants' mental skills. It is important to note that each sub-scale is analysed individually, the percentage score of each sub-scale was used in all analyses as recommended by the developers of the scale.

The scale is scored by computing an average of each sub-scale, a higher score represents a higher level of mental skills. Each item of the MSI is a close-ended statement and participants were required to indicate how often they feel a certain way. The MSI was the second questionnaire completed by the participants. The descriptive statistics for the arousal control sub-scale of the MSI for participants who completed the programme are presented in table 4.6 below.

4.5.1 MSI Arousal Control Descriptive Statistics: Participants who completed the programme

Descriptive statistics for the Arousal Control Sub-scale of the MSI for participants who completed the programme are presented in table 4.6 below.

*Table 4. 6: Arousal Control Sub-scale of the MSI Descriptive Statistics: Participants who completed the programme (Pre-test and Post-test)**

				Statistic	Std. Error
Arousal Control (Participants who completed the programme)	Pre-Test	Mean		58.3965	2.31036
		95% Confidence Interval for Mean	Lower Bound	53.7824	
			Upper Bound	63.0106	
		5% Trimmed Mean		59.0278	
		Median		58.3333	
		Variance		352.293	
		Std. Deviation		18.76947	
		Minimum		16.67	
		Maximum		91.67	
		Range		75.00	
		Interquartile Range		26.04	
		Skewness		-.409	.295
		Kurtosis		-.346	.582
	Post-Test	Mean		58.9015	2.31105
		95% Confidence Interval for Mean	Lower Bound	54.2860	
			Upper Bound	63.5170	
		5% Trimmed Mean		59.2873	
		Median		58.3333	
		Variance		352.503	
		Std. Deviation		18.77507	
		Minimum		12.50	
		Maximum		100.00	
		Range		87.50	
		Interquartile Range		25.00	
		Skewness		-.305	.295
		Kurtosis		.103	.582

*Calculated using 66 participants, 1 participant had incomplete data.

Descriptive statistics of the MSI Sub-scale Arousal Control for participants who completed the programme displayed in Table 4.6 above, indicate that the mean for the pre-test is 58.40 and standard deviation is 18.77. The mean for the post-test is 58.90 and standard deviation is 18.78.

4.5.2 MSI Arousal Control Descriptive Statistics: Participants who did not complete the programme

Descriptive statistics for the Arousal Control Sub-scale of the MSI for participants who did not complete the programme are presented in table 4.7 below.

*Table 4. 7: Arousal Control Sub-scale of the MSI Descriptive Statistics: Participants who did not complete the programme (Pre-test and Post-test)**

				Statistic	Std. Error
Arousal Control (Participants who did not complete the programme)	Pre-Test	Mean		56.7901	3.38127
		95% Confidence Interval for Mean	Lower Bound	49.8398	
			Upper Bound	63.7404	
		5% Trimmed Mean		57.5960	
		Median		58.3333	
		Variance		308.691	
		Std. Deviation		17.56962	
		Minimum		8.33	
		Maximum		87.50	
		Range		79.17	
		Interquartile Range		29.17	
		Skewness		-.834	.448
		Kurtosis		.811	.872
	Post-Test	Mean		52.9321	3.59171
		95% Confidence Interval for Mean	Lower Bound	45.5492	
			Upper Bound	60.3150	
		5% Trimmed Mean		53.6008	
		Median		54.1667	
		Variance		348.310	
		Std. Deviation		18.66308	
		Minimum		8.33	
		Maximum		83.33	
		Range		75.00	
		Interquartile Range		16.67	
		Skewness		-.751	.448
		Kurtosis		.635	.872

*Calculated using 27 participants, 3 participants had incomplete data.

Descriptive statistics of the MSI Sub-scale Arousal Control for participants who did not complete the programme displayed in Table 4.7 above, indicate that the mean for the pre-test is 56.79 and standard deviation is 17.57. The mean for the post-test is 52.93 and standard deviation is 18.66.

4.6 Wilcoxon Signed Rank Test: Mental Skills Inventory Arousal Control Sub-scale

A Wilcoxon Signed Rank Test was used to determine whether there were significant differences between the pre-test and post-test scores for each group respectively. The results are presented in table 4.8 below.

Table 4. 8: Wilcoxon Signed Rank Test: MSI Arousal Control

MSI: Arousal Control (Participants who completed the programme)	Z	-.672
	Asymp. Sig. (2-tailed)	.502
	Effect Size	.08
MSI: Arousal Control (Participants who did not complete the programme)	Z	-.498
	Asymp. Sig. (2-tailed)	.618
	Effect Size	.1

The Wilcoxon Signed Rank Test revealed no statistically significant increase in arousal control following the stress and anxiety reduction programme, $p = .502$, with a small effect size ($r = .08$). No statistically significant increase in arousal control was seen for the participants who did not complete the programme either, $p = .618$, with a small effect size ($r = .1$).

4.7 Mann-Whitney U Test: MSI Arousal Control Sub-scale

A Mann-Whitney U Test was used to determine if significant differences occurred between the scores of both groups (those who completed the programme, and those who did not) for the Arousal Control sub-scale of the MSI. Comparisons were drawn between pre-test and post-test scores. The results for the pre-test comparison between groups are presented in table 4.9 below.

Table 4. 9: Mann-Whitney U Test: MSI Arousal Control (Pre-Test)

Total N	93
Mann-Whitney-U	932.500
Asymptotic Significance	.725
Z- Value	.352
Effect Size	.04

A Mann-Whitney U Test revealed no significant difference in the arousal control levels between those who did not complete the programme, and those who did complete the programme, prior to the implementation of the programme, p = .725, with a small effect size (r = .04). The results for the post-test comparison between groups is presented in table 4.10 below.

Table 4. 10: Mann-Whitney U Test: MSI Arousal Control (Post-Test)

Total N	93
Mann-Whitney-U	1034.000
Asymptotic Significance	.224
Z- Value	1.215
Effect Size	.13

A Mann-Whitney U Test revealed no significant difference in the arousal control levels between those who did not complete the programme, and those who did complete the programme, following the implementation of the programme, p = .224, with a small effect size (r = .13).

4.8 Descriptive Statistics: MSI Concentration Sub-scale

This section presents and analyses the descriptive statistics of the Concentration sub-scale of the Mental Skills Inventory.

4.8.1 MSI Concentration Descriptive Statistics: Participants who completed the programme

*Table 4. 11: Concentration Sub-scale of the MSI Descriptive Statistics: Participants who completed the programme (Pre-test and Post-test)**

				Statistic	Std. Error
Concentration (Participants who completed the programme)	Pre-Test	Mean		62.3316	1.86906
		95% Confidence Interval for Mean	Lower Bound	58.5989	
			Upper Bound	66.0644	
		5% Trimmed Mean		62.6216	
		Median		63.8889	
		Variance		230.562	
		Std. Deviation		15.18428	
		Minimum		27.78	
		Maximum		91.67	
		Range		63.89	
		Interquartile Range		25.00	
		Skewness		-.186	.295
		Kurtosis		-.596	.582
	Post-Test	Mean		62.4579	1.73025
		95% Confidence Interval for Mean	Lower Bound	59.0024	
			Upper Bound	65.9135	
		5% Trimmed Mean		62.3737	
		Median		61.1111	
		Variance		197.588	
		Std. Deviation		14.05661	
		Minimum		19.44	
		Maximum		100.00	
		Range		80.56	
		Interquartile Range		16.67	
		Skewness		.022	.295
		Kurtosis		1.135	.582

Calculated using 66 participants, 1 participant had incomplete data.

Descriptive statistics of the MSI sub-scale Concentration for participants who completed the programme displayed in Table 4.11 above, shows that the mean score for the pre-test is 62.33 and standard deviation is 15.18. The mean for the post-test is 62.46 and standard deviation is 14.06.

4.8.2 MSI Concentration Descriptive Statistics: Participants who did not complete the programme

*Table 4. 12: Concentration Sub-scale of the MSI Descriptive Statistics: Participants who did not complete the programme (Pre-test and Post-test)**

				Statistic	Std. Error
Concentration (Participants who did not complete the programme)	Pre-Test	Mean		63.5802	2.67840
		95% Confidence Interval for Mean	Lower Bound	58.0747	
			Upper Bound	69.0858	
		5% Trimmed Mean		64.1975	
		Median		66.6667	
		Variance		193.693	
		Std. Deviation		13.91735	
		Minimum		27.78	
		Maximum		86.11	
		Range		58.33	
		Interquartile Range		19.44	
		Skewness		-.639	.448
		Kurtosis		.137	.872
	Post-Test	Mean		62.5514	2.78319
		95% Confidence Interval for Mean	Lower Bound	56.8305	
			Upper Bound	68.2724	
		5% Trimmed Mean		63.7803	
		Median		66.6667	
		Variance		209.147	
		Std. Deviation		14.46191	
		Minimum		16.67	
		Maximum		80.56	
		Range		63.89	
		Interquartile Range		16.67	
		Skewness		-1.381	.448
		Kurtosis		2.622	.872

Calculated using 27 participants, 3 participants had incomplete data.

Descriptive statistics of the MSI sub-scale Concentration for participants who did not complete the programme displayed in Table 4.12 above, indicate that the mean for the pre-test is 63.58 and standard deviation is 13.92. The mean for the post-test is 62.55 and standard deviation is 14.46.

4.9 Wilcoxon Signed Rank Test: MSI Concentration Sub-scale

A Wilcoxon Signed Rank Test was used to determine whether there were significant differences between the pre-test and post-test scores for each group. The results are presented in table 4.13 below.

Table 4. 13: Wilcoxon Signed Rank Test: MSI Concentration

MSI: Concentration (Participants who completed the programme)	Z	-.623
	Asymp. Sig. (2-tailed)	.533
	Effect Size	.06
MSI: Concentration (Participants who did not complete the programme)	Z	-.122
	Asymp. Sig. (2-tailed)	.903
	Effect Size	.01

The Wilcoxon Signed Rank Test revealed no statistically significant increase in concentration following the stress and anxiety reduction programme, p = .533, with a small effect size (r = .06). No statistically significant increase in concentration was seen for those participants who did not complete the programme either, p = .903, with a small effect size (r = .01).

4.10 Mann-Whitney U Test: MSI Concentration Sub-scale

A Mann-Whitney U Test was used to determine if significant differences occurred between the scores of both groups (those who completed the programme, and those who did not) for the Concentration sub-scale of the MSI. Pre-Test and Post Test scores were analysed. The results for the pre-test comparison between groups are presented in table 4.14 below.

Table 4. 14: Mann-Whitney U Test: MSI Concentration (Pre-Test)

Total N	93
Mann-Whitney-U	844.000
Asymptotic Significance	.690
Z- Value	.399
Effect Size	.07

A Mann-Whitney U Test revealed no significant difference in the concentration levels between those who did not complete the programme, and those who did complete the programme, prior to the implementation of the programme, p = .690, with a small effect size (r = .07). The results for the post-test comparison between groups are presented in table 4.15 below.

Table 4. 15: Mann-Whitney U Test: MSI Concentration (Post-Test)

Total N	93
Mann-Whitney-U	826.000
Asymptotic Significance	.581
Z- Value	.552
Effect Size	.06

A Mann-Whitney U Test revealed no significant difference in the concentration levels between those who did not complete the programme, and those who did complete the programme, following the implementation of the programme, p = .581, with a small effect size (r = .06).

4.11 Descriptive Statistics: MSI Mental Rehearsal Sub-scale

This section presents and analyses the descriptive statistics of the Mental Rehearsal sub-scale of the Mental Skills Inventory.

4.11.1 MSI Mental Rehearsal Descriptive Statistics: Participants who completed the programme

*Table 4. 16: Mental Rehearsal Sub-scale of the MSI Descriptive Statistics: Participants who completed the programme (Pre-test and Post-test)**

				Statistic	Std. Error
Mental Rehearsal (Participant who completed the programme)	Pre-Test	Mean		56.8939	3.22571
		95% Confidence Interval for Mean	Lower Bound	50.4518	
			Upper Bound	63.3361	
		5% Trimmed Mean		57.6347	
		Median		60.0000	
		Variance		686.742	
		Std. Deviation		26.20577	
		Minimum		.00	
		Maximum		100.00	
		Range		100.00	
		Interquartile Range		35.00	
		Skewness		-.441	.295
		Kurtosis		-.364	.582
	Post-Test	Mean		58.4848	3.40021
		95% Confidence Interval for Mean	Lower Bound	51.6942	
			Upper Bound	65.2755	
		5% Trimmed Mean		59.4024	
		Median		60.0000	
		Variance		763.054	
		Std. Deviation		27.62343	
		Minimum		.00	
		Maximum		100.00	
		Range		100.00	
		Interquartile Range		41.25	
		Skewness		-.362	.295
		Kurtosis		-.557	.582

Calculated using 66 participants, 1 participant had incomplete data.

The descriptive analysis of the Mental Rehearsal Sub-scale of the MSI shown above for participants who completed the programme, indicate a pre-test mean of 56.89, and a standard deviation of 26.21. The mean for the post-test is 58.48 and the standard deviation is 27.62.

1.11.2 MSI Mental Rehearsal Descriptive Statistics: Participants who did not complete the programme

*Table 4. 17: Mental Rehearsal Sub-scale of the MSI Descriptive Statistics: Participants who did not complete the programme (Pre-test and Post-test)**

				Statistic	Std. Error
Mental Rehearsal (Participants who did not complete the programme)	Pre-Test	Mean		48.3333	5.59813
		95% Confidence Interval for Mean	Lower Bound	36.8262	
			Upper Bound	59.8404	
		5% Trimmed Mean		48.0761	
		Median		50.0000	
		Variance		846.154	
		Std. Deviation		29.08872	
		Minimum		.00	
		Maximum		100.00	
		Range		100.00	
		Interquartile Range		50.00	
		Skewness		.205	.448
		Kurtosis		-.969	.872
	Post-Test	Mean		42.963	5.6881
		95% Confidence Interval for Mean	Lower Bound	31.271	
			Upper Bound	54.655	
		5% Trimmed Mean		42.325	
		Median		45.000	
		Variance		873.575	
		Std. Deviation		29.5563	
		Minimum		.0	
		Maximum		100.0	
		Range		100.0	
		Interquartile Range		45.0	
		Skewness		.101	.448
		Kurtosis		-1.034	.872

Calculated using 27 participants, 3 participants had incomplete data.

The above descriptive statistics indicate that for participants who did not complete the programme, the pre-test had a mean score of 48.33 and a standard deviation of 29.09. The post-test on the other hand presented a mean score to 42.96, with a standard deviation of 29.56.

4.12 Wilcoxon Signed Rank Test: MSI Mental Rehearsal Sub-scale

A Wilcoxon Signed Rank Test was used to determine whether there were significant differences between the pre-test and post-test scores within both groups. The results are presented in table 4.18 below.

Table 4. 18: Wilcoxon Signed Rank Test: MSI Mental Rehearsal

MSI: Mental Rehearsal (Participants who completed the programme)	Z	-.904
	Asymp. Sig. (2-tailed)	.366
	Effect Size	.11
MSI: Mental Rehearsal (Participants who did not complete the programme)	Z	-1.467
	Asymp. Sig. (2-tailed)	.142
	Effect Size	.28

The Wilcoxon Signed Rank Test revealed no statistically significant increase in mental rehearsal following the stress and anxiety reduction programme, p = .366, with a small effect size (r = .11). No statistically significant increase in concentration was seen for those participants who did not complete the programme either, p = .142, with a medium effect size (r = .28).

4.13 Mann-Whitney U Test: MSI Mental Rehearsal Sub-scale

A Mann-Whitney U Test was used to determine if significant differences occurred between the scores of both groups (those who completed the programme, and those who did not) for the Mental Rehearsal sub-scale of the MSI. Pre-Test and Post Test scores were analysed. The results for the pre-test comparison between groups is presented in table 4.19 below.

Table 4. 19: Mann-Whitney U Test: MSI Mental Rehearsal (Pre-Test)

Total N	93
Mann-Whitney-U	1057.500
Asymptotic Significance	.158
Z- Value	1.412
Effect Size	.15

A Mann-Whitney U Test revealed no significant difference in mental rehearsal between those who did not complete the programme, and those who did complete the programme, prior to the implementation of the programme, p = .158, with a small effect size (r = .15). The results for the post-test comparison between groups are presented in table 4.20 below.

Table 4. 20: Mann-Whitney U Test: MSI Mental Rehearsal (Post-Test)

Total N	93
Mann-Whitney-U	1148.000
Asymptotic Significance	.029
Z- Value	2.180
Effect Size	.23

A Mann-Whitney U Test revealed statistically significant differences in mental rehearsal between those who did not complete the programme, and those who did complete the programme, following the implementation of the programme, p = .029, with a small to medium effect size (r = .23).

4.14 Descriptive Statistics: Perceived Stress Scale

The study makes use of the Perceived Stress Scale (PSS) for the purpose of measuring stress. Stress is one of the core components of this study, as the designed programme intends to reduce the perceived stress experienced by athletes, for the purposes of performance

enhancement. The PSS is a 10-item scale designed to assess the participants' feelings and thoughts over the past month, in order to gauge perceived stress. A comprehensive discussion of the PSS was undertaken in 3.4.1.1. The purpose of this analysis was to determine whether the perceived stress levels of the participants decreased between pre-test and post-test, and by extension whether the programme effectively reduced stress. A total score is calculated for the PSS, and this score is used in the analysis as per the scale developers' recommendation. The PSS is scored by computing a total of the 10-items, a higher score reflects a higher perceived stress level. The scale contains no sub-sets of data, and is scored as one entity. The PSS was the third questionnaire completed by the participants, and the results of the descriptive analysis are presented below.

4.14.1 PSS Descriptive Statistics: Participants who completed the programme

Table 4. 21: PSS Descriptive Statistics: Participants who completed the programme

				Statistic	Std. Error
Perceived Stress Scale (Participants who completed the programme)	Pre-Test	Mean		23.224	.4204
		95% Confidence Interval for Mean	Lower Bound	22.384	
			Upper Bound	24.063	
		5% Trimmed Mean		23.154	
		Median		23.000	
		Variance		11.843	
		Std. Deviation		3.4414	
		Minimum		17.0	
		Maximum		31.0	
		Range		14.0	
		Interquartile Range		4.0	
		Skewness		.204	.293
		Kurtosis		-.271	.578
	Post-Test	Mean		21.642	.4424
		95% Confidence Interval for Mean	Lower Bound	20.759	
			Upper Bound	22.525	
		5% Trimmed Mean		21.757	
		Median		21.000	
		Variance		13.112	
		Std. Deviation		3.6211	
		Minimum		9.0	
		Maximum		30.0	
		Range		21.0	
		Interquartile Range		4.0	
		Skewness		-.634	.293
		Kurtosis		2.168	.578

The descriptive analysis of the PSS shown above for participants who completed the programme, indicated that the pre-test had a mean score of 23.22 and a standard deviation of 3.44. The post-test mean score decreased to 21.64 with a standard deviation of 3.62.

4.14.2 PSS Descriptive Statistics: Participants who did not complete the programme

Table 4. 22: PSS Descriptive Statistics: Participants who did not complete the programme (Pre-test and Post-test)

				Statistic	Std. Error
Perceived Stress Scale (Participants who did not complete the programme)	Pre-Test	Mean		22.5667	.65858
		95% Confidence Interval for Mean	Lower Bound	21.2217	
			Upper Bound	23.9117	
		5% Trimmed Mean		22.4432	
		Median		21.0000	
		Variance		13.446	
		Std. Deviation		3.66682	
		Minimum		16.00	
		Maximum		31.00	
		Range		15.00	
		Interquartile Range		6.00	
		Skewness		.597	.421
		Kurtosis		-.272	.821
	Post-Test	Mean		22.3333	.69921
		95% Confidence Interval for Mean	Lower Bound	20.9054	
			Upper Bound	23.7613	
		5% Trimmed Mean		22.1481	
		Median		22.0000	
		Variance		15.156	
		Std. Deviation		3.89301	
		Minimum		16.00	
		Maximum		32.00	
		Range		16.00	
		Interquartile Range		4.00	
		Skewness		.706	.421
		Kurtosis		.322	.821

The above descriptive statistics for participants who did not complete the programme indicate that for the PSS, the pre-test had a mean of 22.57 and a standard deviation of 3.67. The post-test mean score is 22.33 with a standard deviation of 3.89.

4.15 Wilcoxon Signed Rank Test: PSS

A Wilcoxon Signed Rank Test was used to determine whether there were significant differences between the pre-test and post-test scores within each group for the PSS. The results are presented in table 4.23 below.

Table 4. 23: Wilcoxon Signed Rank Test: Perceived Stress Scale

Perceived Stress Scale (Participants who completed the programme)	Z	-2.861
	Asymp. Sig. (2-tailed)	.004
	Effect Size	.35
Perceived Stress Scale (Participants who did not complete the programme)	Z	-.500
	Asymp. Sig. (2-tailed)	.617
	Effect Size	.09

The Wilcoxon Signed Rank Test revealed a statistically significant decrease in perceived stress following the stress and anxiety reduction programme, p = .004, with a medium effect size (r = .35). No statistically significant decrease in perceived stress was seen for the participants who did not complete the programme, p = .617, with a small effect size (r = .09).

4.16 Mann-Whitney U Test: PSS

A Mann-Whitney U Test was used to determine if significant differences occurred between the scores of both groups (those who completed the programme, and those who did not) for the Perceived Stress Scale. Pre-test and post-test scores were analysed. The results for the pre-test comparison between groups is presented in table 4.24 below.

Table 4. 24: Mann-Whitney U Test: Perceived Stress Scale (Pre-Test)

Total N	97
Mann-Whitney-U	1127.000
Asymptotic Significance	.339
Z- Value	.956
Effect Size	.10

A Mann-Whitney U Test revealed no significant difference in perceived stress between those who did not complete the programme, and those who did complete the programme, prior to the implementation of the programme, p = .339, with a small effect size (r = .10). The results for the post-test comparison between groups is presented in table 4.25 below.

Table 4. 25: Mann-Whitney U Test: Perceived Stress Scale (Post-Test)

Total N	97
Mann-Whitney-U	961.500
Asymptotic Significance	.733
Z- Value	-.341
Effect Size	.03

A Mann-Whitney U Test revealed no significant difference in perceived stress between those who did not complete the programme, and those who did complete the programme, following the implementation of the programme, p = .733, with a small effect size (r = .03).

4.17 Descriptive Statistics: Sport Competition Anxiety Test

The study makes use of two different psychological tests for the purpose of measuring participants' anxiety. Namely, the Sport Competition Anxiety Test (SCAT), and the State-Trait Personality Inventory - Form Y (STPI-Y). The inclusion of both affords a thorough exploration

of anxiety. The Sport Competition Anxiety Test is a 15-item sport-specific measure of competition anxiety. The scale contains close-ended questions and respondents indicate how often they feel a certain way when competing in their sport. A higher score reflects a higher level of competition anxiety. The scale contains no sub-scales and is scored as one entity. The SCAT was the fourth and penultimate questionnaire completed by the participants.

4.17.1 SCAT Descriptive Statistics: Participants who completed the programme

Table 4. 26: SCAT Descriptive Statistics: Participants who completed the programme (Pre-test and Post-test)

				Statistic	Std. Error
Sport Competition Anxiety Test (Participants who completed the programme)	Pre-Test	Mean		22.567	.5456
		95% Confidence Interval for Mean	Lower Bound	21.478	
			Upper Bound	23.657	
		5% Trimmed Mean		22.697	
		Median		23.000	
		Variance		19.946	
		Std. Deviation		4.4661	
		Minimum		12.0	
		Maximum		30.0	
		Range		18.0	
		Interquartile Range		6.0	
		Skewness		-.330	.293
		Kurtosis		-.373	.578
	Post-Test	Mean		21.179	.5484
		95% Confidence Interval for Mean	Lower Bound	20.084	
			Upper Bound	22.274	
		5% Trimmed Mean		21.221	
		Median		21.000	
		Variance		20.149	
		Std. Deviation		4.4888	
		Minimum		10.0	
		Maximum		30.0	
		Range		20.0	
		Interquartile Range		7.0	
		Skewness		-.095	.293
		Kurtosis		-.316	.578

The descriptive analysis of the SCAT shown above for participants who completed the programme, indicate that the pre-test had a mean score of 22.57 with a standard deviation of 4.47. The post-test mean score was 21.18 with a standard deviation of 4.49.

4.17.2 SCAT Descriptive Statistics: Participants who did not complete the programme

Table 4. 27: SCAT Descriptive Statistics: Participants who did not complete the programme (Pre-test and Post-test)

				Statistic	Std. Error
Sport Competition Anxiety Test (Participants who did not complete the programme)	Pre-Test	Mean		22.533	.7059
		95% Confidence Interval for Mean	Lower Bound	21.090	
			Upper Bound	23.977	
		5% Trimmed Mean		22.630	
		Median		23.000	
		Variance		14.947	
		Std. Deviation		3.8662	
		Minimum		12.0	
		Maximum		30.0	
		Range		18.0	
		Interquartile Range		5.0	
		Skewness		-.398	.427
		Kurtosis		.745	.833
	Post-Test	Mean		22.067	.9172
		95% Confidence Interval for Mean	Lower Bound	20.191	
			Upper Bound	23.943	
		5% Trimmed Mean		22.204	
		Median		21.500	
		Variance		25.237	
		Std. Deviation		5.0236	
		Minimum		11.0	
		Maximum		30.0	
		Range		19.0	
		Interquartile Range		6.8	
		Skewness		-.297	.427
		Kurtosis		-.337	.833

The descriptive analysis of the SCAT shown above for participants who did not complete the programme, indicate that there was a pre-test mean score of 22.53 and a standard deviation of 3.87. The post-test mean score was 22.07, with a standard deviation of 5.02.

4.18 Wilcoxon Signed Rank Test: SCAT

A Wilcoxon Signed Rank Test was used to determine whether there were significant differences between the pre-test and post-test scores within each group for the SCAT. The results are presented in table 4.28 below.

Table 4. 28: Wilcoxon Signed Rank Test: SCAT

Sport Competition Anxiety Test (Participants who completed the programme)	Z	-3.341
	Asymp. Sig. (2-tailed)	.001
	Effect Size (r)	.41
Sport Competition Anxiety Test (Participants who did not complete the programme)	Z	-.821
	Asymp. Sig. (2-tailed)	.412
	Effect Size (r)	.15

The Wilcoxon Signed Rank Test revealed a statistically significant decrease in competition anxiety following the stress and anxiety reduction programme for those who completed the programme, p = .004, with a medium to large effect size (r = .41). No statistically significant decrease in competition anxiety was seen for those participants who did not complete the programme, p = .412, with a small effect size (r = .15).

4.19 Mann-Whitney U Test: SCAT

A Mann-Whitney U Test was used to determine if significant differences occurred between the scores of both groups (those who completed the programme, and those who did not) for the SCAT. Pre-Test and Post Test scores were analysed. The results for the pre-test comparison between groups are presented in table 4.29 below.

Table 4. 29: Mann-Whitney U Test: Sport Competition Anxiety Test (Pre-Test)

Total N	97
Mann-Whitney-U	1024.000
Asymptotic Significance	.882
Z- Value	.149
Effect Size	.02

A Mann-Whitney U Test revealed no significant difference in competition anxiety between those who did not complete the programme, and those who did complete the programme, prior to the implementation of the programme, p = .882, with a small effect size (r = .02). The results for the post-test comparison between groups are presented in table 4.30 below.

Table 4. 30: Mann-Whitney U Test: Sport Competition Anxiety Test (Post-Test)

Total N	97
Mann-Whitney-U	885.000
Asymptotic Significance	.348
Z- Value	-.939
Effect Size	.10

A Mann-Whitney U Test revealed no significant difference in competition anxiety between those who did not complete the programme, and those who did complete the programme, following the implementation of the programme, p = .348, with a small effect size (r = .10).

4.20 Descriptive Statistics: STPI-Y State Anxiety Sub-scale

The State-Trait Personality Inventory Form Y (STPI-Y) is an 80-item self-report questionnaire. The scale contains two distinct sections, the state items make up the initial 40 items and the trait items make up the second 40 items. The state items are close-ended statements, and respondents indicate how accurately the statement reflects how they feel at the current moment. The trait items are close-ended statements pertaining to certain feelings, and respondents indicate how frequently they feel a certain way. The scale contains eight sub-scales pertaining to state and trait anxiety, anger, curiosity, and depression. For the purposes of this study, only the state anxiety and trait anxiety sub-scales have relevance, and were subsequently analysed. Both sub-scales are made up of 10 items each, the results of which provides an indication of the level of state or trait anxiety. A higher score indicates higher anxiety. The STPI-Y is the fifth and final questionnaire completed by the participants.

4.20.1 SPTI-Y State Anxiety Descriptive Statistics: Participants who completed the programme

Table 4. 31: STPI-Y State Anxiety Descriptive Statistics: Participants who completed the programme (Pre-test and Post-test)

				Statistic	Std. Error
State Anxiety (Participants who completed the programme)	Pre-Test	Mean		21.493	.9123
		95% Confidence Interval for Mean	Lower Bound	19.671	
			Upper Bound	23.314	
		5% Trimmed Mean		21.153	
		Median		21.000	
		Variance		55.769	
		Std. Deviation		7.4679	
		Minimum		11.0	
		Maximum		40.0	
		Range		29.0	
		Interquartile Range		12.0	
		Skewness		.463	.293
		Kurtosis		-.740	.578
	Post-Test	Mean		19.821	.8348
		95% Confidence Interval for Mean	Lower Bound	18.154	
			Upper Bound	21.488	
		5% Trimmed Mean		19.413	
		Median		18.000	
		Variance		46.695	
		Std. Deviation		6.8334	
		Minimum		10.0	
		Maximum		39.0	
		Range		29.0	
		Interquartile Range		9.0	
		Skewness		1.005	.293
		Kurtosis		.499	.578

The descriptive analysis of the STPI-Y State Anxiety sub-scale shown above for participants who completed the programme, indicate that there was a pre-test mean score of 21.49 with a standard deviation of 7.47. The post-test indicated a mean score of 19.82 with a standard deviation of 6.83.

4.20.2 SPTI-Y State Anxiety Descriptive Statistics: Participants who did not complete the programme

Table 4. 32: STPI-Y State Anxiety Descriptive Statistics: Participants who did not complete the programme (Pre-test and Post-test)

				Statistic	Std. Error
State Anxiety (Participants who did not complete the programme)	Pre-Test	Mean		20.267	1.1172
		95% Confidence Interval for Mean	Lower Bound	17.982	
			Upper Bound	22.552	
		5% Trimmed Mean		20.056	
		Median		19.500	
		Variance		37.444	
		Std. Deviation		6.1191	
		Minimum		11.0	
		Maximum		33.0	
		Range		22.0	
		Interquartile Range		7.5	
		Skewness		.666	.427
		Kurtosis		-.167	.833
	Post-Test	Mean		20.833	.9518
		95% Confidence Interval for Mean	Lower Bound	18.887	
			Upper Bound	22.780	
		5% Trimmed Mean		20.796	
		Median		21.500	
		Variance		27.178	
		Std. Deviation		5.2133	
		Minimum		11.0	
		Maximum		32.0	
		Range		21.0	
		Interquartile Range		6.0	
		Skewness		-.036	.427
		Kurtosis		-.255	.833

The descriptive analysis of the STPI-Y State Anxiety sub-scale shown above for participants who did not complete the programme, indicate that there was a pre-test mean score of 20.27 with a standard deviation of 6.12. The post-test showed a mean score of 20.83 with a standard deviation of 5.21.

4.21 Wilcoxon Signed Rank Test: STPI-Y State Anxiety Sub-scale

A Wilcoxon Signed Rank Test was used to determine whether there were significant differences between the pre-test and post-test scores for each group for the STPI-Y State Anxiety sub-scale. The results are presented in table 4.33 below.

Table 4. 33: Wilcoxon Signed Rank Test: STPI-Y State Anxiety Sub-scale

STPI-Y State Anxiety (Participants who completed the programme)	Z	-1.97
	Asymp. Sig. (2-tailed)	.049
	Effect Size (r)	.24
STPI-Y State Anxiety (Participants who did not complete the programme)	Z	-.509
	Asymp. Sig. (2-tailed)	.613
	Effect Size (r)	.09

The Wilcoxon Signed Rank Test revealed a statistically significant decrease in state anxiety following the stress and anxiety reduction programme for those who completed the programme, p = .049, with a medium effect size (r = .24). No statistically significant decrease in state anxiety was seen for those participants who did not complete the programme, p = .613, with a small effect size (r = .09).

4.22 Mann-Whitney U Test: STPI-Y State Anxiety Sub-scale

A Mann-Whitney U Test was used to determine if significant differences occurred between the scores of both groups (those who completed the programme, and those who did not) for the State Anxiety sub-scale of the STPI-Y. Pre-Test and Post Test scores were analysed. The result for the pre-test comparison between groups is presented in table 4.34 below.

Table 4. 34: Mann-Whitney U Test: STPI-Y State Anxiety (Pre-Test)

Total N	97
Mann-Whitney-U	1074.000
Asymptotic Significance	.590
Z- Value	.539
Effect Size	.05

A Mann-Whitney U Test revealed no significant difference in state anxiety between those who did not complete the programme, and those who did complete the programme, prior to the implementation of the programme, p = .590, with a small effect size (r = .05). The results for the post-test comparison between groups is presented in table 4.35 below.

Table 4. 35: Mann-Whitney U Test: STPI-Y State Anxiety (Post-Test)

Total N	97
Mann-Whitney-U	809.000
Asymptotic Significance	.125
Z- Value	-1.534
Effect Size	.16

A Mann-Whitney U Test revealed no significant difference in state anxiety between those who did not complete the programme, and those who did complete the programme, following the implementation of the programme, p = .125, with a small effect size (r = .16).

4.23 Descriptive Statistics: STPI-Y Trait Anxiety Sub-scale

This section presents and analyses the descriptive statistics of the Trait Anxiety sub-scale of the STPI-Y.

4.23.1 STPI-Y Trait Anxiety Descriptive Statistics: Participants who completed the programme

Table 4. 36: STPI-Y Trait Anxiety Descriptive Statistics: Participants who completed the programme (Pre-test and Post-test)

				Statistic	Std. Error
Trait Anxiety (Participants who completed the programme)	Pre-Test	Mean		22.388	.8039
		95% Confidence Interval for Mean	Lower Bound	20.783	
			Upper Bound	23.993	
		5% Trimmed Mean		22.126	
		Median		22.000	
		Variance		43.302	
		Std. Deviation		6.5804	
		Minimum		11.0	
		Maximum		38.0	
		Range		27.0	
		Interquartile Range		9.0	
		Skewness		.550	.293
		Kurtosis		-.347	.578
	Post-Test	Mean		21.194	.8357
		95% Confidence Interval for Mean	Lower Bound	19.525	
			Upper Bound	22.863	
		5% Trimmed Mean		20.988	
		Median		20.000	
		Variance		46.795	
		Std. Deviation		6.8407	
		Minimum		10.0	
		Maximum		37.0	
		Range		27.0	
		Interquartile Range		10.0	
		Skewness		.424	.293
		Kurtosis		-.474	.578

The descriptive analysis of the STPI-Y Trait Anxiety sub-scale shown above for participants who completed the programme, indicate that there was a pre-test mean score of 22.39 with a standard deviation of 6.58. The post-test showed a mean score of 21.19 with a standard deviation of 6.84.

4.23.2 STPI-Y Trait Anxiety Descriptive Statistics: Participants who did not complete the programme

Table 4. 37: STPI-Y Trait Anxiety Descriptive Statistics: Participants who did not complete the programme (Pre-test and Post-test)

				Statistic	Std. Error
Trait Anxiety (Participants who did not complete the programme)	Pre-Test	Mean		21.167	1.2411
		95% Confidence Interval for Mean	Lower Bound	18.628	
			Upper Bound	23.705	
		5% Trimmed Mean		20.852	
		Median		20.000	
		Variance		46.213	
		Std. Deviation		6.7980	
		Minimum		10.0	
		Maximum		38.0	
		Range		28.0	
		Interquartile Range		10.5	
		Skewness		.685	.427
		Kurtosis		.056	.833
	Post-Test	Mean		22.367	1.1991
		95% Confidence Interval for Mean	Lower Bound	19.914	
			Upper Bound	24.819	
		5% Trimmed Mean		22.148	
		Median		22.500	
		Variance		43.137	
		Std. Deviation		6.5679	
		Minimum		13.0	
		Maximum		36.0	
		Range		23.0	
		Interquartile Range		11.0	
		Skewness		.399	.427
		Kurtosis		-.917	.833

The descriptive analysis of the STPI-Y Trait Anxiety sub-scale shown above for participants who did not complete the programme, indicate that there was a pre-test mean score of 21.17 with a standard deviation of 6.80. The post-test indicated a mean score of 22.37 with a standard deviation of 6.57.

4.24 Wilcoxon Signed Rank Test: STPI-Y Trait Anxiety

A Wilcoxon Signed Rank Test was used to determine whether there were significant differences between the pre-test and post-test scores for each of the groups for the STPI-Y Trait Anxiety sub-scale. The results are presented in table 4.38 below.

Table 4. 38: Wilcoxon Signed Rank Test: STPI-Y Trait Anxiety Sub-scale

STPI-Y Trait Anxiety (Participants who completed the programme)	Z	-1.89
	Asymp. Sig. (2-tailed)	.059
	Effect Size (r)	.23
STPI-Y Trait Anxiety (Participants who did not complete the programme)	Z	-1.48
	Asymp. Sig. (2-tailed)	.139
	Effect Size (r)	.27

The Wilcoxon Signed Rank Test revealed no statistically significant decrease in trait anxiety following the stress and anxiety reduction programme for those who completed the programme, however a practical significance was evident, p = .059, with a medium effect size (r = .23). No statistically significant decrease in trait anxiety was seen for those participants who did not complete the programme, p = .136, with a medium effect size (r = .27).

4.25 Mann-Whitney U Test: STPI-Y Trait Anxiety Sub-scale

A Mann-Whitney U Test was used to determine if significant differences occurred between the scores of both groups (those who completed the programme, and those who did not) for the Trait Anxiety sub-scale of the STPI-Y. Pre-Test and Post Test scores were analysed. The results for the pre-test comparison between groups are presented in table 4.39 below.

Table 4. 39: Mann-Whitney U Test: STPI-Y Trait Anxiety (Pre-Test)

Total N	97
Mann-Whitney-U	1113.500
Asymptotic Significance	.396
Z- Value	.848
Effect Size	.09

A Mann-Whitney U Test revealed no significant difference in trait anxiety between those who did not complete the programme, and those who did complete the programme, prior to the implementation of the programme, p = .396, with a small effect size (r = .09). The results for the post-test comparison between groups is presented in table 4.40 below.

Table 4. 40: Mann-Whitney U Test: STPI-Y Trait Anxiety (Post-Test)

Total N	97
Mann-Whitney-U	903.000
Asymptotic Significance	.425
Z- Value	-.797
Effect Size	.08

A Mann-Whitney U Test revealed no significant difference in trait anxiety between those who did not complete the programme, and those who did complete the programme, following the implementation of the programme, p = .425, with a small effect size (r = .08).

4.26 Conclusion

Chapter 4 provided the results of the statistical analyses of the data collected during the course of the study. Results were sectionalised and each test or applicable sub-scale was analysed individually using descriptive and non-parametric statistics. Results indicate some

positive response to the novel stress and anxiety reduction programme. Statistically significant improvements were seen in dispositional mindfulness, perceived stress, competition anxiety as well as state and trait anxiety for participants who completed the programme. However, arousal control, concentration and mental rehearsal saw no improvement for participants who completed the programme. The participants who did not complete the stress and anxiety reduction programme saw no statistically significant improvement in any of the tests. The results obtained in this chapter will be further reviewed in Chapter 5.

CHAPTER 5: DISCUSSION OF FINDINGS, LIMITATIONS OF STUDY, RECOMMENDATIONS FOR FUTURE RESEARCH AND CONCLUSION

5.1 Introduction

This chapter begins by presenting the discussion and interpretation of the results presented in Chapter 4. The discussion follows the same structure as Chapter 4, and includes analyses and a conceptualisation of the results within the frame of the study objectives and research problem. Following this, the limitations of the current study are discussed, and a list of recommendations for future research is provided. The conclusion provides a summary of the significant findings for this study.

5.2 Discussion of Results

5.2.1 Mindfulness (MAAS)

The dominant point of interest with the MAAS was to investigate whether the novel stress and anxiety reduction programme, and in particular the mindfulness training section of the programme, increased dispositional mindfulness for participants who completed it. It was hypothesised that the participants who completed the programme would report higher levels of dispositional mindfulness following the programme, and those who did not complete the programme would report no change in dispositional mindfulness. The results of the Wilcoxon Signed Rank Test (see Table 4.3) indicated that there was a statistically significant increase in dispositional mindfulness for participants who completed the programme ($p = .043$) with a small to moderate effect size ($r = .20$). This confirms research conducted by Creswell (2017), Brown et al. (2011), and Ramsay (2019), who noted the positive effect mindfulness training can have on adults' dispositional mindfulness. No statistically significant increase in dispositional mindfulness was noted for participants who did not complete the programme ($p = .821$), with an inordinately small effect size ($r = .04$). This result was anticipated, as increasing dispositional mindfulness is an active process, and therefore it was unlikely that those who did not complete the programme would have seen any significant increase (Brown et al., 2015; Kabat-Zinn, 2007; Ramsay, 2019).

In examination of the above it would seem that the stress and anxiety reduction programme provided the participants with sufficient mindfulness training, such that they experienced an increase in dispositional mindfulness from pre-test to post-test. This result was

further corroborated by the fact that the participants who did not complete the stress and anxiety reduction programme saw no increase in dispositional mindfulness.

Hence, in consideration of the effect of the stress and anxiety reduction programme on mindfulness, it is posited that the participants who completed the stress and anxiety reduction programme reported a significant increase in mindfulness following the programme, with a small to moderate effect size. Accordingly, it is judicious to postulate that the stress and anxiety reduction programme increased dispositional mindfulness in athletes.

The final set of analyses conducted for the MAAS was a Mann-Whitney U Test to determine the effect of differences seen between the groups of participants. The test noted no statistically significant differences between groups at pre-test (.514), nor at post-test (.997). While this was not the expected result following the Wilcoxon Signed Rank Test results, the anomaly in the observations is probably a consequence of the differences in sample sizes between the groups. Although the Mann-Whitney U Test typically works fine with unequal sample sizes, it begins to lose statistical power as the groups become more uneven. With one group having less than 50% of the participants of the other group, it is likely that the Mann Whitney U Tests ability to detect a difference that is really there is somewhat diminished (Mann & Whitney, 1947).

5.2.2 Arousal Control (MSI Sub-scale)

One of the three primary areas of interest with regards to mental skills, was to investigate whether the novel stress and anxiety reduction programme increased the athletes' ability to control their arousal caused by athletic competitions. It was hypothesised that the participants who completed the programme would report increased arousal control following the programme, and those who did not complete the programme would report no change in the ability to regulate arousal during competition. The results of the Wilcoxon Signed Rank Test (see table 4.8) indicated that there was no statistically significant increase in arousal control for participants who completed the programme ($p = .502$), with a small effect size ($r = .08$). Likewise, no statistically significant increase in arousal control was noted for participants who did not complete the programme ($p = .618$) with a small effect size ($r = .1$). In essence indicating no change in arousal control for either group. This lack of significance is contradictory to the dominant literature on the topic, which typically suggests that coherent breathing, mindfulness, and visualisation would increase arousal control in the athletes (Creswell, 2017; Edwards et al., 2013; Piepiora et al., 2017; Zaccaro et al., 2018).

The final set of analyses conducted for the Arousal Control Sub-scale of the MSI was a Mann-Whitney U Test to determine whether differences occurred between groups. The test noted no statistically significant differences between groups at pre-test (.725), nor at post-test (.224).

In examination of the above it is noted that the stress and anxiety reduction programme did not impact the arousal control of the participants who completed the programme, neither positively nor negatively. This lack of statistical significance seems to stem from the very nature of the scale. The MSI is designed to assess the mental skills of athletes who are currently competing, and the questions are designed in such a manner that they pertain specifically to scenarios surrounding competition performance. An example of an arousal control question is "Before important contests I am confident that I can handle the pressure". The MSI assesses experiences in competitive sport and provides an inventory of athletes' mental skills pertaining specifically to the competition environment (Wheaton, 1998). The test was included in the early stages of the study, when it was expected that the participants were going to be in competition at the time of testing. However, with the landscape of COVID-19 restrictions, the athletes were forbidden from participating in sporting competitions, and all competitions were cancelled. Therefore, it is posited that the lack of improvement on the Arousal Control Sub-scale of the MSI, may stem from a discrepancy between the intended environment surrounding the testing (competition environment), and the actual environment (no competitions). Although there are few studies making use of the MSI, as a South African instrument, some support for this theory comes in the form of work done by Van Den Heever, Grobbelaar, and Potgieter (2007), where it was noted that the competition environment played a pivotal role in assessing athletes' psychological skills using the MSI. For the most part, it appears that the MSI is predominantly used in a competition setting (Andrew et al., 2007; Kruger, 2010; Van Den Heever et al., 2007). This may be because the validation of the MSI took place in a competition setting (Wheaton, 1998).

Hence, in consideration of the effect of the stress and anxiety reduction programme on arousal control, it is posited that the participants who completed the stress and anxiety reduction programme reported no significant increase in arousal control following the programme, with a small effect size. Accordingly, it is fair to assume that the stress and anxiety reduction programme had little to no effect on arousal control in athletes. This might have been due to the lack of the competition environment, and does not necessarily denote a shortcoming with

the stress and anxiety programme. Therefore, more research is needed to suitably illuminate the matter.

5.2.3 Concentration (MSI Sub-scale)

The second area of interest under the mental skills heading, was to investigate whether the stress and anxiety reduction programme increased the participants' concentration levels during competition. It was hypothesised that, following the programme, the participants who completed the programme would report higher levels of concentration during competition, and those who did not complete the programme would report no changes to concentration levels. The results of the Wilcoxon Signed Rank Test (see table 4.13) indicated that there was no statistically significant increase in concentration for participants who completed the programme ($p = .533$) with a very small effect size (.06). Similarly, no statistically significant increase in concentration was noted for the participants who did not complete the programme ($p = .903$). This result seems to suggest no changes in concentration for either group. This was in contradiction with the expected outcome informed by current literature, as it was noted that concentration and mindfulness share a strong link (Creswell, 2017; Ramsay, 2019), and that visualisation showed continued reputability in increasing athlete concentration (Blakeslee & Goff, 2007; Calmels et al., 2004; Mousavi & Meshkini, 2011).

The final set of analyses conducted for the Concentration Sub-scale of the MSI was a Mann-Whitney U Test to determine whether differences exist between groups. The test noted no statistically significant differences between groups at pre-test (.690), nor at post-test (.581).

Creswell (2017) positions concentration as one of primary virtues of mindfulness, thus it was initially hypothesised that following the programme, concentration would show the same increase as mindfulness, however this was not the case. The reason for this discrepancy is postulated to be that the concentration measurement is a sub-scale of the MSI, and it is also designed specifically for the competition environment. Similarly to the arousal control sub-scale, it is posited that the lack of statistical significance may be attributed to the discrepancy between the intended circumstances surrounding the testing, and the actual circumstances. This result provides further validity to this theory, as the literature would suggest a strong link between concentration and mindfulness (Creswell, 2017; Kabat-Zinn, 2007; Ramsay, 2019). Subsequently, concentration would be expected to increase concurrently with mindfulness. The absence of this link is indicative of a potential confounding aspect, resulting in the discrepancy seen between the two similar virtues.

Hence, in consideration of the effect of the stress and anxiety reduction programme on concentration, it is postulated that the participants who completed the stress and anxiety reduction programme reported no significant increase in concentration following the programme, with a small effect size. In consideration of this, it is postulated that the stress and anxiety reduction programme had little to no effect on the athletes' concentration. This might have been due to the reason presented above, and does not necessarily denote a problem with the stress and anxiety programme. Therefore, more research is needed to suitably illuminate the matter.

5.2.4 Mental Rehearsal (MSI Sub-scale)

The last area of interest pertaining to mental skills, was to investigate whether the stress and anxiety reduction programme would increase athletes' mental rehearsal prior to competition. It was hypothesised that participants who completed the programme would report higher levels of mental rehearsal following the programme, and those who did not complete the programme would report no difference in mental rehearsal from pre-test to post-test. The results of the Wilcoxon Signed Rank Test (see Table 4.18) indicated no statistically significant increase in mental rehearsal for participants who completed the programme ($p = .366$), with a small effect size ($r = .11$). This was in contradiction with the hypothesised outcome, as visualisation training has shown consistent and reliable results in increasing the mental rehearsal of athletes (Murphy et al., 1990; Piepiora et al., 2017; Weinberg & Gould, 2014). The participants who did not complete the programme also saw no statistically significant increase in mental rehearsal ($p = .142$), with a medium effect size ($r = .28$).

The final set of analyses conducted for the Mental Rehearsal Sub-scale of the MSI was a Mann-Whitney U Test to determine whether differences exist between groups. The test noted no statistically significant differences between groups at pre-test (.158). However, at post-test significant differences were noted between groups ($p = .029$), with a small to moderate effect size ($r = .23$).

The results from the previous two MSI sub-scales (arousal control and concentration), designated the importance of a competition environment in assessing the sub-scales of the MSI. The Mental Rehearsal sub-scale attempts to measure mental rehearsal/visualisation. This is a fundamentally competition-based skill, and subsequently is not immune to the same outcome as arousal control and concentration (Munzert et al., 2009; Piepiora et al., 2017). Hall, Rodgers, and Barr (1990) noted that participants typically use visualisation up to twice as often on

competition days and prior to training, and that vividness and effectiveness were significantly higher at times prior to competing and training. In the current study athletes were unable to compete nor train, reducing the effect of the visualisation training. Although significant results were noted in the Mann-Whitney U Test, none were noted in the Wilcoxon Signed Rank Test. It is posited that the differences seen in the Mann-Whitney U Test, was due to a small change that happened in the group of participants that completed the programme. However, this change was not significant from pre-test to post-test.

Hence, in consideration of the effect of the stress and anxiety reduction programme on mental rehearsal, it is postulated that the participants who completed the stress and anxiety reduction programme reported no significant increase in mental rehearsal following the programme, with a small effect size. However slight differences were seen between the groups, indicating a minor change in mental rehearsal of participants who completed the programme. Accordingly, the stress and anxiety reduction programme had a slight impact on the mental rehearsal of athletes, as a minor difference was noted between groups.

5.2.5 Perceived Stress (PSS)

Following mental skills, a palpable area of interest was that of investigating whether the stress and anxiety reduction programme would in fact reduce perceived stress experienced by the athletes. It was hypothesised that the stress and anxiety reduction programme would reduce stress for participants who completed the programme, and that those who did not complete the programme would experience no notable differences in perceived stress. The results of the Wilcoxon Signed Rank Test (see Table 4.23) revealed a statistically significant reduction in perceived stress for the participants that completed the stress and anxiety reduction programme ($p = .004$) with a moderate effect size ($r = .35$). The participants who did not complete the programme, however, saw no statistically significant change in perceived stress levels ($p = .617$) with a small effect size ($r = .09$). This result suggests a decided decrease in perceived stress levels for participants who completed the programme. This supports findings presented in Chapter 2, indicating the positive effect coherent breathing, mindfulness, and visualisation have on stress levels (Creswell, 2017; Edwards et al., 2013; Kuan et al., 2018). Scott et al. (2019) posits breath control as one of the foundational techniques in achieving stress reduction, and it has shown to be one of the most effective techniques in reducing anxiety experienced by athletes (Weinberg & Gould, 2014). This was mirrored in studies that utilised mindfulness techniques, where it was noted that mindfulness offers not only a decrease in

stress, but also a way to strengthen the aspects that are weakened by stress (Creswell, 2017; Kabat-Zinn, 2007; Ramsay, 2019). These results were echoed in the current study, where the techniques of coherent breathing and mindfulness formed foundational portions of the stress and anxiety reduction programme.

The final set of analyses conducted for the PSS was a Mann-Whitney U Test to determine whether differences exist between groups. The test noted no statistically significant differences between groups at pre-test (.339), nor at post-test (.733). The discrepancy in the observations is likely a consequence of the differences in sample sizes between the groups, as discussed in 5.2.1 (Mann & Whitney, 1947). Since the Wilcoxon Signed Rank Test indicated significant findings, more research on the matter, however, is needed.

The results suggest that the stress and anxiety reduction programme provided the participants with sufficient training, such that they experienced a decrease in perceived stress from pre-test to post-test. This result was further corroborated by the fact that the participants who did not complete the stress and anxiety reduction programme saw no decrease in perceived stress. Hence, in consideration of the effect of the stress and anxiety reduction programme on perceived stress, it is posited that the participants who completed the stress and anxiety reduction programme reported a significant decrease in perceived stress following the programme, with a moderate effect size. Accordingly, it is fair to theorize that the stress and anxiety reduction programme decreased perceived stress in athletes.

5.2.6 Competition Anxiety (SCAT)

An area of interest that is of paramount importance in the athletic context, is the investigation into whether the stress and anxiety reduction programme would reduce the competition anxiety experienced by the athletes. It was hypothesised that the stress and anxiety reduction programme would significantly reduce competition anxiety for the participants who completed the programme, and that those who did not complete the programme would report no difference in competition anxiety following the programme. The results of the Wilcoxon Signed Rank Test (see Table 4.28) revealed a statistically significant reduction in competition anxiety following the programme for participants who completed the programme ($p = .001$) with a moderate to large effect size ($r = .41$). While the participants who did not complete the programme saw no significant reduction in competition anxiety ($p = .412$), with a small effect size ($r = .15$). The result purports a notable decrease in competition anxiety for participants who completed the programme. While this was in agreement with the hypothesised outcome

and literature, it is contradictory to the results of the MSI. The SCAT is also a competition-based test, and the MSI was in-fact designed by utilising modified items from the SCAT (Wheaton, 1998). Therefore, if the lack of a competition environment was impacting the results of the MSI, as suggested in 5.2.2, it would seem that the SCAT should be likewise impacted. The discrepancy seen, could be the result of the reduction in state anxiety, as seen below in 5.2.7 (Halvari, 1996). Competition anxiety and state anxiety are inextricably linked together, as the former is fundamentally a derivative of the latter (Martens, 1977). Subsequently, the result of the SCAT for this study may be indicating a reduction in state anxiety, as opposed to a reduction in competition anxiety per se (Martens, 1977). It is theorised that the SCAT, measuring competition anxiety as a function of state anxiety, could be measuring state anxiety alone, in the absence of a competition environment (Martens, 1977; Vealey, 1990).

The results suggest that the stress and anxiety reduction programme provided the participants with sufficient training, such that they experienced a decrease in competition anxiety from pre-test to post-test. This result was further corroborated by the fact that the participants who did not complete the stress and anxiety reduction programme saw no decrease in competition anxiety. Hence, in consideration of the effect of the stress and anxiety reduction programme on competition anxiety, it is assumed that the participants who completed the stress and anxiety reduction programme reported a significant decrease in competition anxiety following the programme, with a large effect size.

The final set of analyses conducted for the SCAT was a Mann-Whitney U Test to determine whether differences exist between groups. The test noted no statistically significant differences between groups at pre-test (.882), nor at post-test (.348). The lack of statistical significance in the observations is likely a consequence of the differences in sample sizes between the groups, as discussed in 5.2.1 (Mann & Whitney, 1947). The significant changes observed in the Wilcoxon Signed Rank Test however, suggests that the stress and anxiety reduction programme decreased competition anxiety in athletes. However as noted above, this reduction may have had other origins, therefore more research is needed to suitably illuminate the matter.

5.2.7 State Anxiety (STPI-Y Sub-scale)

Another pertinent area of interest under the umbrella of anxiety, was to investigate whether the novel stress and anxiety reduction programme reduced state anxiety for athletes. It was hypothesised that the stress and anxiety reduction programme would reduce state anxiety

for participants who completed the programme, and that those who did not complete the programme would experience no notable differences in state anxiety. A Wilcoxon Signed Rank Test (see Table 4.33) revealed a statistically significant reduction in state anxiety for participants who completed the programme ($p = .049$) with a medium effect size ($r = .24$). Participants who did not complete the programme saw no significant decrease in state anxiety ($p = .613$), with a small effect size ($r = .09$). The results suggest that the stress and anxiety reduction programme had a positive effect on the state anxiety of the participants who completed it. This is confirmation of the positive effect of coherent breathing, mindfulness, and visualisation on state anxiety as presented in current literature (Creswell, 2017; Edwards et al., 2013; Ramsay, 2019). Creswell (2017), posited mindfulness as one of the chief components in the reduction of anxiety, when noting that relaxation is not the opposite of anxiety. It was found that while relaxation has shown to help with anxiety, the mind continues to ruminate even while relaxed, this rumination fuels feelings of anxiety (Creswell, 2017). Mindfulness as a technique assists in controlling the thoughts one has in order to prevent rumination, and ultimately lower anxiety (Creswell, 2017; Creswell & Lindsay, 2014). These results were paralleled in the current study. Moreover, this seems to provide validation to the theory presented in 5.2.6 regarding the decrease in anxiety seen, as both the SCAT and State Anxiety Sub-scale of the STPI-Y reported statistically significant decreases in anxiety. This indicates a possible link between state anxiety and competition anxiety that may have caused the SCAT results seen above in the absence of a competition environment (Martens, 1977). However, more research into this is needed.

The results suggest that the stress and anxiety reduction programme provided the participants with sufficient training, such that they experienced a decrease in state anxiety from pre-test to post-test. This result was further corroborated by the fact that the participants who did not complete the stress and anxiety reduction programme saw no decrease in competition anxiety. Hence, in consideration of the effect of the stress and anxiety reduction programme on state anxiety, it is postulated that the participants who completed the stress and anxiety reduction programme reported a significant decrease in state anxiety following the programme, with a moderate effect size. Accordingly, it is fair to assume that the stress and anxiety reduction programme decreased state anxiety in athletes.

The final set of analyses conducted for state anxiety was a Mann-Whitney U Test to determine whether differences exist between groups. The test noted no statistically significant

differences between groups at pre-test (.590), nor at post-test (.125). The lack of statistical significance in the observations is likely a consequence of the differences in sample sizes between the groups, as discussed in 5.2.1 (Mann & Whitney, 1947). Since the Wilcoxon Signed Rank Test indicated significant findings, more research on the matter, however, is needed.

5.2.8 Trait Anxiety (STPI Sub-scale)

The final area of interest, was to investigate whether the stress and anxiety reduction programme reduced trait anxiety for participants who completed it. It was hypothesised that the stress and anxiety reduction programme would have a slightly positive effect on trait anxiety, as traits are relatively stable over time, and that no change would be seen in participants who did not complete the programme. A Wilcoxon Singed Rank Test (see Table 4.38) revealed no statistically significant decrease in trait anxiety for the participants who completed the programme, however a practical significance was noted ($p = .059$), with a small to medium effect size ($r = .23$). No significant difference was noted for participants who did not complete the programme ($p = .139$), with a medium effect size ($r = .27$). This result was corroborated by the work of Mascioli (2014), who noted the significant effect mindfulness has had on reducing trait anxiety in students, as well as Edwards, et al., (2013) who noted the positive effect of breathing techniques on trait anxiety.

The final set of analyses conducted for trait anxiety was a Mann-Whitney U Test to determine whether differences exist between groups. The test noted no statistically significant differences between groups at pre-test (.396), nor at post-test (.425). The observation is likely a consequence of the differences in sample sizes between the groups, as discussed in 5.2.1.

Conceptualising trait anxiety as a fundamentally stable trait within one's personality, is a crucial foundation for accurate interpretation of the results of the trait anxiety sub-scale (Colman, 2015; Spielberger, 1966; Weinberg & Gould, 2014). The changes forecast for trait anxiety at the hypothesis were notably smaller than changes expected to state anxiety, as trait anxiety is significantly less susceptible to fluctuation. With this in mind, a statistically significant reduction in trait anxiety following the programme was profoundly unlikely, given the rigid nature of the construct. However, the practical significance seen, is a clear indication of a reduction in trait anxiety following the programme (Mascioli, 2014). The results suggest that the stress and anxiety reduction programme provided the participants with sufficient training, such that they experienced a slight decrease in trait anxiety from pre-test to post-test.

This result was further corroborated by the fact that the participants who did not complete the stress and anxiety reduction programme saw no decrease in trait anxiety.

Hence, it is posited that the participants who completed the stress and anxiety reduction programme reported a practically significant decrease in trait anxiety following the programme, with a small to moderate effect size. Although not statistically significant, it can still be postulated that the stress and anxiety reduction programme slightly decreased trait anxiety in athletes.

5.3 Limitations of the Study

Research as a process demands malleability and adaptability, as it does not always unfurl in the manner in which it is planned. This is particularly true for research conducted in the wake of a pandemic. Hence certain limitations are germane to the present study, the following is an account of said limitations:

- Firstly, the use of non-probability purposive sampling provides minor compromises to external validity of the study, as the generalisability of the results is limited (Gravetter & Forzano, 2018). While this was by design, as the programme was intended to be tested within an athletic context, it nonetheless impacts the overall generalisability of the study.
- Secondly, a limitation related to group size. At the outset the goal was to obtain all 134 participants to complete the testing and the stress and anxiety reduction programme in person. However, due to COVID-19 restrictions these were moved online, meaning control over completion was tenuous. Subsequently, some participants were removed from analysis, and of those who remained only 67 completed the stress and anxiety reduction programme, and 30 did not. While this provided for a strengthened design, the group size difference of 37 participants was relatively substantial when comparing groups, even in the face of particularly robust statistical analyses. Therefore it would have been preferable to work with similarly sized groups.
- Similarly to the above limitation, it is noteworthy that the groups were not randomly distributed, and therefore not equivalent. These limitations were somewhat mitigated however, by the fact that the comparison between groups was not the primary analysis technique.
- Finally, with regards to the measurement instruments, hindsight revealed that all data was self-reported and subsequently subject to potential sources of bias germane to the

self-report repertoire. This developed as a result of the COVID-19 regulations, as limited access to the sample demanded the use of self-report measures. Although all self-report instruments used in the study have significant track records of validity and reliability, it is nonetheless pertinent to acknowledge the nature of this data collection method, and the possibility of bias.

5.4 Recommendations of Future Research

The findings and limitations of the study elucidated areas of potential for future work, the following is an account of a few that were noted through the process:

- Firstly, adequately addressing the abovementioned limitations will markedly improve future research on this topic. Simply using a larger sample size, equivalent groups for control, and a diverse range of measurement instruments should greatly increase the scientific soundness of results.
- The initial intention of this study was to use a combination of psychological and physiological measurements, as stress and anxiety are psychophysiological in nature. However, COVID-19 restrictions made this infeasible, therefore future work could look to assess the effect of the programme, using a combination of psychological and physiological measurements.
- In terms of the programme itself, future research could explore which sections of the programme participants did/did not complete, and the reasoning for this. Allowing for refinement of the programme to ensure a higher percentage of completions.
- Future work into this topic should aim to evaluate the effects of the novel stress and anxiety reduction programme used here, in comparison with other established techniques and psychological skills training programmes. This could potentially indicate the effectiveness of the programme in comparison to more traditional approaches, which would provide significant value to athletes of all disciplines around the world.
- Additionally, future research could explore the effect of the novel stress and anxiety reduction programme in other contexts (elite athletes, general population) in order to determine its effect on different populations. The sample could also be separated by athletic discipline, to assess whether certain disciplines experience more of a benefit than others.

- The current study was unable to explore the effect of the programme on athletes' athletic performance, as COVID-19 regulations did not allow for athletic competition. Future research could explore the effect of the programme on athletes who are currently competing, and the effect it has on their performance. This would provide a clear indication of the value of such a programme, in a very practical way.

5.5 Conclusion

Chapter 5 presented the discussion and interpretation of the results of the study, as well as the limitations and recommendations stemming from the results.

The aim of this study was to establish a stress and anxiety reduction programme for athletes and to use psychological measurements to evaluate if it was successful or not. In doing so this research has contributed to the growing body of research in the field of sport psychology in South Africa. It has accomplished this through the finding that the novel stress and anxiety reduction programme has had significant effects on the stress and anxiety of athletes to some extent.

The novel stress and anxiety reduction programme identified benefits in three main areas. Firstly, it significantly increased dispositional mindfulness amongst the athletes, showcasing the effectiveness of the mindfulness training. Secondly, the athletes saw a significant decrease in perceived stress as a result of the stress and anxiety reduction programme, indicating the programme's effectiveness at reducing stress. And lastly, meaningful reductions were seen in state anxiety and trait anxiety amongst the athletes, illustrating the effectiveness of the programme on various types of anxiety.

Furthermore, the results are particularly encouraging regarding the potential of the novel stress and anxiety reduction programme in a South African athletics context. In light of the lack of access to professional intervention, the novel stress and anxiety reduction programme presented in this study, offers the possibility to provide athletes with proven, autonomous methods of performance enhancement.

It is therefore proposed that the novel stress and anxiety reduction programme, consisting of coherent breathing, mindfulness, and visualisation, is worthy of consideration by athletes. It has proven to be a viable option for stress and anxiety reduction, and ultimately, athletic performance enhancement.

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APPENDICES

Appendix A: Coherent breathing training programme

A Psychophysiological Study of the Effect of a Stress and Anxiety Reduction Programme in an Athletic Context

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Stress and Anxiety Reduction Intervention Programme

Document 1: Coherent Breathing Training

Day 1 & 2

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Overall Introduction to Coherent Breathing

Coherent breathing has two fundamental aims that underlie the practice, these are:

- To relax the body and mind, and
- To regulate one's breathing rate to about five (5) breaths per minute, by inhaling for six (6) seconds and exhaling for six (6) seconds.

Coherent breathing differs from other breathing techniques in that, when we feel strain, we simply allow the breathing rhythm to go. If at any point it is a strain to maintain the breathing rhythm (six seconds in, six seconds out) then you give up attempting to control the breath and let it do what it needs to in order to maintain the feeling of relaxation. When attempting to perform coherent breathing, this is the most important aspect to keep in mind, overall relaxation comes before adherence to structure.

Step-by-Step Instructions

Step 1:

- Sit with your body in an upright position (you can rest your back on the back of a chair/couch), do not recline more than 45°. The reason for this is that you are attempting to initiate the balance in your autonomic nervous system, with practice you will be able to do this standing up, if you would like.
- Your eyes can be open or closed, whichever you prefer, however if they are open it may be best to pick a spot opposite you and fix your gaze on it.
- This phase is mainly preparation, prepare for your session by stretching out the built up tension from your breathing muscles. Take in a deep breath to stretch your diaphragm, the idea is to try and breathe in to your stomach. Breathe in so deeply that you are completely full and your rib cage starts to push out, you should feel a stretching in the sides of your rib cage and in your diaphragm. Do this three or four times until the diaphragm feels warm.
- You can imagine this much like stretching out your muscles before a game/practice session, it is your warm up for the breathing muscles, this should allow you to breathe deeper and take in more oxygen. Once this is done you should feel the tension in your diaphragm dissipate, and your breathing should deepen straight away.

Step 2:

- Take a moment to release the tension in your body, start at the top and slowly make sure you're not holding any tension, release your jaw, your shoulders and any unnecessary muscle tension.
- Take a moment and relax, clear your head of any thoughts, and just bring focus to your breathing.

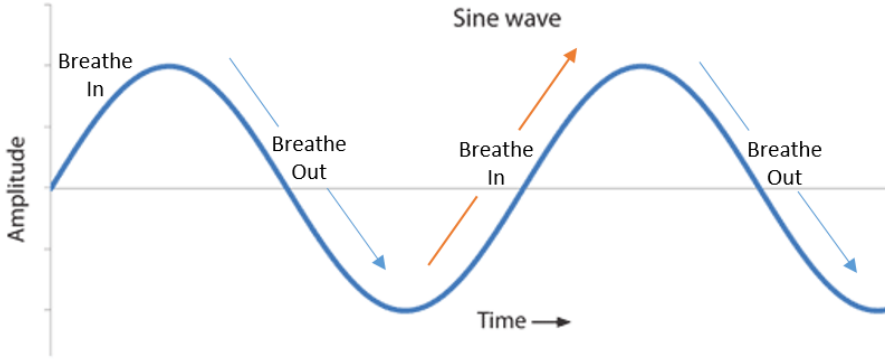
Step 3:

- In order to keep count, there is no problem with counting in your head (it need not be 100% accurate), otherwise a metronome app or clock ticking can help as a pacemaker.
- Inhale deeply, then time your exhale to about 6 seconds. Every person is different so yours may be a bit shorter or longer, that's not a problem, as long as it is deep enough to require a little gentle effort, but to still be relaxed.

- While this is not a deep breathing pattern and you should feel no strain, you should have the sensation that you are breathing into your stomach and using your diaphragm so that your breaths are not shallow.
- When learning coherent breathing, it is perfectly okay if every breath is not 6 seconds at the start. Exhale for 6 seconds, then relax your breathing, then attempt another 6 second exhale followed by a 6 second inhale, then if need be relax your breathing again, do not try to control every breath in the first few minutes, ease into it.
- I can understand if you are impatient to do the whole thing from the beginning, but take your time, the technique will get much easier with practice, and you will get better.

Step 4:

- Make sure that your breathing is not jerky, that you don't force a stop and a start because of time, try to keep it as smooth and gentle as possible, imagine a pendulum going back and forth, or a sine wave, for example:



Step 5:

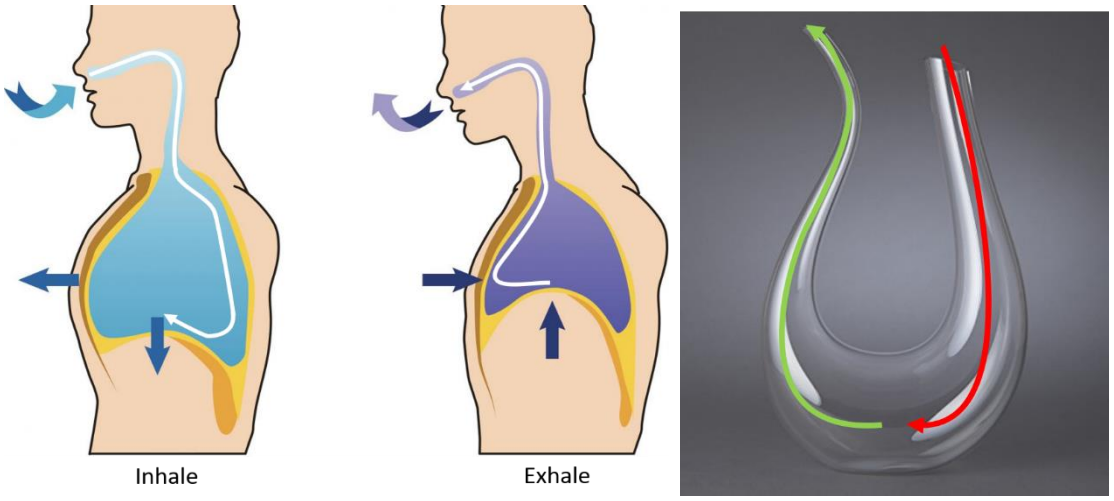
- Continue breathing as above, as you do this imagine physical relaxation spreading throughout your body. One way to do this is to picture your body inflating as you inhale, and then deflating as you exhale, and to picture with every exhale it deflates more than it inflated, so your body feels more and more relaxed.
- While this is one technique, you are welcome to use any technique that works, as long as you can imagine physical relaxation spreading through your body.

Step 6:

- As you breathe, pay attention to the sensation of breathing and your body slowly relaxing. Try and focus on your breathing at this point, while there may be variations

in the timing of your breaths (again this is okay, just focus on relaxation), focus your awareness on how you breathe. While there are a few ways to do this, one that we recommend is to focus your inhale along your spine, inhale along the back of your body, store at the bottom of your lungs, and exhale along your chest.

- This may be difficult to visualise, so the diagrams below should assist you in understanding what to focus on when breathing. One way to visualise it is represented as the wine carafe below, with one opening along the back for inhaling (red arrow), and one opening along the front for exhaling (green arrow), an easy way to initiate this is to inhale through your nose and exhale through your mouth (not essential). You may elect to use this or not, it is only intended to provide one way in which you can make sure your attention is on your breathing.



- Maintain the 6 second breathing pattern, as described above, you can adjust as necessary in order to feel as relaxed as possible.
- What you are looking for in this technique is subtle, you want to feel the most relaxed, and as you get into this you will find your body settling into its own rhythm. This rhythm is a balance in the autonomic nervous system, and is the goal of coherent breathing.

Step 7:

- As you breathe, make concerted effort to add more 6 second exhalations as often as you can, the more you can do this while maintaining relaxation, the closer you will get to the abovementioned rhythm.

- This 6 second period may seem arbitrary, but in fact what you are doing is co-ordinating your exhalation with the parasympathetic phase of your heart rate variability cycle and inducing an effective parasympathetic response. All of this just means we are using this breathing to induce a physiological and psychological relaxation.
- Congratulations! At this point you have effectively learned a therapeutic approach for a healthy stress response.

Step 8:

- So far we have focused mainly on 6 second exhalation, the next step is to start combining the 6 second exhalations with 6 second inhalations. Again, it is not necessary to make every inhalation and exhalation 6 seconds, relaxation is always the first priority.
- The purpose of this step is twofold: (1) To start focussing on inhaling for 6 seconds, and (2) To begin the process of combining 6 second inhales and exhales while maintaining a state of relaxation.
- If you need to, use this step to focus solely on inhaling for 6 seconds, and let your exhale do what it needs, while slowly adding a few 6 second exhales as well.

Step 9:

- Start combining the 6 second inhales with the 6 second exhales, try to get progressively more and more together. You don't have to start by making every inhale and exhale 6 seconds.
- Start with 2/3 6 second inhales and exhales back to back, then let your breathing go as normal, then try get 4/5 together, and so on until you can maintain this pace of breathing continuously.

Additional things to keep in mind:

- Over the next couple weeks as you perform this technique, keep in mind that it may take 10-20 minutes to get to step 9, this is perfectly normal, please take your time and don't feel any pressure. However, as you get better at this you can get to step nine in just a few minutes, and when this happens it becomes a very powerful tool in sport psychology.

- This is not a particularly lengthy technique and can be done while doing other things like working on the computer, cooking, or even while warming up for a game/practice.
- During phases of heightened stress, this technique also strengthens your immune system.
- There are breathing techniques that induce a deep parasympathetic response (deep relaxation), and you can achieve this through the same technique above, but instead each inhalation/exhalation is 15 seconds. This is effective prior to sleep or other times where deep relaxation is needed, but the coherent breathing technique above allows for autonomic nervous system balance, and is thus the best for a sporting situation, as it affords for a healthy stress response, but also improved cognition, decision-making, and focus (among others) and is not solely for relaxation purposes.

Contact Me

If you have **any** questions or concerns, please do not hesitate to contact me, and I will happily clarify them for you. I will avail myself to you as priority number 1 for the period of this study, and following its conclusion.

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Appendix B: Mindfulness training programme

A Psychophysiological Study of the Effect of a Stress and Anxiety Reduction Programme in an Athletic Context

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Stress and Anxiety Reduction Intervention Programme

Document 2: Mindfulness Training

Day 3 & 4

Ryan Tehini

Dr Nicoleen Coetzee

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Overall Introduction to Mindfulness

Those of you who meditate, or do yoga, may have encountered mindfulness in some form or another. Whether you have encountered it or not, it is likely that you have heard of it within some context in conversation or on social media.

While mindfulness is usually attached to meditation practices, therapy, yoga and the like, the intention for this mindfulness training is slightly different. Mindfulness is a powerful tool, and when used correctly can have significant and influential results in a wide sphere of activities. In a sporting context in particular, aspects of mindfulness allow for the growth of performance enhancing virtues. We scoured mindfulness theory and practice, and have hand-picked aspects that pertain particularly to sporting performance enhancement for this training, as such this training focuses on the following aspects:

- Overcoming Distraction;
- Improving focus and concentration;

- Curating selective attention (the ability to tune out noise, and single-mindedly focus in on one selected aspect);
- Outlining a process of self-regulation;
- Tackling adversity; and
- Handling pressure/Utilising pressure to thrive.

These are representative of what this program was tailored around, however you may draw a number of other virtues from this programme, which is fantastic, don't let the above limit you in what you take from this training. I provide these simply because it is important to keep these in mind as we go through the training, because it allows you to understand the purpose of what you are doing, and that we have purposefully designed this for your unique requirements.

We have also designed this programme to integrate into the breathing, and visualisation techniques (to be introduced later). Thus, while they are three, powerful psychological skills, the designed programme integrates them into one, which requires less time, and provides a more sport-available technique that can be done while doing a physical warm-up. These techniques also become more effective with practice, as they cultivate innate virtues that do not need to be actively instigated but become a by-product of the training already done, this allows real-time, in-game advantages without active thought or control.

Step-by-Step Instructions

Step 1:

- Begin by doing the coherent breathing from day 1 & 2. As always, aim for the 6 second inhale and exhale with a priority on overall relaxation, do this for a few minutes to induce subtle relaxation and bring focus to your breath before beginning with the next step.

Step 2:

- Once you have induced a feeling of relaxation with the breathing, set an alarm for 2:30 minutes. Start the clock and just let your mind wander, your breathing can go back to normal, sit up straight at no more than 45°, and just allow your mind to wander as it wants and to whatever it wants for 2:30 minutes.

- Once your time is up, sit for a little bit and just recall what you thought about, think about where your mind went and keeping this is mind, answer these questions:
    - What was I thinking about?
    - Does my mind often go to these topics?
    - How many of these thoughts are the cause of stress for me?
    - How do I feel after those few minutes of uncontrolled thought?
    - How many different topics did I think of?
    - When I think about myself and my sport, is it a positive or negative experience?
- The point of this exercise is to indicate that relaxation is not the opposite of stress and anxiety, that even though the breathing exercise induced relaxation, your thought process could still cause anxiety and stress. What you have just experienced is mindlessness, your thoughts carry so much more weight than you think, and more often than not, they are the exclusive cause of stress and anxiety leading to inhibited sport performance.
- Understanding the feeling of mindlessness indicates the importance of mindfulness in a stress and anxiety reduction programme, as relaxation itself, does not entirely inhibit these two experiences on its own.

Step 3:

- Now that you understand mindlessness, and its role in stress and anxiety through overthinking, it is time to explore mindfulness, its effects and how to successfully practice it.
- Begin by sitting upright, again at no more than a 45° angle. Keep your eyes open and start the breathing again, do this for a few minutes until your breathing is 6 seconds in and 6 seconds out, bring your attention to your breath and start to focus.

Step 4:

- Now close your eyes, we will start with the grounding process, actively start to feel the chair you are sitting on, continue breathing but shift your attention to the feeling of sitting on the chair, focus on the sensation of touch and the feel of sitting in the chair. Then use your hands to touch the chair, again, focus on the touch sensation.
- Now open your eyes, find 5 things you can see, focus on the shapes, the colours, anything you need to focus on in order to keep your attention on the visual targets. This

act of grounding begins the process of self-regulation, I recognise that some of these things may seem arbitrary, but if you just trust the process the end result will be a very strong technique.

- If you are struggling with the above technique: the above can be a difficult process, so if you feel that it is not working for you, try getting a physical anchor (a tattoo, a coin, a photo, jewellery), anything that is a physical reminder of something more, for example a medal that you won after a gruelling tournament, the meaning behind the anchor is more than the physical item itself. Essentially an anchor is anything that means something to you and reminds you of something else, it grounds you, it reminds you of that which it represents, it is a physical reminder of a cognitive construct. Hold this in your hand (if possible) and focus on what the anchor means e.g. in the above example of the medal, think about the tournament and what it took to get the medal. This can be an easier process to do on your own, in the absence of a psychologist for questions.

Step 5:

- Close your eyes again, start breathing, 6 seconds in, 6 seconds out. Now bring your attention to your breath again, continue with this until you feel you are entirely focussed on your breathing.
- As you are breathing, just try to be aware of this present moment, exist simply where you are right now, actively stop thinking about all that exists in the past, and all that belongs to the future. If this is a bit difficult, focussing on your breathing is a nice way to start, and then just venture out little by little, making sure that all your thoughts are about this present moment, avoid anything that has happened, or may happen in the future.
- The following statements may help bring you to the present moment, repeat the ones you find helping you:
  - "I am here", or variations: "I am me", "I exist here"
  - If you are stressed "I may be stressed, it's okay to feel that"
  - "I am more than my thoughts"
- The goal for this is to be able to acknowledge your thoughts, recognise them and observe them, try and see them as an objective third party. Your thoughts are not you,

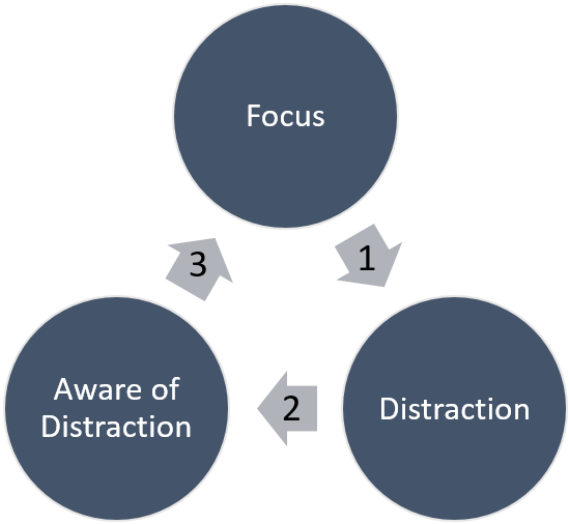
you are more than your thoughts, you have thoughts but they are not you, they are a product of context and conditioning, you are more than your thoughts.

- While doing this, be sure to maintain your breathing.

Step 6:

- While we have laid the foundation, the next step is to begin the training of your mind, like any training (fitness, strength etc.), this can be a tedious process, but the results are impressive, so please try stick with it.
- Begin by returning focus to your breathing, now let yourself think, let your mind go, just like we did in step 1, do this for 1 minute.
- Now once the minute is up, continue to focus on our breathing and try to think of only your breath. When your mind drifts to other topics take notice of it, just gently observe that your mind has wandered off. When this happens do not condemn yourself or get angry that you got distracted (this only makes the anxiety worse), but notice and **gently** guide yourself back to focussing on your breath.
- You can do this for as long as you'd like, but ideally longer than 5 minutes.
- This process is about attempting to focus, objectively observing the distraction/thought that takes away from your focus, and then very gently guiding yourself back to a state of focus, it can be visualised as below:

The Art of Overcoming Distraction



1. This is the passive process of attention wandering off, an automatic process we have all experienced.

2. This is the active process of noticing that your attention has wandered off, you have to actively attempt this and it doesn't happen on its own.

3. This is the process of gently guiding your attention back to focus, do not condemn yourself, notice where your thoughts go and then gently bring your focus back.

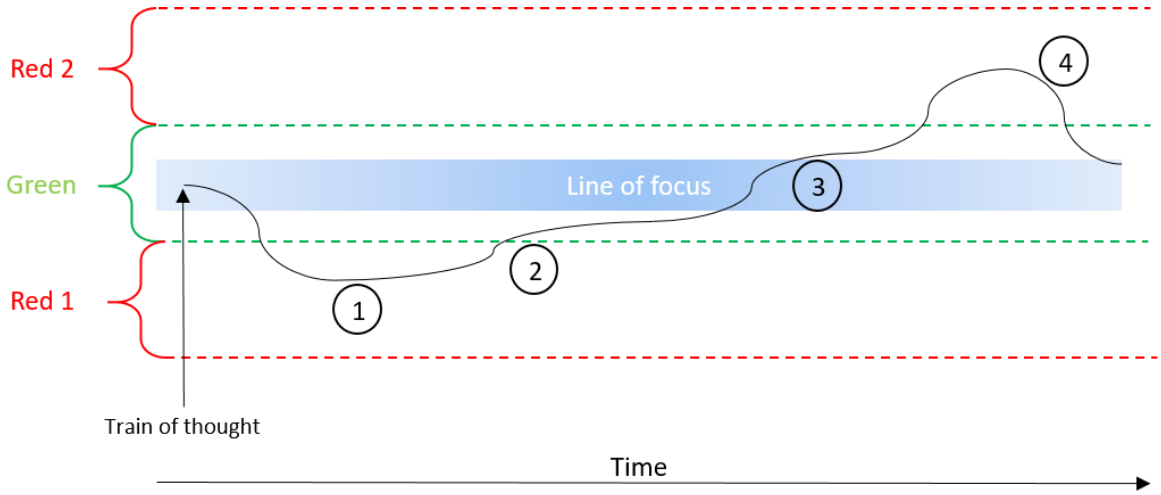
- While this seems like a relatively simple process, it is tricky to implement successfully and very difficult to master. We are training your mind to recognise distraction, and select not to attend to it, subsequently reconditioning your mind to focus remarkably. Grasping this construct leads to strong abilities to selectively attend to information, resulting in increased focus, concentration and reduced performance anxiety.

Step 7:

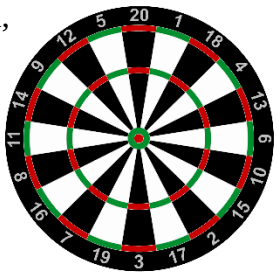
- The final step is to combine the above aspects into a coherent picture of mindfulness, it begins with breathing, 6 seconds in, 6 seconds out. As your breathing becomes more controlled, begin to draw your attention to your breath, you can then let your mind roam to experience mindlessness, or go straight into grounding, and then the focus exercise.
- As it is the most important aspect, I am going to revisit step 6 here from a different angle, in order to provide a clear picture of what you should be doing/thinking.

- The above process of distraction and refocus can also be viewed as a continuum (this is how I like to think of it, I find it to be the least murky, and easiest to visualise), this can be represented as follows:

Continuum of Focus



The line of focus: This area (seen above as the blue section), can be thought of as the ideal place with regards to mindfulness focus, this is where you aim to be, in this section you are focused and not distracted at all, it is where you bring yourself back to when you notice you are getting distracted.



Green area: The area around the line of focus is seen as the green area, it is a place where, although you may not be entirely focused, you are close enough for it not to spiral, and to recover quickly, and it encompasses the line of focus. If you imagine a bullseye on a dartboard, the red bullseye would be the line of focus, while the green bullseye would be the green area above. The green area is representative of the present moment, it is not thoughts about the past or future, but is existing in the present.

Red 1: This area represents an area of thought far away from focus, any form of distraction that is something that comes from the past can be categorised into "Red 1", when you are no longer in the present moment but your thoughts are on something in the past it opens you up to anxiety and stress and it is categorised in this area.

Red 2: This area, exactly like "Red 1" represents an area of thought far away from focus, any form of distraction that comes from concern over the future can be categorised into "Red 2".

You are no longer in the present moment and your thoughts have drifted to concern over the future.

Train of thought: The thin black line above represents where your thoughts go to, it is normal that they will stray from the "Line of focus", but the aim of what we are doing with mindfulness is to keep the "Train of thought" as close to the "Line of focus" as possible. As it strays from focus, we notice it and gently guide it back to the middle.

Practical Examples using the numbers

In order to illustrate the above, I have included numbers on the diagram above that are representative of certain points in time and thought, I will use these to explain what is happening at each point.

Number 1:

The individual has been distracted by something, and their thoughts have gone to something in the past (Red 1).

Number 2:

After noticing that they are not focused and they have been distracted by the past, the individual has gently guided their attention back to the present moment (Green), and eventually back to clear and defined focus (Line of focus).

Number 3:

The individual is focused and within the present moment, not distracted by any thoughts, this is the place we aim to be with Step 6.

Number 4:

The individual has been distracted by thoughts of the future (Red 2), and has noticed, so they begin gently guiding themselves back to a place of focused attention.

Contact Me

If you have **any** questions or concerns, please do not hesitate to contact me, and I will happily clarify them for you. I will avail myself to you as priority number 1 for the period of this study, and following its conclusion.

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Appendix C: Visualisation training programme

A Psychophysiological Study of the Effect of a Stress and Anxiety Reduction Programme in an Athletic Context

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Stress and Anxiety Reduction Intervention Programme

Document 2: Mindfulness Training

Day 3 & 4

Ryan Tehini

Dr Nicoleen Coetzee

Prof Peet Du Toit

A Psychophysiological Study of the Effect of a Stress and Anxiety Reduction Programme in a Sporting Context

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Stress and Anxiety Reduction Intervention Programme

Document 3: Visualisation Training

Day 5 & 6

Ryan Tehini

Dr Nicoleen Coetzee

Prof Peet Du Toit

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Overall Introduction to Visualisation/Mental Imagery

While visualisation seems like a relatively easy undertaking, the successful application of this psychological skill is intricate and the results profound. Used religiously by many Olympic athletes, research has signposted the effectiveness and neuropsychological properties of mental imagery.

The foundational theory behind the designed and tailored visualisation technique that follows, is that of the psychoneuromuscular theory, which posits that vivid and controlled mental imagery leads to the activation of areas of the brain that mimic brain activation during the execution of the sporting activity. Subsequently, the core components of this visualisation technique are going to be that of vividness and control, as with the other techniques, it has been tailored to your specific needs and focuses on the following beneficial aspects:

- Improvement of concentration;
- Regulation of emotional responses;

- Mental training during off-time;
- Competition preparation; and
- Enhancement of problem-solving capabilities.

Its combination with the preceding mindfulness training (and the goals thereof), allows for the ability to successfully integrate external stimuli, that assists in priming the visual and perception system to help athletes effectively attend to relevant and necessary stimuli without distraction, reducing the possibility for mental overload.

Step-by-Step Instructions

Step 1: Vividness Training

This visualisation training begins with exercises designed to enhance vividness, a core component of successful visualisation. When attempting to visualise vividly, it's important to try and incorporate as many senses as possible.

- Imagery preceded by relaxation techniques have proven significantly more effective, this is one of the main reasons that coherent breathing is the common foundation throughout this program. As such, we begin by initiating coherent breathing until you have a comfortable and relaxed rhythm (not entirely necessary to have 6 seconds inhale/exhale perfectly, but if you can then that's great), as long as you feel induced relaxation.
- Following this, we begin with the first exercise:
  Exercise 1: Imagining Home
    - Visualise yourself sitting in your living room on your couch (anywhere in the house that you normally sit would work if you do not have a living room), now see yourself sitting there.
    - Look around and take in all the details, what do you see? Think about the intricacies, what colour? What shape are the table legs? What does the carpet look like? What texture is everything? When you visualise something, think about its shape, texture, colour, etc.
    - As you are sitting, what sounds do you hear? Where are they coming from? What is the temperature of the room like? What do you smell?

    - The most important part of this activity is to try and activate all your senses. Be sure to do this slowly, start with vision, develop a clear image and then move on to the others, vividness relies on an assembly of the senses working together.
- If you are battling with vividness, or you feel comfortable with this exercise and you would like to try something a little bit more challenging (perhaps later on in the weeks of implementation to follow), I have included two more exercises at the end of the document under "Vividness Exercises".
- As with everything, you will notice that the more you do this, the better you get, and as you get better you start to realise the value of what you are doing.

Step 2:

The next step is to practice controllability, stress and anxiety often interfere with the controllability of our thoughts, and subsequently our visualisation may not go the way we want it (we would miss the shot, or make mistakes etc.). While mindfulness assists us with this aspect as well, it is important to incorporate controllability training into our visualisation, this allows for clear and accurate mental imagery, while also incorporating emotional responses.

- We continue by spending a few minutes controlling our breathing again, ensuring an induced feeling of relaxation as close to 6 seconds inhale/exhale as possible.
- Following this, we begin the second exercise:
  Exercise 2: Controlling performance
    - Imagine a netball skill that has given you trouble in the past, taking careful notice of what you do wrong. Now visualise yourself executing this task perfectly, making sure to see and feel all of your movements.
    - As an example I will use shooting, if this is something you battle with, think about how you look when you do it, what your coach has told you to remember, and visualise executing on these instructions, how good it feels to see the ball go through nothing but net, how different it feels compared to normal.
    - Now take this and put yourself in a competitive environment, visualise a tough opponent, your team is tied and you have the ball inside the goal circle. Now see yourself calm and composed, you are capable of doing this, and watch as you sink the shot.
- The above is the starting point, it should give you the foundation that allows the mental visualisation of a situation with emotion, and assist in controlling the emotion. Should

you want more specific exercises, I have compiled an extra two under "Controllability Exercises" at the end of the document that tackle specific situations and more emotional responses. I would recommend doing these at some point during the programme, they should prove highly beneficial.

Step 3:

- As you go forward, you will begin developing your own scenarios for visualisation, in order to get the most out of your visualisation, the scenarios should emphasise the following aspects:
    - The physical movement itself, and the feeling of your body when executing the movement;
    - The specifics of the environment surrounding the action;
    - The timing of the movement should be in real time;
    - The emotion behind the situation (and the individual meaning of the scenario to you); and
    - The perspective of the action, are you doing it or watching yourself do it?
- If you keep these in mind you should have no issue developing your own scenarios to be used when you need them, which I would encourage. If you need some guidelines, please use the exercises presented here to guide you in the development of your own scenarios, it will help for vivid and controlled visualisation.

Tips to Keep in Mind

- It can be beneficial to practice this in different settings (once you are again allowed to), the more it becomes part of your training the more improvements you will see. It can be done in the locker room before a game, on the field, athletes who are highly skilled at visualisation can do it nearly anywhere.
- Like anything, visualisation gets better through systematic practice, but a negative mind-set around it will lead to inhibited results. While I understand the theoretical nature of this act (particularly in the absence of a psychologist), it has an extremely sound grounding in neuroscience, physiology, and psychology.
- It is important to make this process your own, as you get better you will start to like certain aspects and dislike others, it is perfectly okay to develop your own system based off of what you find works for you.

Contact Me

If you have **any** questions or concerns, please do not hesitate to contact me, and I will happily clarify them for you. I will avail myself to you as priority number 1 for the period of this study, and following its conclusion.

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Cell: 073 567 7387

Extra Exercises

Vividness Exercises

Exercise 3: Positive Performance

- Select a particular skill in your sport (shooting, steals, rebounds, etc.), and visualise yourself performing it perfectly. See the opponents, the crowd, and perform the skill over and over in your mind, imagine every feeling and movement in your muscles.
- For example: in shooting the ball, imagine the rough feel of the ball in your hands, the feel of the players around you, imagine your arms going up above your head, see the net and the opponents hand, visualise your knees bending and releasing the ball, now see the ball arc over the opponents and draining through the net.
- The act should be visualised from start to finish, as vividly as possible.

Exercise 4: Positive Performance 2

- Recall as vividly as possible, a time in the past when you performed really well. Try get as clear of a picture as possible, if you need to review films in order to do this it can be a good idea.
- Recall how everything felt, how does your body feel? Do you feel fast? How do your muscles feel?
- Now imagine the sounds when you are playing well, imagine the crowd, but the most important aspect here is to imagine your internal dialogue. What are you saying to yourself? How are you saying it? What is your response when you start to lose?

Controllability Exercises

Exercise 5: Tough Opponent

- Visualise yourself in a game against your toughest opponent, now picture your team executing on a planned strategy laid out by your coach, as you successfully execute this strategy, you start to get the upper hand on your opponent. Picture them getting flustered and frustrated, as you remain calm and composed, and your calmness makes them more frustrated, they make mistakes because of this, and you execute flawlessly because of your teams composure.

- You can individualise this as well if you would like, using shooting or any individual aspect if that makes it more controllable for you.

Exercise 6: Controlling Emotions

- Now visualise yourself in a situation in which you typically lose control of your emotions, tense up, become angry, lose concentration, or lose confidence (this can be missing an important shot, or personally I find this happens mostly for me with a bad call from the referee, that could also work in this situation).
- Now recreate the situation in your head, focusing mainly on the feelings that accompany it, like the anxiety of playing in a tournament final. Then go through it in your head, and as you do so, make use of the breathing and mindfulness techniques, to be aware of your thoughts, and manage the anxiety and stress. Control what you see, hear, and feel. Actively be aware of how it feels, and how you calm yourself down.
- This training leads to control in a number of ways, and is one that I would recommend doing as much as possible, the results become autonomous, and you don't have to think of how to react in a game setting.

Appendix D: Ethics Clearance Certificate

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Humanities 100.
1919 - 2019
Research Ethics Committee

11 December 2019

Dear Mr RCA Tehini

Project Title:	A psycho-physiological study of the effect of a stress and anxiety reduction programme in an athletic setting
Researcher:	Mr RCA Tehini
Supervisor:	Dr N Coetzee
Department:	Psychology
Reference number:	14029252 (HUM019/1119)
Degree:	Masters

I have pleasure in informing you that the above application was **approved** by the Research Ethics Committee on 28 November 2019. Data collection may therefore commence.

Please note that this approval is based on the assumption that the research will be carried out along the lines laid out in the proposal. Should the actual research depart significantly from the proposed research, it will be necessary to apply for a new research approval and ethical clearance.

We wish you success with the project.

Sincerely

Prof Maxi Schoeman
Deputy Dean: Postgraduate and Research Ethics
Faculty of Humanities
UNIVERSITY OF PRETORIA
e-mail: PGHumanities@up.ac.za

Fakulteit Geesteswetenskappe
Lefapha la Bomotho

Research Ethics Committee Members: Prof MME Schoeman (Deputy Dean): Prof KL Harris; Mr A Bizos; Dr L Blokland; Dr K Booyens; Dr A-M de Beer; Ms A dos Santos; Dr R Fasselt; Ms KT Govinder Andrew; Dr E Johnson; Dr W Kelleher; Mr A Mohamed; Dr C Puttergill; Dr D Reyburn; Dr M Soer: Prof E Taliard: Prof V Thebe: Ms B Tsebe: Ms D Mokalaoa