

**COPING AND MOTIVATIONAL STRATEGIES OF NON-ELITE
ENDURANCE ATHLETES UNDER EXTREME
ENVIRONMENTAL CONDITIONS – A SALUTOGENIC
PERSPECTIVE**

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DECLARATION

I, the undersigned, declare that this thesis is my own original work and have not been previously used in full or partially at any other University for degree purposes.

J.W. O' Neil

Date

***“And let us run with perseverance
the race marked out for us”.***

Hebrews 12: 1

***“And we boast in the hope of the glory of God. Not only so,
but we also glory in our sufferings, because we know that
sufferings produces perseverance; perseverance character;
and character hope”.***

Romans 5: 2 – 4

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SUMMARY

The number of South African endurance athletes is increasing yearly. However, very little research has been done on non-elite South African endurance athletes. Due to the length and nature of endurance sport and especially extreme endurance sport, athletes have to employ more self-motivating strategies for longer periods to perform well. One factor that increases athletes' stress levels is the environment within which they are participating. These environments can and usually are very harsh, such as extreme heat or cold. However, the motivational- and coping strategies used by athletes specifically in extreme endurance events have not been studied to a great extent (Weinberg & Gould, 2003).

The aim of this study is to determine the coping- and motivational strategies that non-elite athletes use to overcome environmental factors during endurance events. A qualitative approach was used where 53 non-elite endurance athletes completed a questionnaire and interviews. Through analysis of the data it emerged that environmental factors are perceived to have a physical and mental impact on performance. The perception of this impact differs and can be positive, negative or neutral depending on situational factors. Motivational strategies that are employed during endurance events are the result of two factors: focus of motivation and source of motivation. By combining these two factors, four motivational strategies were identified: positive-internal, positive-external, negative-internal and negative-external of which positive-internal was most frequently used, followed by negative-internal, positive-external and negative-external. Endurance athletes used all three coping strategies that were identified in the literature. The most frequently used strategy was to remove the source of the stress, followed by strategies that changes the athlete's perception of the stressor, and lastly strategies that focuses on the symptoms of the stress.

Endurance athletes perceive themselves able to overcome the challenges of endurance events. However, this ability must constantly be tested by participation in endurance sport or other stressful situations. Previous successful participation in endurance events or other stressful situations leads to an increase in positive self-perception of own abilities, as well as an increase in performance in endurance events.

OPSOMMING

Die getal deelnemers aan uithousport vermeerder jaarliks in Suid-Afrika. Daar is egter betreklik min navorsing gedoen oor Suid-Afrikaanse amateur uithou atlete. Uit die aard van uithousport en spesifiek ekstreme uithousport is dit vir deelnemende atlete noodsaaklik om meer gebruik te maak van selfmotiverende strategieë oor langer tydperke as nie-uithou atlete. Een faktor wat kan lei tot 'n toename in stresvlakke by uithou atlete is omgewingsfaktore soos hitte of koue. Betreklik min navorsing is egter gedoen oor die motivering- en aanpasingsstrategieë wat deur uithou atlete gebruik word spesifiek in ekstreme uithoukompetisies (Weinberg & Gould, 2003).

Die doel van hierdie studie is om te bepaal watter motivering- en aanpasingsstrategieë deur uithou atlete gebruik word in ekstreme uithoukompetisies. 'n Kwalitatiewe benadering is gebruik waar 53 amateur uithou atlete 'n vraelys en onderhoud voltooi het. 'n Analise van die data het getoon dat die persepsie bestaan dat omgewingsfaktore 'n fisiese en psigiese invloed het op atlete tydens uithoukompetisies. Die invloed van elke faktor verskil van situasie tot situasie en kan positief, negatief of neutraal wees. Motiveringstrategieë wat gebruik word is die resultaat van twee faktore, naamlik fokus van motivering en bron van motivering. 'n Kombinasie van die twee faktore lei tot die identifisering van vier motiveringstrategieë naamlik positief-intern, positief-ekstern, negatief-intern en negatief-ekstern. Positief-intern word die meeste gebruik gevolg deur negatief-intern, positief-ekstern en negatief-ekstern. Al drie aanpasingsstrategieë wat in die literatuur geïdentifiseer is, word gebruik deur atlete gedurende uithoukompetisies. Die mees algemene strategie is waar die oorsaak van stres verwyder word, gevolg deur strategieë wat die persepsie van die stres verander en laastens strategieë wat fokus op die simptome van stres.

Voorts beskou uithou atlete hul eie vermoëns voldoende om die uitdagings van uithoukompetisies te oorkom. Hierdie beskouing moet egter voortdurend getoets word deur deel te neem aan uithoukompetisies of soortgelyke stresvolle situasies. Vorige suksesvolle deelname aan uithoukompetisies of soortgelyke stresvolle situasies versterk hul positiewe selfkonsep en lei tot verhoogde prestasies in toekomstige uithoukompetisies.

CHAPTER 1

PROBLEM STATEMENT AND RESEARCH GOAL

“I had to keep gritting my teeth to prevent myself from grinding to a halt. My feet were sore, my legs had seized up and my brain felt fatigued beyond words. I felt sick. More than anything I just wanted to stop and walk for a while. I had entered that phase where psychology was everything. Whatever I decided mentally my body would obey. Although it was incredibly difficult to keep on running, the remaining distance was falling and finishing became an ever-increasing reality. I just had to keep going”.

– Mike Stroud

1.1 INTRODUCTION

“WARNING: ADVENTURE RACING IS A SPORT WHERE YOU MAY BE SERIOUSLY INJURED OR DIE”.

This preface to Mann and Schaad’s book *The Complete Guide to Adventure Racing* (2001) would normally be enough to warn most sane and normal people to stay away from this sport. However, a close analysis of most endurance sport disciplines would reveal the same sobering fact – endurance sport is a sport where you may be seriously injured or killed. However, it seems as if a large section of the South African population are neither normal nor sane, whatever that means, since the number of South African endurance athletes are increasing yearly.

One only needs to look at the increase in endurance events as well as the increasing number of participants in events such as the Comrades Marathon, Pick and Pay Cape Argus Cycling Challenge, Pick and Pay 94.7 Cycling Challenge, Pick and Pay OFM Cycling Challenge, Pick and Pay CANSA Cycling Challenge etc. to see this.

Compared to sport disciplines such as rugby or cricket, endurance sport disciplines such as cycling, mountain biking, adventure racing, mountaineering, canoeing/kayaking or marathon running are not very rewarding in monetary terms. In

fact, the majority of participants can expect no monetary reward and their continued participation is an expensive luxury. The physical and mental challenges of endurance sport are extreme and demand a lot of preparation, sometimes months and years of preparation for one event. Once the event starts, the athletes have to overcome extreme challenges to the body as well as their mind just to finish. The levels of pain and discomfort as well as risk of injury or even death would discourage less motivated athletes. Yet, despite all these obstacles, thousands of South Africans are yearly willing to prepare for, pay for and participate in endurance events. The question that begs to be answered is why thousands of non-elite or non-professional athletes are willing to do this.

When one considers all the comforts, conveniences and numerous indulgences that the technological advances of our modern society offers, why do people feel the need to expose themselves to the hardships of endurance sport and are actually willing to pay for this hardship? Some of the most obvious answers are to increase their health or to be in nature. However, these answers seem to be too neat and obvious. It would be much more convenient, comfortable and cheaper to join the closest gym or fitness group. If you really want to be in nature a comfortable way would be to get in your car and visit the closest nature reserve. People are not by nature made to live in comfort. This can be seen by the number of illnesses that plague modern society. People were made with the ability and need to be physically active. Not only do people have the potential and need to be physically active, but they need to test this ability.

People have a need to place themselves in situations of risk, where they must use their own skill and resources to survive and overcome the challenges to achieve success. People need to take risks for what are achievements without risks – mere formalities. However, our modern society offers few opportunities for physical challenges or situations where people need to test themselves physically and mentally. These situations or adventures are what give meaning to people on this level. Of course there are different levels on which individuals can give meaning to their lives and many types of adventures that can lead to fulfillment. However, people still need to have physical adventures where the overcoming of challenges lead to a merger of physical, emotional and spiritual facets. This need for physical adventure and challenges might be what motivates thousands of people in South Africa and millions of people worldwide to participate in endurance sport. Endurance sport provides people with the opportunity to test their physical and mental abilities to see if

they have what it takes to achieve success. This is best illustrated by the following quote by Bob Gries owner of NFL (Williamson, 2003):

*“To venture into the unknown,
To search for your maximum potential,
To achieve the impossible or highly improbable is life’s greatest satisfaction,
It takes intense preparation, total dedication and the risk of failure.
If you have paid the price and give 100%, you’re a WINNER.”*

Therefore, it seems as if participation in endurance sport is an adventure into the unknown where participants venture into the unknown of themselves to discover their own abilities and potential. However, very little research has been done on the psychological dimension of endurance sport (Campen & Roberts, 2001). Very little is known about the motivations for people to start or continue participation in endurance sport. Very little is known about the perceived stressors involved in endurance sport. Very little is known about the strategies that athletes employ to cope with the stressors of endurance events or the strategies that they employ to motivate themselves to cope with the stressors (Campen & Roberts, 2001; Weinberg & Gould, 2003).

The aim of this study is to determine some of the psychological aspects of endurance sport. This study will be an explorative study that focuses on the stressors involved in endurance events, the motivations to start and continue participation in endurance events as well as the motivational and coping strategies employed by endurance athletes during endurance events to overcome the extreme conditions.

1.2 PROBLEM STATEMENT

People seem to have the need to take risks and to fulfil an internal need to overcome enormous physical and mental challenges. This is seen in the growth of extreme/endurance sports such as triathlons, cycling and adventure racing. Endurance sport, as opposed to non-endurance events, has differences not only in the technical aspects of the sport but also in the type of challenges that is involved. In non-endurance sport such as athletics, rugby and soccer events usually take place in front of crowds or spectators. Apart from the stress induced by the athlete on himself, this is a factor that increases the level of stress experienced by the athlete(s). Due to the length and nature of endurance sport and especially extreme endurance sport it

is seldom that the athletes compete in front of spectators. Logically, this should decrease their levels of stress. However, this stress can also help to motivate athletes of non-endurance events (Jones & Hardy, 1990; Cox, 2002; Weinberg & Gould, 2003). Athletes in endurance sport therefore have to employ more self-motivating strategies for longer periods to perform well. One factor that increases endurance athletes' levels of stress is the environment within which they are participating. These environments can and usually are very harsh, such as extreme heat, cold, the distance involved etc. The influence of these factors has been studied extensively from a physiological perspective and is not the aim of this study. The psychological stresses that these factors place on athletes have also been studied, although less extensively than the physiological stresses.

However, the motivational and coping strategies used by endurance athletes specifically in extreme endurance events have not been studied to a great extent (Weinberg & Gould, 2003). Furthermore, very little research has been done on the reasons, the motivation, for individuals to participate in sports events that have the unique set of physical and mental challenges of endurance events. What research that has been done was mostly on elite athletes. However, the motivation for non-elite endurance athletes to participate has been neglected.

The aim of this study is therefore to determine what type of influence environmental conditions or stressors have on non-elite athletes' performance, and the motivational and coping strategies used to control this. A study of the adaptation of endurance athletes to the challenges of endurance sport from the Salutogenic approach would focus on WHY athletes successfully adapt to the challenges as well as HOW they successfully adapt to the challenges of endurance sport. The aim of this study is therefore to determine what type of influence environmental conditions or stressors have on athlete's performance, and the motivational and coping strategies used to control this. An important part of this study would be to focus on the coping and motivational strategies that are used by non-elite athletes to cope with the challenges of endurance races. Furthermore, in this study the focus would also be on the determination of some of the sources of coping strategies and how this motivates individual athletes to seek out challenging situations (endurance sport) that places them in a state of tension. The stressors that create this state of tension will also be identified as well as how the individual's sense of coherence translate these situations into meaningful and coherent life experiences.

1.3 RESEARCH QUESTION

To determine the coping and motivational strategies that endurance athletes use to overcome physical and mental challenges.

1.4 RESEARCH OBJECTIVES

In answering this question, the following aspects of endurance events will be described as it comes forth in the data:

- What are the physical and mental environmental stressors experienced by endurance athletes in endurance events?
- What coping strategies do endurance athletes use to overcome physical and mental challenges associated with endurance events?
- What strategies do endurance athletes use to motivate themselves to overcome physical and mental challenges associated with endurance events?
- What are endurance athletes' attitudes towards and perceptions of challenges encountered in endurance events?
- What are endurance athletes' self-perception of their ability to overcome the challenges of endurance events?

1.5 CONCEPTUALISATION

In this section, a few of the key terms used in this study will be defined.

ENDURANCE EVENTS: Those sport events where the distance, time and the level of aerobic fitness/intensity requirements for successful completion are considerably higher than when compared to other sport events.

EXPERIENCED NON-ELITE ENDURANCE ATHLETES: Experienced non-elite endurance athletes are people who have participated in at least four endurance events (marathons – 21.1km+, cycling – 50km+, mountain biking – 35km+,

canoeing/kayaking – 30km+, backpacking – 30km+, adventure racing – 50km+, Iron Man etc.), two in the last year without being a professional athlete (non-paid).

SALUTOGENIS: A theoretical approach that attempts to identify the reasons why people do not become ill or how healthy systems are able to stay healthy despite similar stressors than systems that do become disrupted.

SENSE OF COHERENCE (SOC): SOC is in essence a life philosophy or an attitude that perceives life and problems or challenges in a positive light. It is furthermore an attitude or belief in the individual's own ability to overcome most problems by means of understanding of problems and the mobilization of the correct coping strategies.

STRESS: The internal psychological tension caused by internal and external stressors that changes or are perceived to change the nature of the present and/or future situation to such an extent that it forces the individual to adapt by means of physiological and psychological responses.

STRESSORS: Are any physical, psychological or environmental factor that changes or are perceived to change the nature of the present and/or future situation to cause internal psychological tension to such an extent that it forces the individual to adapt by means of physiological, psychological or behavioural responses.

COPING STRATEGIES: Those strategies (cognitive, emotional, behavioural and social) that individuals use to successfully adapt to stressors or adversity in their present or future situations and thereby continue to function at the same or better level of functioning/performance than before the adverse or stressful situation.

ACTIVE COPING STRATEGIES: Active coping strategies are conscious, rational learned behavioural, emotional, cognitive or social responses used to minimize the effect of or the sources of stress and anxiety.

MOTIVATION: Motivation is the (conscious or unconscious) internal tension due to several factors (such as drives, needs and learned behaviour) that impels the individual into action and determines the intensity and duration of this action to relieve this tension.

MOTIVATIONAL STRATEGIES: Motivational strategies are those methods and techniques that athletes use before and during endurance races to motivate them to achieve their own objectives.

1.6 CHAPTER OUTLINE

This study consists of nine (9) chapters excluding the list of references and appendix A and B. The nine chapters are the following:

CHAPTER 1: PROBLEM STATEMENT AND RESEARCH GOAL. In this chapter a basic introduction of the study and problem statement is given to familiarise the reader to the background of the study. Included in this are short definitions of the key concepts used throughout the study.

CHAPTER 2: THEORETICAL APPROACH OF STUDY. The aim of this chapter is twofold: Firstly, to give a brief overview of the basic aspects of the Salutogenic perspectives. The second aim is to provide a brief discussion of the application of the Salutogenic Model to endurance sport.

CHAPTER 3: EXTREME CONDITIONS IN ENDURANCE SPORT. This chapter forms part of the literature study and focuses on the extreme conditions found in endurance sport, the relationship between stress, arousal and performance and how extreme conditions influence performance in endurance events.

CHAPTER 4: COPING STRATEGIES. In this chapter coping and coping strategies are defined, theoretical approaches to coping are explored and coping strategies in endurance sport are discussed.

CHAPTER 5: MOTIVATIONAL STRATEGIES. In this chapter motivation and motivational strategies are defined, theoretical approaches to motivation are explored and motivational strategies in endurance sport are discussed.

CHAPTER 6: METHODOLOGY. The aim of this chapter is to discuss the methodology used in this study in detail. This includes the methodology used to gather the data as well as the analysis thereof.

CHAPTER 7: RESULTS. In this chapter the results of the study are discussed in detail. In this chapter the different levels of analysis as well as the graphic representation thereof are given.

CHAPTER 8: DISCUSSION OF RESULTS. This chapter critically discusses the results of the study and compares these with other research findings from similar studies.

CHAPTER 9: LIMITATIONS, RECOMMENDATIONS AND PRACTICAL APPLICATIONS OF RESULTS.

The aim of this chapter is to critically evaluate the limitations of the study. Furthermore, this chapter makes recommendations in terms of future research as well as the practical uses of the study's findings.

CHAPTER 2

THEORETICAL PERSPECTIVES

“When we try to pick up anything by itself we find it is attached to everything in the universe”.

- John Muir (Scrivener, 1990)

2.1 INTRODUCTION

According to Denzin and Lincoln (2000:19) "all research is interpretative; it is guided by a set of beliefs and feelings about the world, and how it should be understood and studied". The beliefs and feelings about the world shape how the researcher sees the world and acts on it. Thus, the theoretical approach the researcher follows has two interlined functions. In the first place it functions as the lenses through which the researcher sees the world. It is the basic ontological point of departure that shapes the way in which the researcher sees and evaluates reality. The second function of a theoretical approach is to shape the way in which the researcher can make this reality known to others. In other words, it answers the epistemological question of what the relationship between the knower and what is to be known is, as well as the methodological question of what methods and strategies can be employed to make reality known to others.

Therefore, the second aim of this chapter is to be an explanatory guide to the reader on how this study is compiled and the literature study was done. This study focuses on two major areas of which the first is the stressors and motivation for participation in endurance sport. The second area is the motivational and coping strategies used by endurance athletes to overcome these stressors during extreme conditions. The latter part of the study is based in the basic assumptions of the Salutogenic theory. The aim of this chapter is twofold: Firstly, to give a brief overview of the basic aspects of the Salutogenic perspectives. The second aim is to provide a brief discussion of the application of the Salutogenic Model to endurance sport.

2.2 SALUTOGENIC THEORY

2.2.1 INTRODUCTION

For many years, the basic theoretical assumption from which psychologists, social workers, medical sociologists and other related medical professionals approached basic research and applied their professions was to identify the source or cause of illness or disease (Antonovsky, 1991; Murray, 1996; Lena & Bengt, 1998; Van Breda, 2001; Kent, 2002; Kent, 2005). This approach is called Pathogenesis (from the Latin; *Patho* means illness or disease and *Genesis* means origin). By finding the source or cause of the illness it could be treated and/or prevented. Therefore, the basic assumption is that people normally function in a status or condition of health until some disorder disrupts the healthy system causing disease. Pathogenic research and practice therefore focus on the identification, cure and prevention or avoidance of disruptions to the healthy system (Murray, 1996; Lena & Bengt, 1998; Van Breda, 2001; Kent, 2002; Kent, 2005). However, in 1978, a medical sociologist called Aaron Antonovsky coined a term Salutogenesis, a basic assumption that approaches the study of health and healthy living from a different angle (Antonovsky, 1991; Murray, 1996; Lena & Bengt, 1998; Van Breda, 2001; Kent, 2002; Kent, 2005). Salutogenesis can also be related to the Latin meaning; where *Salus* is translated to mean health and *genesis* to mean origin. Therefore, Salutogenesis is the study of the origin of health.

2.2.2 SALUTOGENESIS

According to Antonovsky (1991), health should not only be studied from the pathogenic approach where the source of the illness is identified. Salutogenesis attempts to identify the reasons why people do not become ill or how healthy systems are able to stay healthy despite similar stressors than systems that do become disrupted. According to Antonovsky and others (Antonovsky, 1991; Murray, 1996; Lena & Bengt, 1998; Van Breda, 2001; Kent, 2002; Kent, 2005), the Salutogenic approach has six primary assumptions:

- **Health as a continuum:** In contrast to the pathogenic approach, people are not categorised as either healthy or diseased. According to Salutogenesis, people are on a continuum between two poles of ease and disease. People closer to the disease pole would require more psycho-medical interventions but the aim of

Salutogenesis is not to determine why the individual is closer to the disease pole than the ease pole but rather why and how the person is moving towards the ease pole.

- **Broad focus on health:** Whereas Pathogenesis focuses exclusively on the specific disease or illness as well as the specific cure or remedy for that specific disease, Salutogenesis focuses on the broader general factors that would promote the movement towards health in general irrespective of the specific disease experienced by the individual.
- **Health causation:** The basic approach of Salutogenesis is to focus and identify the origins of healthy behaviour and systems. This is in contrast to Pathogenesis that attempts to identify the causes of disease. Therefore, Salutogenesis focuses rather on the reasons why people are and stay healthy rather than on the reasons why people contract diseases.
- **Stressors can be good:** Salutogenesis do not deny the possible negative consequences of stress but posits that stress can also have healthy consequences. This is especially true when the successful overcoming of challenges leads to the development of better self-knowledge, confidence and coping-skills. Stress is an unavoidable part of life and the focus should not be on the avoidance or eradication thereof, but rather on the development of coping mechanisms that will enable the individual to use stress to his or her own advantage.
- **Struggle for adaptation:** The Salutogenic approach recognises and acknowledges the limited success achieved in the struggle against diseases as well as the search for a disease free environment. Although this struggle is in no way unimportant or belittled, Salutogenesis focuses on the overall problem of adaptation as well as sources of successful adaptation. In other words, although the search for a disease free society is important, it is of equal importance to answer the questions why and how people actually adapt to diseased environments and still perform well, as well as to identify the sources of adaptation.
- **Deviant cases:** Salutogenesis posits that humans are by virtue of our own physiological, psychological and social make-up as well as the environment in

which we live a high-risk group. Due to the demands of our society it is no wonder that a disease free society is an utopian dream. However, there are those deviant cases (frequently in the majority) that can and do overcome the various physical and mental demands and challenges of daily life and that actually thrive despite these challenges. Salutogenesis is interested in these “deviant” cases and focuses on the strategies, methods and mechanisms whereby they are able to overcome challenges.

Therefore, Salutogenesis does not attempt to replace the pathogenic approach but rather to develop parallel to it. Salutogenesis is a theoretical approach that focuses on more than just physical health. Salutogenesis, as defined by Antonovsky (1991), is a theoretical approach that focuses on the total holistic system’s ability to be healthy and able to adapt successfully to the demands of an often hostile environment. It therefore is the study of physical, emotional, psychological and social adaptation within a hostile environment.

2.3 SALUTOGENIC THEORY AND ADAPTATION OF ENDURANCE ATHLETES TO THE CHALLENGES OF ENDURANCE SPORT

A study of the adaptation of endurance athletes to the challenges of endurance sport from the Salutogenic approach would focus on why athletes successfully adapt to the challenges as well as how they successfully adapt to the challenges of endurance sport. Another question that should be answered is how their successful participation in endurance sport influences their general well-being and health. An important part of this study would be to focus on the coping and motivational strategies that are used by non-elite athletes to cope with the challenges of endurance races. Furthermore, in this study the focus would also be on the determination of some of the sources of coping strategies and how this motivates individual athletes to seek out challenging situations (endurance sport) that places them in a state of tension. The stressors that create this state of tension will also be identified as well as how the individual’s sense of coherence translate these situations into meaningful and coherent life experiences.

2.4 CONCLUSION

The aim of this chapter was twofold. Firstly, to discuss the basic ontological point of departure that underlies this study and secondly, to briefly explain how this approach would shape this study. The basic theoretical approach that will be used in this study is that of the Salutogenic Model of Health. Salutogenesis and the Salutogenic approach have a philosophy that concepts and research should be done to determine why systems or individuals remain healthy despite an unhealthy environment. This is better understood when it is remembered that most traditional research or Pathogenesis approach concepts and research with a philosophy that to understand health, research should focus on the reasons why systems and individuals become ill. Therefore, the basic approach of this study and the researcher will not be to determine the reasons why endurance athletes cannot cope with the stressors of endurance sport, but rather to determine why endurance athletes want to place themselves in these situations and how they cope with stressful environments. This approach will be used to determine the theories of motivation and coping that will be used in this study as well as the way in which all data will be analysed. In the next chapter endurance sport as well as the conditions related to endurance sport will be discussed.

CHAPTER 3

EXTREME CONDITIONS IN ENDURANCE SPORT

“I believe that most of us have an astonishing natural strength that includes the ability to walk and run considerable distances every day, and we also have the capacity to survive in conditions that are scarcely imaginable”. – Mike Stroud

3.1 INTRODUCTION

The aim of this chapter is twofold. Firstly, to give a broad overview of extreme conditions in general and extreme conditions in endurance sport. This will be done to give the reader a clear understanding of what extreme conditions in endurance sport are as well as the differences between “normal” endurance conditions and extreme endurance conditions. In this chapter both concepts will be defined as well as the conditions that constitute extreme conditions. The second aim of this chapter is to discuss the extreme conditions of the specific group that participated in this study as well as the psychological effect that these specific environmental factors have on this specific group. This is done to give the reader a clear and specific understanding of the factors that constitute extreme conditions for this specific group. Furthermore, the psychological influence of these environmental conditions will be discussed to highlight the important influence on performance that these environmental factors have.

3.2 DEFINING KEY CONCEPTS

Since the first marathon in ancient Greece, people seem to have the urge to prove their physical and mental abilities by pushing themselves to go faster, further and higher. In fact, this is a condition seen not only in sport, but also in most facets of human civilization. If humans did not have this capacity, we, if we survived, would probably still be living in caves. Fortunately, people are created and programmed with the capacity to adapt to and overcome obstacles and challenges. However, it is only in the last 150 years that people have been starting to participate in endurance events just for the enjoyment of the event itself. It is only in the last 40 years that endurance events such as marathon running, cycling, to name a few, have become commonplace events accessible to the general population (Stroud, 1998). The

growth of extreme/endurance sports such as triathlons, cycling and adventure racing, may highlight the need to take risks and to fulfill an internal need to overcome enormous physical and mental challenges some people seem to have. Endurance sport, as opposed to non-endurance events, has differences not only in the technical aspects of the sport but also in the type of challenges that are involved. In non-endurance sport such as athletics, rugby and soccer the events usually take place in front of crowds or spectators. Apart from the stress induced by the athlete on himself, this is a factor that increases the level of stress experienced by the athlete(s). Due to the length and nature of endurance sport and especially extreme endurance sport, it is seldom that the athletes compete in front of spectators. Logically, this should decrease their levels of stress. However, this stress can also help to motivate athletes of non-endurance events (Jones & Hardy, 1990). Athletes in endurance sport therefore have to employ more self-motivating strategies for longer periods to perform well.

One factor that increases endurance athletes' levels of stress is the environment within which they participate. Owing to factors such as extreme heat, cold, the distance involved, these environments may be and usually are very harsh. The influence of these factors on endurance athletes has been studied extensively from a physiological perspective. This can be seen in the numerous examples of studies conducted such as Creagh, Reilly and Nevill (1998) on female "off road" runners, Laursen and Rhodes (2001) on factors affecting performance in an ultra endurance triathlon and Ainslie, Campbell, Frayn, Humphreys, MacLaren, Reilly and Westerterp (2002) on energy balance, metabolism, hydration and performance during strenuous hill walking. Although some studies have been conducted to identify the psychological stress environmental factors create in endurance events (Bolmont, Thullier & Abraini, 2000; Lane, Terry, Stevens, Barney & Dinsdale, 2004), this has been studied less extensively than the physiological stresses. The motivational and coping strategies used by endurance athletes specifically in endurance events under extreme conditions have also not been studied to a great extent (Campen & Roberts, 2001; Weinberg & Gould, 2003).

The aim of this study is therefore to determine what type of influence environmental conditions or stressors have on non-elite athletes' performance as well as the motivational-and-coping strategies used to control this. It is therefore important to know what stress is as well as the influence of stress in sport on performance with the emphasis on its effects on performance and arousal. The remainder of this

chapter will focus on the conceptualisation of endurance sport, what the environmental conditions present in endurance events are and how it influences performance.

3.2.1 STRESS IN SPORT

Stress is a term that is widely used in everyday conversations as well as academic circles. In psychology and sport psychology this term is widely used and researched. However, due to the fact that stress is often used interchangeably with terms such as resilience, anxiety and arousal, some confusion exists about the meaning of the term as these terms distinguish between related factors that are closely linked but are not the same. According to Jones and Hardy (1990), Cox (2002), O' Neil (2002) Potgieter (2003) and Weinberg and Gould (2003), a distinction should be made between the terms stress, fear, anxiety and arousal. To fully understand the relationships it is necessary to clarify any confusion between the terms and give clearly defined distinctions between the terms fear, anxiety, stress and arousal.

Fear can be defined as the emotional and physiological reaction to immediate, tangible and realistic danger (Reber, 1995; *Gale Encyclopaedia of Science*, 2001). Fear may be provoked by exposure to traumatic situations, observations of other people exhibiting fear or when receiving frightening information. Anxiety can be defined as the physical and psychological response to a perceived threat or danger. This perception can be triggered by a combination of biochemical changes in the body, individual history and memory and the social situation (Reber, 1995; *Gale Encyclopaedia of Science*, 2001). Lazarus (2000) concurs and stresses that anxiety like all emotions such as anger or happiness has a powerful influence on performance. These emotions occur as a response to an environmental event following an appraisal of the impact of the environmental event on the individual. If the athlete perceives an environmental event to be threatening he would experience anxiety. Anxiety is related to fear and has the same physiological and psychological symptoms, but it is not the same thing. The difference is that fear is the direct response to a specific, objectively observable danger or threat that the individual is consciously aware of. Anxiety on the other hand, is often unfocused, vague, hard to pin down to a specific event and can be a very subjective observation (Reber, 1995; *Gale Encyclopaedia of Science*, 2001). The cause of anxiety might not be the same for another individual. Anxiety experienced in the present might stem from an event or person that caused pain or fear in the past. In this situation, the individual might

not even be consciously aware of the cause of the anxiety (Reber, 1995; *Gale Encyclopaedia of Science*, 2001).

Stress, according to Kellmann (2002), from a system point of view, can be described as a destabilisation or deviation from the norm in a biological or psychological system. Deviations in a psychological system are the result of demands that are too high or too low. Reber (1995) distinguishes between stress as a *cause* and stress as an *effect*. Stress as a cause is seen as any force that when applied to a system (individual/group) will cause some significant change or adaptation to that system. These forces that cause stress are called stressors. Stress as an effect is the psychological tension that is the result of forces that are applied to any system that cause significant changes or adaptations. Stress is both a psychological and physical response that occurs when an individual has to adapt to changing conditions, whether those conditions are real or perceived, positive or negative. In this point of view, stress can be differentiated in Eustress (positive) or Distress (negative) (Cox, 2002).

Weinberg and Gould (2003) define stress in terms of balance between the demands (physical and/or psychological) of a situation and the ability of the individual to respond successfully to these demands. This usually takes place in a situation where the individual's inability to successfully meet the demands of the situation has important consequences for the individual. According to the *Israel Centre For the Treatment of Psycho Trauma*, stress is the feeling of discomfort that individuals experience when they perceive that they are in a threatening situation. Following the same point of view, O'Neil (2002) defines stress as the physical and psychological process of reacting to and coping with events or situations that place extraordinary pressure upon a human being. Stress is a normal reaction to an abnormal situation and serves primarily the function of self-preservation in a threatening situation enabling one to focus full attention on a particular threat, thereby mobilizing maximum physical and psychological energy to respond to a particular threat.

All individuals experience stress in daily life that may produce tension, frustration and anger. However, an individual's reaction is largely determined by that individual's physical and psychological strength (coping capacity) or weakness at that specific time. Thus, each individual's capacity to handle stress will differ and even for the same individual the ability to cope with stress will vary (O'Neil, 2002). Stress consumes physical, cognitive and emotional energy and although some stress can

be beneficial to the individual, it should not be allowed to accumulate to the point where it cannot be controlled. This leads to cumulative stress, a situation where the individual is not able to cope anymore (O'Neil, 2002). Cumulative stress (Grossman, 2000; Ford-Martin, 2001) is the result of stress that occurs too often (frequency), lasts too long (duration) and is too severe (intensity). In these circumstances stress leads to exhaustion and other manifestations that undermines an individual's ability to cope.

From these definitions about stress, the following deductions can be made:

- o Various factors or stressors that destabilize the individual's physiological and psychological equilibrium or balance can cause stress.
- o Stressors usually cause a change in the present (or future) situation. These changes in the situation cause internal tension to the individual to rectify the equilibrium or situation. This forces the individual to adapt to the situation by means of psychological, behavioural and physiological responses.
- o The stressors may be difficulties and challenges, real physical danger (fear) or it may be perceived to be dangerous (anxiety) by the individual or it may be when the individual perceives that he/she will not be able to cope with the demands (stressors) of the situation.
- o It is important to notice that threats, challenges, difficulties or danger do not necessarily have to be physical danger to the individual's life (although it can be). It can include failure or any threat to the individual's short- or long-term goals, self-esteem or ego.
- o Stress can be positive (Eustress) or negative (Distress). Eustress can energize the individual to perform well, while distress can lead to a stress overload where the individual is unable to perform or performs poorly. The experience of stress (emotional state) as positive or negative depends on the individual's perception of the situation and perceived capacity to cope with the demands (stressors) of the situation.

- o The methods whereby the individual adapts to changes in the situation are called coping strategies or stress management techniques. These strategies may be physiological or psychological or a combination of both.

For the purpose of this study, stress will be defined as the internal psychological tension caused by internal and external stressors that changes or are perceived to change the nature of the present and/or future situation to such an extent that it forces the individual to adapt by means of physiological and psychological responses.

A process that is related and linked to stress is arousal. Arousal, according to Jones and Hardy (1990) and Potgieter (2003), can be defined as the energizing of the body and mind leading to a level of alertness. Reber (1995) defines arousal as a dimension of activity or readiness for activity based on the level of sensory excitability, glandular and hormonal levels and muscular readiness. Various authors (Jones & Hardy, 1990; Robert *et al.*, 1996; Grossman, 2000; Ford-Martin, 2001; Cox, 2002; Potgieter, 2003; Weinberg & Gould, 2003) identified three types of arousal namely; cognitive, autonomic and behavioural.

Cognitive arousal refers to the sensory and emotional processes that are involved to prepare an individual for action. These processes involve the sensory awareness (perception) of a change in a situation. It also involves the cognitive evaluation of the situation, stressors involved and the individual's ability to cope. This evaluation leads to an emotional state such as fear or anxiety that determines the level of autonomic and behavioural response. The intensity of the emotional state would be determined by the perceived threat to the individual that the stressor holds. Thus the higher the threat level – the more intense the emotional state.

Autonomic arousal refers to the degree of physiological activity primarily controlled by the autonomic nervous system to prepare an individual's body for action. Indicators of this are palmar sweating, increased skin conductance, increased rapid respiration, increased heart-rate, higher blood pressure, tensed muscles, dryness of mouth, numbness and tingling of limbs, metabolic rate decreases and dilated eyes.

Behavioural arousal refers to the overt or visible activity of the individual. This includes actions such as frequent urination, nausea, vomiting or diarrhoea, pacing,

trembling, restlessness, hand wringing, pressured speech, withdrawal, confusion, inability to concentrate, emotional outbursts or aggressive behaviour.

Cognitive, autonomic and behavioural arousal are closely linked and interact to prepare the individual for action. This action will be the response to a stressor or stressors that the individual identified and the consequent coping strategy(s) that are necessary to adapt to these stressors.

The relationship between stress, anxiety, fear and arousal can be summarised in the following manner: stress is the internal tension of the individual caused by changes in the situation or future situation. These changes or perceived changes cause an emotional state of either fear or anxiety, depending on the stressor. This forces (motivates) the individual to take certain physiological and psychological actions to adapt to these changes. The process whereby the individual is prepared physiologically and psychologically for the adaptive actions is called arousal and takes place before the individual starts to take adaptive action. The level of arousal will depend on the level of stress that the individual experiences as well as the intensity of the emotional state experienced by the individual. The intensity of the emotional state experienced would depend on the stressor or perceived stressor as well as the individual's perceived capacity to cope with the stressor or perceived stressor. Therefore, stress will be the factor that motivates the individual to adapt to changes in the situation. This is accompanied by an emotional state that will determine the level of arousal that the individual experience. The arousal level will determine the individual's physiological and psychological readiness to respond to changes or stressors and the physiological and psychological coping strategies will determine how the individual will respond to stressors. As seen previously in this chapter, stress can have positive and negative effects on the individual and his or her performance. The effect of stress would depend on the individual's capacity and perceived capacity to cope with the stressors as well as the level of physiological and psychological readiness to do so. However, therein lie the two important factors that determine the effect of stress on individual performance. Firstly, if the individual does not have the capacity or perceived capacity to cope with the demands or stressors of the situation or chooses incorrect strategies – the individual's performance will suffer or he will be overwhelmed completely. (Coping strategies will be discussed in chapter 4). Secondly, if the individual's level of readiness is too low or too high, performance will also suffer or fail completely. The effect of arousal on performance will be briefly discussed in the following section.

3.2.2 AROUSAL AND SPORT PERFORMANCE

One of the major concerns of many athletes is to attain a psychological state (arousal level) that will facilitate increased performance (Jones & Hardy, 1990). In sport there are many factors that can have a negative influence on the athletes' psychological state and thereby alter it from the optimum required for a particular sport. (As seen in the previous section, these factors are called stressors). According to Jones and Hardy (1990) and Potgieter (2003) one of the causes of deterioration in performance is that athletes cannot control the effect of over-arousal. In other words, they are unable to cope with the effects of over-arousal and consequently perform poorly. However, if the athlete were able to control his arousal level his performance would probably increase. This is similar to Csikszentmihalyi's (1990) theory of flow and the influence of inner disorder or psychic entropy where he states that information that disrupts consciousness by threatening an individual's goals leading to a disorganisation of the self and impaired effectiveness. Flow is the state of inner calmness where the individual is able to focus on his goals without disruption thereby increasing effectiveness.

There are several theoretical approaches and perspectives on the complex relationship between arousal and performance in sport. However, the main focus of this study is not what the relationship between arousal and performance is. Therefore, in this section only the main similarities and differences between the theories will be briefly discussed. The theories that will be compared in this section are the drive theory, inverted-u theory, zones of optimal functioning, flow approach and catastrophe model. According to various authors (Csikszentmihalyi, 1990; Jones & Hardy, 1990; Horn, 1992; Reber, 1995; Woods, 1998; Gill, 2000; Cox, 2002; Potgieter, 2003; Weinberg & Gould, 2003), arousal has the following effects on performance:

According to the drive theory there is a positive linear relationship between arousal and performance. The higher the level of arousal, the better the performance if the task is well learned or a skill is mastered. If the task is not well learned or a skill not mastered or complex, an increase in arousal will negatively affect performance. Social facilitation suggests that the presence of other people will increase arousal. If the task is simple and well learned – increased arousal will lead to increased performance. If the task is not well learned or a skill not mastered or complex, the

presence of others will negatively affect performance. Subsequent research has shown that it is not the mere presence of others that affects performance but the evaluative capacity or perceived evaluative capacity of these people that influences arousal levels.

According to the inverted-u theory the relationship between arousal and performance follows an inverted-u curve with optimal levels that differ according to each individual and each individual task. As the complexity of a task increases, so the level of arousal required for performance decreases. Arousal levels above and below the optimal level are associated with lower performance. According to this theory optimal arousal level depends on the nature of the task. According to this theory a slightly above average level of arousal will enhance performance on all motor tasks. Moderately high arousal levels would enhance gross motor activities involving speed, strength or endurance but would interfere with complex skills, concentration or fine motor activities. Optimal arousal would depend on the ability and personality of the athlete. For a highly skilled and experienced athlete complex skills might not be the same for the beginner athlete. Athletes with a personality tendency of high trait anxiety would experience more arousal more quickly than an athlete with lower trait anxiety. It is therefore difficult to determine what each individual's optimal level of arousal would be. According to this theory there are always some kind of pressure or stressors on athletes. This pressure or stressors do not in themselves cause stress. It is the individual's perception of the situation and response that is the relevant factor. The athlete will experience stress when he perceives himself unable to cope with the demands of the situation. High trait anxiety athletes are more susceptible to this perception than athletes with lower trait anxiety.

According to Jones and Hardy (1990), the problem with the inverted-u theory is that it is simple and intuitive appeal leads to unquestioning acceptance by sport psychologists. Furthermore, they state that the theory is too simplistic and does not take into account the advances made by research in cognitive psychology. According to Jones and Hardy (1990), the relationship between arousal and performance is much more complex than the inverted-u theory postulates. As previously mentioned, one of the problems with the inverted-u theory is that it is difficult to measure. Secondly, all athletes seem to have the same optimal level of arousal and therefore, the theory does not take individual differences into account.

The zones of optimal functioning (ZOF) attempt to overcome these shortcomings by proposing individual zones of optimal functioning. Each athlete would have a zone within which his performance would be optimal. This theory is based on the anxiety level that the individual experiences. As seen in section 3.2.1, anxiety is an emotional state that determines the level of arousal. Therefore, when the athlete's anxiety level falls outside the optimal zone (too high or too low), his performance would also deteriorate. The difference between the ZOF and inverted-u theory is that an athlete's optimal level of arousal and therefore performance is not necessarily at midpoint, but can differ according to individual differences.

Another theory that follows a similar approach as the inverted-u theory and the ZOF is the flow approach. According to this theory athletes perform at their best when they are in a state of flow. This state is reached when the athlete is completely absorbed by the activity that he/she is busy with. This state is achieved when there is a balance between the ability of the athlete and the demands of the situation. If the demands are too little the athlete will become bored and if the demands are too high he will experience anxiety (Csikszentmihalyi, 1990). Another factor that influences this state is the level of perceived capacity to cope. When the individual perceives his coping capacity to be enough, he/she will feel in control of the situation and will be able to cope. However, any uncertainty or loss of confidence will induce anxiety. Anxiety will also influence concentration (Csikszentmihalyi, 1990; Cox, 2002; Weinberg & Gould, 2003). The athlete must be able to concentrate on the task at hand. In a state of flow any stimulus that are irrelevant to the task at hand are disregarded. The deduction that is made by the researcher is that anxiety will produce an increase in arousal levels. This will ensure a drop in performance, as the athlete would be outside his/her flow state or zone of optimal arousal.

Most of the previous theories make the assumption that less than optimal arousal would lead to a gradual decline in performance. In other words, if the athlete's level of arousal were too low or too high, the decline in performance would be slight or extreme depending on the degree of deviation. Furthermore, any deviation from the optimal level would result in gradual decline in performance and that the correct intervention(s) will be able to rectify this decline. The catastrophe model does not support this symmetrical relationship between arousal and performance. Performance depends on the interaction between arousal and cognitive anxiety (Cox, 2002; Potgieter, 2003; Weinberg & Gould, 2003).

Under normal circumstances the relationship between arousal and performance follows an inverted-u curve. However, when cognitive anxiety is extremely high, arousal levels also become extremely high (higher than the optimal level) and performance drops dramatically rather than gradually. This catastrophic pattern is usually associated with high cognitive anxiety but is further increased when coupled with high levels of physiological arousal. Once this catastrophic pattern starts it is very difficult to recover even to moderate levels of performance. This model suggests that optimal arousal is important but that extreme levels of anxiety and arousal should be controlled in order to prevent the catastrophe pattern.

According to Jones and Hardy (1990) and Weinberg and Gould (2003), the main critique against the theories previously discussed is that they are simplistic and do not take into account the complex nature of the arousal-performance relationship. They ignore the fact that people actively attempt to cope with any harmful demands in a sporting environment.

Therefore, several two-dimensional theories were developed to accommodate the complex nature of the arousal-performance relationship as well as individual coping responses. These theories by Broadbent, Eysenck, Hockey and Hamilton proposed a two-dimensional arousal system where the first system is a passive, undifferentiated physiological arousal state that influences performance according to the processing demands of a particular task (Jones & Hardy, 1990). A second, cognitive control, system monitors and rectifies any adverse effects of the passive arousal system on performance. In other words, when performance is negatively influenced by under- or over-arousal in the first (physiological) system, the second (cognitive) system compensates for this by increasing or decreasing arousal levels.

According to these theories high performance levels are obtained through two different methods: through optimal or near-optimal arousal in the first system with minimal involvement of the second system, or through compensatory action by the secondary system. Therefore, according to this approach, performance is not always impaired through under or over physiological arousal levels since the equilibrium is maintained by efficient action of the second (cognitive) control system. According to this approach, a distinction should be made between performance effectiveness and processing efficiency. Performance effectiveness relates to the quality of performance, in other words how well or poorly the athlete performs. Processing efficiency refers to the relationship between performance effectiveness and the effort

required for this performance. This relationship can be expressed by the following formula:

$$\text{Processing efficiency} = \text{Performance effectiveness/effort}$$

In other words, when performance is good and the effort required to do so is low, processing efficiency would be high. When effort is high and performance is low or mediocre, processing efficiency would be lower. Processing efficiency would therefore be the total effectiveness of the individual's coping strategies. Compensatory action by the second arousal system would reduce the effects of under- or over-arousal on performance effectiveness. Thus, should the arousal level be lower or higher than what is needed for optimal performance, the secondary control system would compensate for this by increasing or decreasing physiological arousal. However, the effort needed would increase as additional cognitive activation or cognitive coping strategies are needed to compensate for the arousal deficiencies. Therefore, arousal would influence the processing efficiency more than performance effectiveness.

According to these theories, different stressors such as noise, incentives, and extreme environments create qualitatively different cognitive activation states that then influence performance through different cognitive processes. The focus of these theories is the different performance patterns that emerge under different environmental conditions. The underlying assumption is that different stressors influence performance in different ways.

To summarize, arousal therefore has a definite influence on performance. From the theories it seems as if performance is dependant on an optimal level of physiological and cognitive arousal. As each individual is different with regards to skills, experience, motivation and personality traits, the perception of stressors as well as coping strategies and optimal arousal level will differ. When an individual's arousal level is under or above the optimal level, his/her performance will deteriorate. Arousal is influenced by the cognitive perception of a stressor and different stressors would require different cognitive activation states or coping strategies. Arousal, as such, is not the focus of this study. However, it is one of the factors or stressors that endurance athletes have to cope with during endurance events.

In the next section, the concepts endurance sport as well as the environmental stressors present in endurance sport will be discussed.

3.2.3 ENDURANCE SPORT

To give a comprehensive definition of endurance sport is almost as difficult as defining personality. Most people would know what an endurance event is and would probably be able to make the distinction between an endurance event and a non-endurance event. However, to give a scientific definition based on literature that would satisfy most people is difficult.

There are various ways and methods to classify endurance events and to make a distinction between endurance events and non-endurance events. Four basic methods are identified in the literature, distance, time needed to complete the event, comparison with other events, and the amount of aerobic and anaerobic fitness or intensity required.

- *Distance* (Jarver, 1989; Kellmann, 2002). In the Olympic Games, all track events longer than 800m are considered endurance events.
- *Time needed to complete the event* (Brook, 1987; Jarver, 1989; Kellmann, 2002). Some events such as the 800m track event can take anything from 3 minutes and more. Events such as a marathon would need 2½ hours for elite athletes, while ultra-marathons and expedition adventure races may take several days of non-stop racing.
- *Comparison with other events* is the third method that is used to classify an endurance event (Brook, 1987; Jarver, 1989). Compared to ultra-marathons and adventure races, the 800m might seem to be a walk in the park. However, when the 3 minutes of the 800m is compared to the 10 seconds of the 100m sprints, it definitely is an endurance event. The time and distance as well as the aerobic and anaerobic requirements of a specific event are compared with other events. The higher the requirements for a specific event, the more endurance is required.
- *The intensity of energy required* used during an event will determine the level aerobic or anaerobic fitness required (Brook, 1987; Jarver, 1989; Seiler,

1996; Mann & Schaad, 2001; Rawling, 2003). For short high intensity events such as the 100m sprint or power lifting, the athlete would require high levels of anaerobic energy. This would also lead to a quick build-up of lactic acid in the muscles that would limit the endurance of the athlete. For longer events such as marathon running, adventure racing or rock-climbing, the intensity of the event is much lower and the athlete would require high levels of aerobic energy. As the intensity of the event is lower, the build-up of lactic acid is slower and the endurance of the athlete would be more. However, due to the duration (several hours or days) the energy requirements would increase with very little or no opportunity to replace used energy that will counter the build-up of lactic acid in muscles. Therefore, endurance can be seen as a product of the athlete's aerobic energy capacity.

It is clear that these definitions cannot necessarily be used on their own, but that the combination of these definitions can be best used to differentiate between endurance events and non-endurance events. When combining all four definitions, endurance events can be classified as *those sport events where the distance, time and the level of aerobic fitness/intensity requirements for successful completion are considerably higher than when compared to other sport events.*

To achieve the aim of this study a combination of these four definitions will be used to determine the events that can be seen as endurance events. This will then be used to select the participants that will participate in this study. The criteria for inclusion are that an event should take at least one hour to complete and should involve one or more disciplines that involve one or more aerobic/anaerobic exercises such as running, walking, cycling, swimming or rowing. An operational definition of an experienced non-elite endurance athlete is a person who has participated in at least four endurance events (marathons – 10 km+, cycling – 30km+, mountain biking – 20km+, canoeing/kayaking – 30km+, backpacking – 30km+, adventure racing – 25km+, Iron Man etc.), of which two must have been in the past year without being a professional athlete (non-paid).

3.2.4 EXTREME CONDITIONS IN ENDURANCE SPORT

According to the literature (Sisson, 1983; Dettweiler, 1991; Anthony, 1996; Powers & Dodd, 1996; Stroud, 1998; Mann & Schaad, 2001) extreme conditions in sport can be defined as those environmental conditions or characteristics of the specific sport that

place extreme physical and mental pressures on the athlete. These pressures or stressors, when not correctly managed, can have psychological, cognitive and physical effects ranging from perceptual distortions to lower performance and extreme physical injuries or death. Stressors refer to factors such as heat, cold, altitude; sleep deprivation, hunger, thirst, terrain that disturb the homeostatic balance of the body.

According to the literature (Sisson, 1983; Dettweiler, 1991; Bloomfield, Fricker & Fitch, 1992; Anthony, 1996; Powers & Dodd, 1996; Stroud, 1998; Mann & Schaad, 2001) the environmental conditions that have an influence on athletes during endurance events can be seen in table 3.1.

TABLE 3.1: ENVIRONMENTAL CONDITIONS DURING ENDURANCE EVENTS

PHYSICAL	
Heat	Lack of Nutrition
Cold	Lack of Hydration
Altitude	Terrain
Distance	Sleep deprivation
Rain	Wind
Equipment	

The human body consists of materials and elements that, on their own, are extremely unstable. Only a few minutes of oxygen deprivation can damage brain cells irreparably or a rise in body temperature by a few degrees before proteins start to break apart at the molecular level. In comparison to the external environment, one's body is extremely vulnerable and fragile (Armstrong, 2000). However, due to various physiological responses and biochemical reactions that maintain stability within the body's cells, the human body is more robust and adaptable than what most people think. Humans can disregard the external environment because of the cell consistency and are therefore independent of the external world (Armstrong, 2000). This explains why people can live, work and exercise in a variety of potentially dangerous environments such as extreme heat, cold or altitude. The nineteenth century scientist Claude Bernard, who is acknowledged as the first author to recognize the relative independence from the external environment by the human body, puts it in the following manner (Bernard in Armstrong, 2000: 25):

“The organism is...constructed in such a fashion that, on the one hand, there is full communication between the external environment and the internal environment of cells, and on the other, that there are protective functions...holding living materials in reserve and maintaining (temperature, fluids) and other conditions indispensable to vital activity. Sickness and death are only a dislocation or perturbation of (these processes)”.

The physiologist, Walter Cannon, described the actions of cells that respond to perturbing stimuli in terms of a dynamic relationship of equilibrium and variability, rather than absolute intracellular constancy. Cannon coined the term homeostasis to indicate similarity with some variability, rather than sameness. Homeostasis refers to the body’s tendency to maintain a steady state despite external changes or stressors. Adaptive responses or adaptations (physiological changes that minimize bodily strain) are attempts by the body to neutralise stressors and to re-establish the homeostatic balance of the body (Bloomfield *et al.*, 1992; Armstrong, 2000). Adaptations may be short-term (accommodation), intermediate (acclimatization) or long-term (genetic adaptation). Accommodation refers to the reaction of cells and tissue to changes in the external environment. An example of this would be shivering when cold. Acclimatization involves a complex set of adaptive responses to changes in the external environment. An example of this would be the metabolism of body fat when all carbohydrate stores have been depleted to provide the body with energy. Genetic adaptation refers to semi-permanent physiological, morphological or other changes that occur over thousands of years within one species to ensure survival due to changes in the external environment. Each of the stressors or extreme environments requires a unique set of adaptive responses. Adequate acclimatization to virtually all extreme environments requires approximately 8–14 days of exposure and the loss of acclimatization to these stressors occurs in 14–28 days (Bloomfield *et al.*, 1992; Armstrong, 2000).

Each of the stressors or extreme environments, their effect on the individual as well as physiological adaptations will be discussed in the following section.

3.2.4.1 HEAT

According to the literature (Bloomfield *et al.*, 1992; Powers & Dodd, 1996; Stroud, 1998; Armstrong, 2000) humans are homeotherms, which means that body

temperature, is regulated around a set point to keep this temperature around 37°C. To maintain this body temperature, the body is constantly adapting to changes in air temperature, humidity, air movement, solar radiant, barometric pressure, and clothing insulation. Variations in body temperature can result in serious bodily injury. In fact, heat illness can occur when body temperature increases by as little (relatively speaking) as 4°C. Therefore, to avoid life-threatening situations, the body has to maintain strict control over temperature (Bloomfield *et al.*, 1992; Powers & Dodd, 1996; Stroud, 1998; Armstrong, 2000). During exercise, heat is produced as a by-product of muscular contractions. High-intensity exercise using large muscle groups generates more heat than low-intensity exercise using small muscle groups. Therefore, exercise using large muscle groups such as running, walking, rowing, cycling and so forth generates a large amount of heat that the body has to get rid of to prevent a dangerous rise in temperature.

Short-term exposure (30 – 60 minutes) to an extremely hot environment causes sufficient heat stress to lead to heat illness in some people (Bloomfield *et al.*, 1992; Powers & Dodd, 1996; Stroud, 1998; Armstrong, 2000). Even people who are physically fit and used to heat are at risk when exercising in hot environments. The duration of most endurance events is 2 – 3 hours or longer and therefore the risk increases considerably for heat stress and other heat-related illnesses. Heat stress is not only a function of air temperature but also of heat and humidity. The higher the humidity, the higher is the level of “effective temperature”. According to Powers and Dodd (1996) the effective temperature can be defined as the temperature that the body senses. At high levels of humidity, evaporation is retarded and as this defence mechanism is less effective, the body cannot get rid of excess heat through evaporative processes. This then causes the body temperature to increase to levels higher than what it would have been on a less humid day at the same ambient temperature. Thus, high humidity causes a moderately high ambient temperature to be sensed by the body as extremely hot.

3.2.4.2 COLD

According to Stroud (1998), the human body is genetically better adapted to hot environments than colder environments. When faced with extreme cold, humans have to use behavioural means such as clothing or lighting fires to be able to survive and function. When exercising in effective temperatures below 27°C your ability to lose heat increases and greatly reduces the opportunity for heat illness. However,

when exercising in temperatures below 16°C a combination of heat production due to muscle contraction as well as protective clothing is needed to prevent excessive heat loss. If muscle contractions and protective clothing are not properly combined in extremely cold conditions the chances for a major decrease in body temperature (hypothermia) increase. This could be life threatening.

Exercise in extremely cold conditions for prolonged periods (1 – 4 hours) without adequate protection or swimming in cold water may overpower the body's ability to generate enough heat, resulting in an increase in heat loss and hypothermia (Bloomfield *et al.*, 1992; Powers & Dodd, 1996; Stroud, 1998; Armstrong, 2000). One factor that has a large impact on heat loss is water. Water is 25 times or more heat conductive than air at the same temperature (Powers & Dodd, 1996; Stroud, 1998; Armstrong, 2000). Therefore, a person who is immersed in water at a temperature of between 0°C - 13°C for between 1 – 6 hours will probably die from hypothermia. However, this depends on the physical activity, fitness, body mass, clothing insulation, position in the water, psychological factors such as will to live and subcutaneous fat (Stroud, 1998; Armstrong, 2000). A second factor that influences the loss of body heat is the speed of wind, also called wind chill factor (Armstrong, 2000). Any air movement over the body will accelerate body cooling in three ways:

- a. Removing still warm air layers trapped in insulative clothing;
- b. Increasing evaporative cooling directly from sweat-soaked skin and;
- c. Increasing evaporative cooling when the insulative clothing is wet.

Therefore, the higher the wind speed, the faster this cooling process takes place and the colder it feels. This effect may account for up to 80% of body heat loss during cold conditions. However, at wind speeds above 64 km/h, very little additional heat loss takes place due to convection. Wind chill can have a serious influence on the body cooling of a person exercising or performing tasks in extreme cold conditions. On a calm day with very little wind but an air temperature of -30°C convective heat loss becomes dangerous. At a wind speed of 10 km/h the effective temperature drops to -58°C and at a wind speed of 20 km/h the effective temperature drops to -81°C. An effective temperature this low falls into the great danger category due to convective heat loss. Even a temperature as relatively high as 15°C can become dangerous at wind speeds of 64 km/h at which level the effective temperature would be -29°C. In conditions such as this, exposed skin and flesh can freeze in one minute or less.

3.2.4.3 ALTITUDE

According to the literature (Bloomfield *et al.*, 1992; Powers & Dodd, 1996; Stroud, 1998; Armstrong, 2000), the main concern with exercise at high altitude (altitudes of >1500m) is that the low barometric pressure puts limits on the amount of oxygen transported in arterial blood. This leads to a reduction in the transportation of oxygen to exercising muscles and therefore, reduces both exercise tolerance and VO₂ max. The reduction in oxygen transportation increases as a function of the altitude. In other words, the higher the altitude, the greater the reduction in exercise tolerance and VO₂ max. At altitudes from sea level up to 1500m there is very little difference in the exercise tolerance or VO₂ max performance. However, there is a marked drop in performance at altitudes above 1500m. Where the VO₂ max performance at sea level is 100%, this percentage drops to approximately 82% at 3000m, 69% at 5000m and 55% at 6000m. According to Armstrong (2000: 174), this can be illustrated by the following experience of a climber near the summit of Mount Everest:

“After every few steps, we huddle over our ice axes, mouths agape, struggling for sufficient breath to keep our muscles going. I have the feeling I am about to burst apart. As we get higher, it becomes necessary to lie down to recover our breath”.

To cope with this reduction in oxygen delivery to exercising muscles, the body makes several physiological adjustments. In an attempt to maximize oxygen transfer from the lungs to the blood, breathing becomes faster and deeper. To increase blood flow and oxygen delivery to exercising muscles the heart rate rises. To lower the target heart rate, the individual has to lower the intensity of the exercise at high altitude. In general, there is little need to alter the duration or frequency of training during a brief stay at high altitude. However, at very high altitudes the air is very dry, which results in increased water loss with breathing. In addition, the body decreases its water content as a way of coping with the stress of altitude exposure.

3.2.4.4 NUTRITION

Substances contained in food that are necessary for good health are called nutrients. Nutrients can be divided into two categories called macronutrients and micronutrients. According to Mann and Schaad (2001), food performs three basic functions. Firstly, the three macronutrients; carbohydrates, proteins, and fats give us energy to move about. Secondly, protein and minerals are needed to build and repair tissue. Thirdly, nutrients are needed to regulate many mechanisms, such as

concentration. This occurs with the help of vitamins, minerals and proteins. Therefore the second nutrient category, micronutrients, such as minerals and vitamins regulate the functioning of the cells. Good nutrition means that an individual’s diet supplies all of the necessary foodstuffs required to maintain a healthy body. Although many industrialized countries had a problem with dietary deficiencies in the past, the biggest problem associated with nutrition today is overeating (Bloomfield *et al.*, 1992; Mellion, 1994; Powers & Dodd, 1996; Stroud, 1998). However, very few or no endurance athletes have major problems with overeating (Stroud, 1998). Most endurance athletes have less than 20% body fat and usually fall into the range of 10% – 20% or less body fat (Powers & Dodd, 1996; Stroud, 1998, Armstrong, 2000) and tend to fall into the “Too Lean” category (see figure 3.1). According to Dettweiler (1991) various researchers report body fat percentages of 5.1% to 19.1% for elite endurance athletes depending on the sport with a mean of 12 – 14.4%.

A healthy male would have between 10% and 20% fat as a percentage of his total body weight. A healthy female would have between 15% and 25% fat as a percentage of her total body fat. Any percentage below or above 10% –20% and 15%-25% would be either “Too Fat” or “Too Lean”.



FIGURE 3.1: **BODY FAT PERCENTAGES (POWERS & DODD, 1996)**

Most endurance athletes would therefore fall into the lower “Optimal” body weight category with a tendency towards the *Too lean* category. The reason for this lies in the nature of endurance events and the effect that it has on the metabolism of a

human body (Dettweiler, 1991; Bloomfield *et al.*, 1992; Powers & Dodd, 1996; Stroud, 1998, Armstrong, 2000; Mann & Schaad, 2001). Endurance events such as marathon running, endurance cycling, long-distance walking, kayaking and so forth impose severe metabolic demands and provoke strenuous cardio-respiratory responses. Metabolism refers to the rate at which the body transfers fuel into energy. People cannot use food eaten directly as energy. It has to go through a series of processes in order to be converted into energy that can be used for mechanical work. That form of energy is called adenosine triphosphate or ATP. High-intensity activities demand quick metabolism of energy through the ATP system. Once immediate stores of ATP are used, broken down carbohydrates that reside in the muscles or glycogen are anabolized to create ATP through a process called glycolysis. Oxygen plays a key role in muscle glycolysis. When oxygen is abundant during aerobic activity, enormous amounts of ATP are available for aerobic or continuous energy. If oxygen is not available during anaerobic events, less ATP is produced and fatigue sets in rapidly.

Carbohydrates are the main source of energy for the body (Mellion, 1994; Mann & Schaad, 2001). Muscle contraction is dependant on the efficient breakdown of this macronutrient. Once absorbed by the small intestines it is converted to glucose and can be used as energy. When excess carbohydrates are present, it is stored in the liver and muscles as glycogen. When these stores are “full”, additional carbohydrates are stored as potential energy under the skin in the form of subcutaneous fat and also between the muscles. According to various authors (Dettweiler, 1991; Powers & Dodd, 1996; Stroud, 1998, Armstrong, 2000; Mann & Schaad, 2001), the body has a limited capacity to store glycogen and these stores are rapidly depleted during exercise. The body's energy system works synergistically to provide a steady flow of energy to the body when working. In endurance events the body uses all energy reserves to work. Once immediate reserves in the liver and muscles have been used, body fat is converted into glucose and moved to the muscles via the blood. However, the body needs carbohydrates to effectively metabolise body fat. When sufficient carbohydrates are not available, the body mobilizes more fat than what can be metabolized. The breakdown of fatty acid (lipid metabolism) is dependant on certain levels of carbohydrates. However, when lipid metabolism is the primary source of energy, muscle power is approximately half compared to a normal situation where carbohydrate metabolism is the primary source of energy. The second drawback to lipid metabolism as sole source of energy is that the depletion of muscle glycogen

causes localized muscular fatigue during exercise. The result is that the person not only performs at a slower rate but also feels more fatigued.

When sufficient levels of carbohydrate and body fat are not available for energy – the body starts to metabolise protein for energy. This alternative is not as efficient in energy production as carbohydrate metabolism. When protein is metabolized as energy it uses lean muscle mass and therefore disturbs the body of this vital source of tissue synthesis and repair. Furthermore, sufficient carbohydrates are essential for the nervous system. When carbohydrate levels fall below normal, the normal functioning of the brain is affected. Substantial losses in carbohydrate levels can lead to deficiencies in memory, concentration and situational awareness through hallucinations and even brain damage in extreme cases of starvation. When exercising, glycogen stores are initially readily available in the muscles and additional liver and muscle glycogen provides up to 50% of energy needs. Lipids and a small percentage of protein metabolism provide the other 50%. The percentage of energy substrates is dependant on the intensity of the exercise. In high-intensity exercise carbohydrates dominate whereas lipids dominate during low and moderate intensity (Dettweiler, 1991; Powers & Dodd, 1996; Stroud, 1998, Armstrong, 2000; Mann & Schaad, 2001).

After 20 minutes of exercise, glycogen stores are reduced and blood glucose is the major supplier of energy. During prolonged exercise, lipid breakdown also contributes a great deal of energy. As blood glucose is reduced and lipid metabolism becomes the major source of energy, the body is in a carbohydrate-depleted state where performance is dramatically reduced. According to Mann and Schaad (2001), when exercising beyond the stage where liver and muscle glycogen levels are depleted is where fatigue sets in and is called “bonk” or “hitting the wall”. This is fairly common in high-intensity endurance events such as marathon running, mountain biking, cycling, backpacking and adventure racing. If exercise is continued without sufficient carbohydrate intake, performance will drop even further and changes in cognitive thinking patterns can be expected. Sufficient carbohydrate intake is essential for daily functioning. As a general rule, a person with normal daily activities should ingest 10 grams of carbohydrates for every kilogram of body weight. Therefore, a 65kg person would need a daily carbohydrate intake of 650g or 2600 calories. During intense exercise, a steady depletion of carbohydrates occurs and in order to satisfy the body’s requirement for glycogen synthesis it is recommended that the diet consists of 70% carbohydrates (Dettweiler, 1991; Mellion, 1994; Powers & Dodd, 1996; Stroud,

1998, Armstrong, 2000; Mann & Schaad, 2001). In some cases of prolonged exercise (several days) even 80% may be necessary. The remaining 20% to 30% should be made up of proteins and fats (15% – 25% proteins and 5% fats). The amount of energy expended per hour during an endurance event is dependant on several factors such as size, ratio of lean mass to fat, efficiency in the discipline, intensity of the event (speed of work, weight of equipment carried and terrain), climate and metabolism (Mann & Schaad, 2001).

Mann and Schaad (2001) give the following values as estimates of energy utilisation during endurance races of progressively longer distances:

- a. Marathon: 2600 – 5000 calories.
- b. 160-km Ultra run: 10 000 calories.
- c. Eco-Challenge British Columbia (592 km; elevation gains 20 000 m; pack weight 15 – 20 kg): 60 000 calories.

Therefore, the average endurance athlete expends approximately 100+ calories per hour. In endurance events with a duration of 2 hours or more (especially non-stop events such as adventure races spanning several days) athletes will expend an enormous amount of energy, which if not replaced at regular intervals, will lead to a drop in performance levels.

The following quote by Don Mann (in Mann & Schaad, 2001: 196) illustrates this:

“One of my favourite conversations Angelika Castaneda (team Odyssey, RAID Gauloises, 1997) was when I said to her, “Angelika, be sure you bring enough food for this race. We are going to be out there for eight to eleven days and I want to be sure that you eat enough.” Her reply in a thick Austrian accent was this: “Don, you do not need to worry about me. I do not need to eat much in a race this short. My body will eat from itself. I will not die on you, I will only feel like I’m going to die”.

3.2.4.5 HYDRATION

According to Mann and Schaad (2001), water is the single most important environmental factor influencing sport performance. The average adult requires at least 1.7 litres of water a day to keep essential physiological systems functioning. If the person is active, another 280ml is needed. In conditions of extreme heat and humidity performing physically demanding tasks requires even more water.

According to Mann and Schaad (2001), a multi-day adventure race in humid conditions would require at the very least 4 litres. Water allows the body's physiological systems to function smoothly. Almost all our metabolic mechanisms require water to function. When water supply is inadequate, alternate routes such as a fall in performance are created to compensate for this lack. Disturbances in body water and resultant disturbances of electrolyte balance can adversely affect cellular as well as systemic functioning, thereby reducing the ability of humans to tolerate prolonged exercise (Armstrong, 2000). Water lost during exercise-induced sweating can lead to dehydration of both intracellular and extracellular fluid compartments of the body. Even a small amount of dehydration (see table 3.2) can place strain on the cardiovascular system.

TABLE 3.2: ADVERSE EFFECTS OF DEHYDRATION (Powers & Dodd, 1996)

% Body weight loss	Symptoms
0.5	Thirst
2	Stronger thirst, vague discomfort, loss of appetite
3	Concentrated blood, dry mouth, reduced urine
4	Increased effort for exercise, flushed skin, apathy
5	Difficulty in concentration
6	Impaired temperature regulation, increased heart rate
8	Dizziness, laboured breathing in exercise, confusion
10	Spastic muscles, loss of balance, delirium

11	Circulatory insufficiency, decreased blood volume, kidney failure
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Although some forms of heat illness can occur prior to significant weight loss due to sweating, table 3.2 shows that weight loss due to sweating can adversely affect the human body physiologically and mentally. Prolonged, profuse sweating is the first warning indicator of impending dehydration. The negative effect of dehydration on the cardiovascular system can be seen by an increase in heart rate and a limitation in the ability of the body to transfer heat from contracting muscles to the surface skin where it can be dissipated by convection into the environment (Stroud, 1998; Armstrong, 2000). According to Powers and Dodd (1996), exercise in the heat can be extremely dangerous depending on ambient temperature, exercise intensity, relative humidity, clothing and state of hydration (water content of the body). A product of exercise is metabolic heat. Under normal circumstances the body is able to manage this heat effectively (Mann & Schaad, 2001). However, when environmental heat is added to heat metabolism, this can have the following three effects namely; overheating, chemical balance disruption and dehydration. To keep from overheating, blood flows to the skin surface to be cooled and skin pores excrete fluids that through air movement on the skin (convection) is evaporated into the environment.

The higher the intensity of the exercise, the more blood flows to the skin surface and less flows to the working muscles thereby cooling the body down. However, the more the body sweats, the more body fluids are lost and when enough fluid is lost, 6% of body weight (see table 3.2), temperature regulation becomes difficult (Stroud, 1998). When this happens, the body's core temperature increases dramatically and if body fluids are not sufficiently replaced, it can lead to serious injury or even death. In an attempt to cool down, temperature regulation prevails over muscular function, as immobility of muscles will not be as life threatening as an extreme rise in core temperature. Therefore, performance will decrease when the body is dehydrated (Powers & Dodd, 1996; Stroud, 1998; Armstrong, 2000; Mann & Schaad, 2001).

Normal biochemistry is severely threatened if the body's core temperature rises by only a few degrees. If the core temperature rises past 37°C the situation becomes life threatening. Temperatures above 37°C greatly alter the body's physiological mechanisms. If the core body temperature rises above 37°C, enormous volumes of

blood are diverted to the skin surface in an attempt to cool down the body temperature. The effect thereof is that optimal blood pressure and cardiac output are lessened, thereby depriving the muscles of oxygen and leading to muscle suffocation.

In average environmental conditions, the body stays cool by means of physiological mechanisms such as blood being carried to the surface skin and sweating (Mann & Schaad, 2001). However, as previously mentioned, when body temperature rises and sweating increases in an attempt to cool the body down – the body loses fluids that, if not sufficiently replaced can lead to dehydration and severe physiological, mental and behavioural effects.

According to Mann and Schaad (2001) a major concern in extreme endurance events is not only the amount of body fluid loss, but also the loss of electrolytes through sweating. To maintain adequate hydration, it is important to have a steady intake of water every 15 minutes, striving to drink at a minimum of 420ml per hour. It is important to drink water as often as possible and to sip from a sports drink such as *Energade* or *Powerade* every 15 to 20 minutes. The reason for the sports drink is that the body loses large amounts of sodium and to a lesser degree potassium through sweating, creating a biochemical imbalance. In endurance events lasting more than four hours, hyponatremia or a low sodium concentration in the blood can become a problem if not effectively replaced. Hyponatremia can lead to confusion, a reduction in coordination and possible seizures. To prevent this it is necessary to have an adequate intake of salt or foods and sports drinks high in sodium.

3.2.4.6 TERRAIN

During “normal” field and track events the terrain where athletes compete is usually controlled, level and as flat as possible. This is done to eliminate extraneous factors that could detract from the athlete’s performance. Consequently, terrain plays a limited role in these events. However, during endurance and extreme endurance events, terrain is seldomly controllable and consequently plays a major role in the performance of endurance athletes. In some events such as adventure racing difficult terrain is purposely chosen to increase the difficulty of the event. Terrain also greatly affects the amount of energy used (Mann & Schaad, 2001). Walking in sand uses twice the amount of energy used on grass or tarmac. Snow can use up to three times as much energy as paved roads. When the terrain encompasses large gains/losses

in elevation, it will not only affect energy use, but will also use different joint- and muscle groups than level roads.

Mountainous terrain puts enormous strain on the athlete for several reasons. Going uphill requires that the athlete's cardiovascular system has to work harder (Mann & Schaad, 2001). Therefore the athlete's energy requirements increase, heat production increases as well as hydration needs. Walking downhill might seem to be easier; it is so only for the cardiovascular system (Mann & Schaad, 2001). When going downhill, it requires enormous effort for a person to keep his/her balance. This "resisting" and "breaking" with good form and a safe tempo down a steep gradient is very costly in terms of energy usage. Deceleration is actually harder on the human body, especially wearing a backpack, adding greater wear and tear over time. When the terrain is higher than 1500m above sea level, altitude starts to play a role as previously mentioned. When the mountains are very high, the likelihood of extremely cold and windy conditions increases leading to the effects of cold as mentioned. Rockslides and scree found on mountain slopes are frequently easier to cross than thick bush, but can be tricky and lead to serious injury (Mann & Schaad, 2001).

Other terrain factors such as sand, marshes, rivers, thick bushes, lack of water and snow are all types of terrain encountered during endurance events such as adventure racing, backpacking, mountain biking. Although most athletes and people participating in events and working in this terrain accept this as part of the event or working environment, it still has a great influence on the performance of the individuals (Mann & Schaad, 2001). This influence is not only physiological, but also more importantly psychological (Stroud, 1998; Mann & Schaad, 2001).

Kelly of Team A.C.A.R in *Adventure Racing*, (Senk, 2001: p 2), says the following about the psychological impact of severe terrain in adventure racing:

"I think ultimately the competition is the race course. From all my understanding and experience, the race course is designed to hurt, bruise, maim, punish and take no prisoners...When you feel physically broken...when you really feel on edge but you think you can hang on, then something really small, really insignificant, like a flat tyre, will happen and it just screws you emotionally - and then you snap!"

According to various authors (Stroud, 1998; Mann & Schaad, 2001), one of the most profound aspects of endurance races and especially adventure racing is the physical

and mental discomfort caused mostly by the terrain. When an athlete is busy with a race or event, the level of discomfort increases with time. Any endurance athlete will know that to succeed in an endurance race or event depends on the amount of pain and discomfort the person can tolerate (Mann & Schaad, 2001). The more time a cyclist spends on the road, the more the level of pain and discomfort increase. A canoeist on the Berg river marathon will not only endure physical fatigue and painful muscles, but also extreme discomfort due to wetness and cold. The ultra-marathon runner has to contend with muscle pain and cramps, dehydration, sweat, heat and elevation gains and losses. The level of tolerance for pain and discomfort will determine whether the endurance athlete is ultimately successful. According to the literature (Stroud, 1998; Mann & Schaad, 2001), tolerance becomes a blend of physical stamina, mental endurance and emotional stability. One of the biggest factors in endurance sport that test the athlete's tolerance is the terrain.

3.2.4.7 DISTANCE

Apart from the terrain, the distance covered by endurance events is one of the main factors that distinguishes it from "normal" track and field events. As seen in the definition of endurance sports, distance is one of the factors used to define endurance events. As previously mentioned by various authors (Brook, 1987; Jarver, 1989), all track events in the Olympic Games further than 800m are considered endurance events.

Various sport disciplines also have varied distances. In adventure racing four types of races are found: sprints, shorts, classics and expeditions.

Sprints are usually events of 15 – 50km in length with duration of a few hours. Shorts consist of distances of 65 – 150km with duration of 12 – 48 hours. In classic races, the competitors cover distances of between 150 – 250km in events lasting between 48 – 96 hours. Expedition-style races cover distances of 250 – 700+ km and can take up to 10+ days to complete. These races are usually non-stop (Caldwell & Siff, 2001; Greyling, 2002; KIMM, 2002; Marais, 2002).

Cycling usually consists of events from 30 – 5000+ km and can take between 1½ hours to several days to complete. Most ultra-cycling events cover distances of 100+ km and can take between 2½ and 7½ hours to complete. An example of this in South Africa is the *Pick and Pay Cape Argus Cycle Challenge*. Ultra-ultra cycling events

such as the *Tour de France* can take several days to complete the 5000+ km. However, this is done in several stages.

A marathon, long considered the ultimate endurance race, covers a distance of 42.2km and can take between 2½ and 6 hours to complete. However, for a number of years ultra-marathons such as the *Comrades*, *Two Oceans* and *Skyrun* have covered distances of respectively 87.6km, 56km and 150km. The time needed to complete these distances varies according to the race but usually takes between 4 – 35+ hours to complete. Another example of ultra-endurance events and the distances covered would be the *Iron Man* competitions. In the standard event in South Africa, the athlete would have a time limit of 18 hours. In this time, the athlete has to swim 3.2km, cycle 180km and run 42.2km.

An obvious deduction that can be made is that the further the distance, the longer the time required to finish the endurance event. As seen previously, the longer an individual is participating in an event, the more factors such as heat, cold, altitude, terrain, hydration and nutrition can negatively affect the individual physiologically and psychologically. Not only does the person's physiological demands increase, but pain and discomfort also increase as the duration of an endurance event increases, thereby contributing to the physical and mental/emotional difficulty of the endurance event.

3.2.4.8 WIND AND RAIN

Wind and rain have a dual effect on the individual's environment. Firstly, wind and rain have a marked effect on the temperature level. Secondly, wind and rain increase the level of discomfort that the individual experiences. As seen previously under 3.2.2.1 and 3.2.2.2 wind and water can have a definite influence of effective temperature in the sense that wind and sweat are major elements of the body cooling processes of evaporation and convection (Stroud, 1998; Armstrong, 2000). At the same time a lack of wind can increase temperature and if coupled to a high level of air moisture can increase humidity. This will negatively influence the body's ability to effectively cool down and increase hydration needs. Furthermore, wind can also increase extreme cold through the same processes by cooling the human body down too quickly. This is called the wind chill factor and as seen in 3.2.2.2 can have a dramatic effect on the effective temperature.

Invariably, this will also have an influence on the energy needs of the individual in the sense that the individual would need more energy. Furthermore, the individual's hydration needs would also be affected. By increasing heat, humidity and cold to extreme levels will increase the level of physical and psychological discomfort for the individual. Another factor is that heavy rain can decrease performance by reducing visibility, turning ground into mud and rivers into torrents. Although a wind from behind can be of great help to increase performance, a headwind will not only hinder performance and increase performance demands, but would also increase the energy outputs and hydration needs.

3.2.4.9 SLEEP DEPRIVATION

In general it can be said that sleep has a recuperative function. It is the recuperation that individuals experience that allows a level of optimal performance (O'Neil, 2004). Although this level of performance is relative to each individual's abilities, it is certain that it would decrease as soon as recuperation through sleep is not obtained. The physiological mechanisms by which sleep restores and sustains alertness and cognitive performance are not yet known (Wesensten, Balkin & Belenky, 1999). One sleep parameter, however, clearly impacts on the recuperative value of sleep, namely sleep duration.

Most healthy adults need between 6 and 8 hours sleep per 24 hours to function effectively the following day. However, the amount of sleep per day needed differs between individuals. Regardless of the inter-individual differences of sleep duration needs, the fact remains that when an individual sleeps less than what is needed, he or she is said to be sleep deprived (O'Neil, 2004). It has been proposed by Horne (in Van Dogen, Rogers & Dinges, 2003) that a normal nocturnal sleep period is comprised of two types of sleep: core or obligatory sleep and optional or facultative sleep. The initial sleep period of the night is referred to as "core" sleep which Horne posits repairs the effects of waking wear and tear on the cerebrum. Accordingly, only the core sleep duration, especially dominated by EEG slow wave activity (SWS), is required for adequate daytime alertness and functioning to be maintained. The additional optional sleep does not contribute to this, although it is regularly cited that the loss of optional sleep resulted in daytime sleepiness (not necessarily cognitive performance degradation). However, it is proposed that this is due to the habitual sleep-wake cycle of individuals and consequently adaptation may take place, which will result in the elimination of this effect.

Horne's theory (Van Drogen *et al.*, 2003) stipulated that a lack of core sleep results in sleep debt, and thus sleep deprivation. Originally Horne's hypothesis (Belenky, Wesensten, Thorne, Thomas, Sing, Redmond, Russo & Balkin, 2003) stated that a minimum amount of nightly sleep that is equal to approximately 4,5 hours is required to satisfy the brain's physiological need for recuperation. In other words, the core sleep duration is 4-5 hours of sleep per night. However, faced with recent evidence of cumulative physiological sleepiness and neurobehavioral deficits at this level of nocturnal sleep, Horne has increased core sleep to be 6 hours of good quality, uninterrupted sleep for most adults (Van Drogen *et al.*, 2003).

According to the core sleep hypothesis, the utilization of spare cerebral capacity enables the brain to perform well with less than 8 hours sleep each night. The possibility of such spare cerebral capacity is consistent with the suggestion of Drummond (Belenky *et al.*, 2003) that the cognitive performance during sleep deprivation involves recruitment of resources from additional, non-task specific – and therefore relatively non-fatigued brain regions. However, Belenky *et al.* (2003) cited that core sleep might best be considered as a minimum amount of sleep needed by the brain to achieve a state of equilibrium in which alertness and performance are maintained at a stable but lower-than-normal level.

Results of other studies (Van Drogen *et al.*, 2003) support this hypothesis. One night of total sleep deprivation was found to produce a significant decline of neurobehavioral performance capability. Subjects whose time in bed was restricted to 4 hours of sleep per night or 6 hours of sleep per night for several nights displayed neurobehavioral performance declines as well. These decrements were less substantial than after 24 hours total sleep deprivation, but were greater after 2 days with 4 hour-restricted sleep and four days of 6 hour restricted sleep. The 6 hours sleep restriction conditions showed less neurobehavioral impairment and it was consequently concluded that a compensatory adaptive mechanism operated during slow accumulation of sleep debt. However, since neurobiological impairment did occur after 8 hours accumulated sleep debt, it was inferred that 8 hours of basal sleep is needed to satisfy optimal functioning levels. This approximate 8 hours of sleep is referred to basal sleep that implies the duration of sleep below which waking deficits begin to accumulate.

At this point, a differentiation should be made between Total Sleep Deprivation (TSD) and sleep restriction (SR or TSR for the Total Sleep Restriction over a period of time). TSD is 24 hours or more without any sleep. TSD is typically defined as the length of time since the end of the last sleep period (Bonnet & Arand, 2001) and can as such be categorized in Steenari's (2003) categorization of short- and long-term sleep deprivation. Short-term sleep deprivation is 24 - 45 hours without sleep, while long-term sleep deprivation is over 45 hours without sleep (Steenari, 2003).

Sleep restriction is what Steenari (2003) refers to as partial sleep deprivation. Sleep will be restricted when a person sleeps less than the amount required (Normally less than 7 – 9 hours of sleep per 24 hours) (Belenky *et al.*, 2003). According to Steenari (2003) partial sleep deprivation will refer to sleep restriction that allows approximately 5 out of 24 hours of sleep. Partial sleep deprivation is typically defined both by the length of the partial sleep period and the chronicity of the shortened sleep schedule (Bonnet & Arand, 2001).

According to Bonnet and Arand (2001: 289) "*the effects of partial and total sleep deprivation are qualitatively similar (a) hormonal effect; (b) pulmonary effects; (c) behavioural effects and (d) alertness effects*".

In addition to sleep duration the sleep continuity seems also to play a role in the extent to which sleep may be recuperative (Belenky, 1997; Wesensten *et al.*, 1999). A disturbance in the continuity of sleep is also referred to as sleep fragmentation. Based on studies that have shown to affect next-day performance and alertness as impaired by sleep fragmentation procedures even when total sleep time (TST) is unaffected it is hypothesised that both the duration and continuity of sleep determine its recuperative value (Wesensten *et al.*, 1999). Brief fragmented sleep has little or no recuperative value and is similar to TSD on performance. In a review of comparative studies Bonnet and Arand (2001) concluded that the symptoms of TSD and sleep fragmentation are effectively the same.

Sleep deprivation is directly linked to a decrease in overall performance owing to impairments in the mental (cognitive), emotional and physiological functions. A meta-analysis by Pilcher and Huffcutt (Steenari, 2003) revealed that sleep deprivation affects cognitive performance more than motor performance. According to Belenky (1997) laboratory studies showed that mental work declines by 25% during each successive 24 hours of continuous wakefulness. Even though sleep

deprived individuals are able to maintain accuracy on cognitive tasks the speed declines as wakefulness is extended. According to O' Neil (2004), sleep deprivation degrades complex cognitive performance, including the ability to understand, adapt, and plan in rapidly changing circumstances. In contrast to the complex mental performance, simple psychomotor performance, physical strength and endurance are unaffected by sleep deprivation.

Sleep loss symptoms become more prevalent as sleep debt builds up. In other words, the effects of sleep deprivation become more severe the longer the individual is sleep deprived. Sleepiness is one of the first indications of sleep loss and micro sleep lapses; the eventual outcome of accumulating sleepiness is often visible after approximately 48 – 72hours TSD.

Sleepiness by sleep loss impairs human performance (Hodoba, 1999). Mild sleepiness is most apparent during passive or boring situations. With more severe sleepiness, the individual may have difficulty staying awake during more active conditions, such as during conversations or meals. Sleepiness is excessive when it occurs at inappropriate or undesirable times. Chronic or excessive sleepiness is accompanied by lapses of attention and by impaired motor and cognitive abilities. When sleepiness is chronic and severe, the individual may become less aware of sleepiness and may fall asleep without warning – these episodes are called sleep attacks or micro sleep lapses.

With prolonged sleep deprivation the body's requirement for sleep will increase so strongly that it becomes impossible to withstand sleep, and subjects will fall asleep even in the upright position (Opstadt, 1995; Caldwell & Siff, 2001; RAILRIDERS, 2001; E.S.C.A.P.E, 2002; Frontier Adventure Racing, 2002; Marais, 2002). Firstly however, this will appear during the night-time, particularly in a period with rather low physical activity, in the form of extreme tiredness followed by balance disturbance, problems with straight walking along the roads, later with pseudo – or real illusions and hallucinations.

Poor performance in sleep-deprived condition refers to below the expected average performance after no sleep loss. Poor performance of sleep-deprived individuals may be ascribed to higher error rates and errors of omission (Bonnet & Arand, 2001). Consequently below standard performance occurs. The sleep-deprived individual is also inclined to underestimate his/her performance as well as accept the below

standard performance. This can be seen in the results of a study by Engle-Friedman, Riela, Golan, Ventuneac, Davis, Jefferson and Major (2003).

According to the authors, sleep loss results in a preference for tasks demanding minimal effort. In other words, when individuals have control over the tasks they have to do, sleep deprived individuals will preferably engage in the tasks demanding minimal effort. Motivation often lacks to complete tasks that are perceived as trivial. It is because of this that in endurance events one may find that athletes fail to complete routines like drying the feet, changing socks, or filling canteens when water is available. One of the clinical symptoms of SD is poor mood, which includes increased fatigue, confusion, stress and irritability (Belenky, 1997; Bonnet & Arand, 2001). It may also include aggression or abusiveness, mood swings and in extreme cases apathy.

Mood changes, decreased motivation or willingness to work, and diminished performance go hand in hand. Sleep deprived individuals may feel less energetic, alert, and cheerful and less interested in their surroundings while at the same time, they are more irritable and increasingly negative and sleepy (Caldwell & Siff, 2001; Senk, 2001; KIMM, 2002; O'Neil, 2004). Some may even become depressed and apathetic. After long periods of sleep loss, individuals may go from being irritable and negative to dull and weary. The effect of SD on emotion is visible after only 24 hours SD. Losing more than one night's sleep does produce a noticeable increase in irritability, lethargy, and disinterest (Gale Encyclopaedia of Science, 2001). Engle-Friedman et al., (2003) found that after 24 hours of sleep deprivation subjects' levels of depression/dejection, fatigue, tension/anxiety, confusion/bewilderment and anger/hostility increased, while vigour decreased. All of these mood states differed significantly from a non-sleep deprived group, except for anger/hostility. From this one can infer that depression, fatigue, tension/anxiety and confusion/bewilderment may be a direct consequence of SD, while anger and hostility may be more situationally bound. In this same study, the total mood disturbance of sleep-deprived individuals was also significantly higher than that of non-sleep deprived individuals.

According to Hodoba (1999) the results of a meta-analysis of 19 original studies suggest that mood is more affected by SD than either cognitive or motor performance. Of course, mood, cognition and physical functioning are interlinked and may have direct or indirect influence on one another.

Mild cases of paranoia have been cited as symptom of sleep deprivation. For some paranoia may set in after only 24 hours of SD or SR (Gale Encyclopaedia of Science, 2000). This may be linked to the individual's mental state before SD/SR occurs, although the basis of this has not yet been established. Hallucinations are a very common occurrence under sleep-deprived conditions. Visual hypnagogic hallucinations occur, according to Opstadt (1995), after 72 hours SD. If these symptoms of prolonged SD start to appear, the subjects may take the hallucinations for real signs, whereas at later on stages, they will have become normal and all unexpected events will be registered as hallucinations.

In other words, the individual no longer has the ability to distinguish between reality and 'dream' (O' Neil, 2004). In endurance events such as adventure races or multi-day ultra marathons, this may be a serious impairment of an athlete's functioning owing to the loss of ability to differentiate between real and not real signs – functions such as navigation will become impossible (Brook, 1987; Caldwell & Siff, 2001; E.S.C.A.P.E, 2002; Frontier Adventure Racing, 2002; KIMM, 2002; Marais, 2002).

According to Thomas, Sing, Belenky, Holcomb, Mayberg, Dannals, Wagner, Thorne, Popp, Rowland, Welsh, Balwinski and Redmond (2001) task performance during SD are influenced by visual perception. Subjects reported that they had difficulty seeing numbers on a computer screen while busy with an addition/subtraction exercise. Their visual perception decreased significantly from 24 – 72 hours sleep deprivation. Blurred vision, fog sight and disturbed distance vision were also reported by Opstadt (1995) after 72 hours of sleep deprivation. Increases in occurrences of blurred vision and visual misperceptions were evident in the study by Thomas *et al.*, (2001).

According to the authors (Thomas *et al.*, 2001), there was a linear increase over the prolonged SD period for occurrences of blurred vision, which was significant only for the 24 hours to 48 hours, SD. By implication occurrences of blurred vision increase over the period of 72 hours, but there is a larger increase between 24 to 48 hours of SD than between 48 to 72 hours. Slurred and incoherent speech is another symptom of SD. Except for the speech deficits, communication overall seems to deteriorate. The sleep-deprived individual has difficulty formulating messages, deciding on the priority in the message content or how to communicate the message content in an understandable manner.

Many authors have cited the effect of SD on alertness. Lamberg (1999: 3) notes that sleep “*may be viewed as a drug that increases alertness*”. In other words, optimal alertness is directly linked to adequate recovery sleep. The reduced vigilance in sleep-deprived individuals may be directly linked to attention and concentration impairments. Lapses in attention and concentration are one of the clinical symptoms of SD (Bonnet & Arand, 2001). In effect a subject who is sleep deprived can be easily distracted as SD causes the attention span to shorten. The sleep-deprived person cannot sustain peak attention in monotonous circumstances (Moore-Ede, 2003).

After 24 hours, concentration seems to be adversely affected, although not seriously impaired. Concentration over 72 hours of SD seems to reduce rapidly between 48 hours and 72 hours. Thomas *et al.* (2001) cite that concentration measured over 72 hours of sleep deprivation shows a linear decrease and causes an increase in task difficulty that is significantly different at 72 hours than at 48 hours or 24 hours.

SD is known to have an effect on memory. Memory is the retention of information over time. Impaired short-term memory or working memory (memory loss for recent events) is a clinical symptom of SD (Bonnet & Arand, 2001). Working memory enables one to manage in new situations and is necessary for fundamental aspects of human behaviour including learning, reasoning and language comprehension. Working memory can further be divided into the central executive who is an attention control system and hierarchical lower slave systems that are utilize in holding and manipulating modality-specific working memory information (Steenari, 2003).

Owing to impaired working memory due to SD it is also increasingly difficult to learn new information. However, Thomas *et al.*, (2001) note that long-term memory (remembering how to do tasks) also has an influence on task performance over 72 hours of SD.

It is said that SD slows reaction speed (delayed responses) and leads to mental lapses in cognitive tests (Kim, Guilleminault, Hong, Kim, Kim, Go & Lee, 2001). According to Belenky (1997) the cognitive performance of subjects over a period of 72 hours SD, indicated that performance on serial addition/subtraction declined steadily. In other words, the degradation in performance was linear. Under sleep-deprived conditions, the overall performance typically declines, primarily as a result of a reduction in speed. Accuracy can be relatively preserved during SD. Between 0

– 24 hours of sleep deprivation, performance actually inclines, while after 24 hours a steady decline is observable. In a study of serial subtraction/addition over a period of 85 hours of SD with 30-minute naps per day, indicated that decreased the rate of performance degradation.

Decision-making is a complex cognitive process. It includes the accurate search and appraisal of information, understating the options and choosing the best option of the available alternatives. The latter includes the evaluation of possible consequences of specific actions. During the process, the individual will continue to seek new information and re-evaluate old information and when the desired level of confidence is reached a final decision is made (Bruck & Pisani, 1999).

SD has the effect of reduced decision-making abilities, impaired judgment, the persistence of ineffective solutions, fixation/inability to mentally adapt to differing situations, difficulty in processing information and reduced comprehension and perceptual abilities. As cited by Lamberg (1999: 1): *“Sleep disruption, coupled with heavy physical demands...may impair critical decision-making and other cognitive skills”*.

A decrease in stimulus comprehension (i.e. not understanding incoming stimuli) has been cited in other studies as well. Thomas *et al.* (2001) cited that stimulus comprehension in an addition/subtraction task over 72 hours SD increased task difficulty and resulted in lower task performance. According to Flemming-Michael (2003), SD has serious consequences for decision-making, information processing and judgment. This is owing to the regions of the brain that best perform these actions which are most affected by SD. Degrading activity in the prefrontal cortex, parietal cortex and thalamus can cause problems during these types of cognitive tasks. These cognitive tasks are associated with higher-order thinking or executive thinking. The effects of SD on cognitive functioning have been well documented. The most effected mental processes are the more complex higher order functions such as high-level executive thinking. Although executive tasks are not clearly defined, it includes the frontal lobe functions involved in *“the ability to plan and co-ordinate willful action in the face of alternatives, to monitor and update action as necessary, and to suppress distracting material by focusing attention to the task in hand”* (Jones & Harrison, 2001: 464).

Executive tasks do not draw on automatic processes, but should include a combination of novelty, effort and working memory demands. Examples of the effect of SD on executive thinking are outlined by Jones and Harrison (2001). Short-term sleep deprivation (36 hours) has been found to decrease creative thinking, verbal fluency and working memory, and impair risk-taking strategies. Chronic partial sleep deprivation impairs mental flexibility, attention and memory. People working in emergency situations who are sleep deprived are likely to have an impaired ability to make decisions that involve the unexpected. The effects of SD become physically visible in appearance. Changes in appearance include vacant stares, bloodshot eyes, pale skin, and poor personal hygiene. Other physical signs of sleep loss include the body swaying when standing, sudden dropping of the chin when sitting occasional loss of handgrip strength and walking into obstacles and ditches.

According to Opstadt (1995) slow motion, visible balance disturbances and headaches become apparent after 72 hours SD. Physical exhaustion becomes especially apparent after 72 hours SD. The consequences of SD are affected by the time of day in which performance is measured or observed. In terms of circadian rhythms, the effects seem to occur during nighttimes or the times during which the individual will usually sleep. Also, of course, melatonin secretion does not take place during darkness, which also has an influence on the effects SD. For example, sleepiness may be increased. Since core body temperature has an effect on sleepiness, a person who is sleep-deprived may be more susceptible to the effects of SD during some periods of the day when the core body temperature is at its lowest. Athletes may feel that it takes more effort to do a physical task in the morning than it takes to do the same task in the afternoon. They may feel like stopping work due to exaggerated feelings of physical exertion. This is especially true between 04h00 – 07h00. During this time the tendency to fall asleep is considerably more noticeable than at other times of the nighttime work period. The time of day should however only be a determining factor for a certain period of time. After approximately 72 hours most effects will not be enhanced by the time of day.

The individual's health and diet (water and food intake) also plays a role in the prevalence of SD (O'Neil, 2004). No studies dedicated how these aspects influence the effects of SD, were found. However, the logical inference would be that poor health and diet during SD should increase the effect thereof. Another logical inference may be that health and diet may determine when the effects set in. Logically, a healthy person following a balanced diet during SD should maintain the

body's balance for longer. Degradation in the body system should however have special needs in terms of diet. The specific dietary needs of a sleep deprived individual have however not been specified.

The amount of physical activity has a definite effect on the consequences of SD. While physical activity should lead to physical exhaustion, it should reduce sleepiness owing to the maintenance of core body temperature. As mentioned earlier, sleepiness is induced by a loss of core body temperature (Matsumoto, Mishima, Satoh, Shumizu & Hishikawa, 2002).

In light of this it makes sense that subjective sleepiness can be elevated by physical exercise as it produces a heat-production effect. However, even though subjective sleepiness may be elevated by physical exercise, objective productivity impairments remain. In other words, although an individual may not feel sleepy due to physical exercise, his performance levels will still be influenced by a lack of sleep. According to O'Neil (2004), this effect of dissociation between sleepiness and performance levels may increase the risk of human error as the decrease in subjective sleepiness may blind one of the actual deteriorating brain functions.

High motivation can help keep people going, but there is an increased risk due to impaired performance. When sleep is limited to 4-5 hours of sleep each night alertness and performance decline to the same low levels as those seen following two-days of TSD.

3.2.4.10 EQUIPMENT

In endurance events such as backpacking, kayaking/canoeing, cycling, mountain biking, adventure racing, participants have some form of equipment that they need to complete the event and that increases the difficulty of the event. Marathon running and cycling are the only exceptions where athletes carry as little as possible and where refreshments are available along the route. However, even in events such as ultra-distance cycling, competitors take along hydration bags and other forms of nutrition, especially when the event is longer than 2½ -3 hours. In some ultra-distance marathons such as the *Skyrun* or the *Marathon of the Sands* in Morocco, competitors have to carry their own nutrition and hydration on their backs in packs weighing between 7 – 16kg (Stroud, 1998).

In adventure racing the compulsory equipment for a short race can weigh up to 20kg whereas unassisted expedition races can require packs of up to 25kg. This does not include the parts of the race where the competitors have to carry their mountain bikes or watercraft for long distances. Even in canoeing events such as the *Duzi* or *Berg River*, competitors have to get out of the water and carry their canoes for long distances where the water levels are too low for paddling. Backpacking involves that hikers have to cover long distances carrying all their nutrition and hydration needs on their backs – enough for 5+ days. This involves packs sometimes weighing between 25 – 35kg. Some people such as soldiers and policemen sometimes have to carry between 35 – 45+ kg packs for extended periods of time.

The effect of this is that the equipment needed for some endurance events contributes to the extreme conditions in the sense that it increases the difficulty of the event and increases the energy and hydration needs. Furthermore, the weight of the packs increases the level of pain and discomfort that the individual has to endure.

3.3 SUMMARY

This chapter focused on stress and arousal in sport as well as the influence thereof on performance. For the aim of this study, stress was defined as *the internal psychological tension caused by internal and external stressors that changes or are perceived to change the nature of the present and/or future situation to such an extent that it forces the individual to adapt by means of physiological and psychological responses.*

The process whereby the individual is prepared physiologically and psychologically for the adaptive actions is called arousal and takes place before the individual starts to take adaptive action. The relationship between stress, anxiety, fear and arousal is that stress is the internal tension of the individual caused by changes in the situation or future situation. These changes or perceived changes cause an emotional state (fear and anxiety) depending on the stressor. This forces (motivates) the individual to take certain physiological and psychological actions to adapt to these changes.

The level of arousal would depend on the level of stress that the individual experiences as well as the intensity of the emotional state experienced by the individual. The intensity of the emotional state experienced would depend on the stressor or perceived stressor as well as the individual's perceived capacity to cope

with the stressor or perceived stressor. Therefore, stress will be the factor that motivates the individual to adapt to changes in the situation. This is accompanied by an emotional state that will determine the level of arousal that the individual experiences. The arousal level will determine the individual's physiological and psychological readiness to respond to changes or stressors and the physiological and psychological coping strategies will determine how the individual will respond to stressors. Stress can have positive and negative effects on the individual and his or her performance. The effect of stress would depend on the individual's capacity and perceived capacity to cope with the stressors as well as the level of physiological and psychological readiness to do so. However, therein lie the two important factors that determine the effect of stress on individual performance. If the individual does not have the capacity or perceived capacity to cope with the demands or stressors of the situation or chooses incorrect strategies – the individual's performance will suffer or he will be overwhelmed completely.

Secondly, if the individual's level of readiness is too low or too high, performance will also suffer or fail completely. The effect of arousal on performance is that performance is dependant on an optimal level of physiological and cognitive arousal.

As each individual is different with regards to skills, experience, motivation and personality traits, the perception of stressors as well as coping strategies and optimal arousal level will differ. When an individual's arousal level is under or above the optimal level, his/her performance will deteriorate. Arousal is influenced by the cognitive perception of a stressor and different stressors would require different cognitive activation states or coping strategies. Arousal, as such, is not the focus of this study. However, it is one of the environmental factors or stressors that endurance athletes have to cope with during endurance events.

The second part of this chapter focused on physical environmental factors that have an influence on athletes that participate in endurance events. To do this it was necessary to define endurance sport. In this study, endurance events are defined as:

Those sport events where the distance, time and the level of aerobic fitness/intensity requirements for successful completion are considerably higher than when compared to other sport events.

Furthermore, it was necessary to identify the environmental factors or stressors that have an influence on the endurance athlete. The factors that were identified and discussed in this chapter were heat, cold, altitude, nutrition, hydration, wind & rain, terrain, distance, sleep deprivation and equipment. Each of these factors were discussed in terms of the negative influences that they have on the physiological and psychological functioning and performance of the endurance athlete.

In the next chapter, the psychological adaptations that people make to cope with extreme conditions in endurance events will be discussed.

CHAPTER 4

HUMAN PSYCHOLOGICAL ADAPTATION TO EXTREME ENVIRONMENTS

“Where there is no pain in the fight - there is no glory in the triumph”.

– Pierre Corneulle (1606 – 1635)

4.1 INTRODUCTION

In the previous chapter, extreme environments or stressors during endurance sport were discussed as well as the physiological adaptations that the human body makes to survive in these conditions. In this chapter, the focus will be on the cognitive, emotional and social adaptations or coping strategies that the individual makes in order to survive in these extreme environments. According to various authors (Stroud, 1998; Armstrong, 2000; Mann & Schaad, 2001), there are several principles that need to be considered to fully understand human ability to adapt to extreme environments. These principles are the following:

- a. Humans may lack or have insufficient hereditary physiological abilities to survive and adapt to all extreme environments.
- b. All people are different and therefore may differ in their reaction to threats, danger or challenges. For some, stressful experiences may result in temporary upsets or permanent psychological damage. For some, these stressful experiences may have positive effects and may lead to personal growth.

- c. Different individuals respond differently to the same stressor. Some may show no strain, illness or injury depending on factors such as age, developed tolerance, immune system, competence, level of physical and mental fitness and the number, intensity and outcome of previous exposure to the stressor.
- d. Stressors may have positive effects that will allow the individual to meet future physical and psychosocial challenges successfully.
- e. Extreme environments are strongly mediated by psychological factors (see table 4.1). If extreme environments are not seen as noxious or alarming, they will produce smaller or even opposite physical responses.
- f. If humans are able to prevent, control, avoid or respond to stressors, they will usually not become ill or injured and will perceive the stressor(s) and their own ability to cope more positively.
- g. Psychological strategies or coping strategies may influence or change the amount of strain that the individual experiences when exposed to a stressful environment. Strategies used can include self-assurance, self-deception, denial, religion, social support, visualization.
- h. Mediators are biological, social, cognitive and emotional modifiers that act on stressors to alter the level of physiological strain experienced. Mediators can lower or enhance the level of physiological strain experienced.
- i. Physiological and behavioural changes occur sometimes even before a stressor is experienced in anticipation of and in preparation for challenges, threats or danger. An example of this is the high arousal levels experienced by an individual before an important event.

TABLE 4.1: FACTORS THAT INFLUENCE THE OUTCOME OF EXPOSURE TO A STRESSFUL ENVIRONMENT (ARMSTRONG, 2000)

Personal perception of environment or situation Emotional response to the environmental situation
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Genetic characteristics
Available resources
Age (especially in preadolescence and old age)
Nature and duration of previous experiences
Control or escape possibilities
Intelligence, education and skills
Number of similar previous experiences

As seen in chapter 3, human beings have extensive physiological mechanisms to cope with extreme environments. However, the human body is not genetically designed to be able to withstand all extreme environments and even where it is, the physical and psychological discomfort caused by these environments can have a negative impact on performance under these conditions (Stroud, 1998; Armstrong, 2000; Mann & Schaad, 2001; Williamson, 2003). Therefore, individuals and groups that have to survive and perform under extreme conditions need to employ certain psychological strategies to cope with the extreme environment and to motivate themselves to survive and perform. To fully understand the coping strategies used by endurance athletes under extreme conditions, it is necessary to break up the concept into two parts, motivational strategies (will be discussed in Chapter 5) and coping strategies. The next section will focus briefly on the coping strategies employed by humans to survive and perform under extreme conditions.

4.2 COPING STRATEGIES

According to various authors (Aldwin, 1993; Lingren, 1998; Taylor, 1998; Levin, 2003; Fryenburg, 2004; Lopez-Vazquez & Marvan, 2004) coping strategies refer to the specific efforts, both behavioural and psychological, that people employ to master, tolerate, reduce, or minimize stressful events. Some authors use the term resilience to describe the same phenomena.

Weinberg and Gould (2003) define coping as the process where the individual constantly changes cognitive and behavioural efforts in order to manage specific external and/or internal demands or conflicts that are appraised as taxing or exceeding the individual's resources. Garmezy (Van Breda, 2001) uses the term resilience to describe the skills, abilities, knowledge and insight that accumulate over time by people to surmount challenges and overcome adversity. It is an ongoing fund of energy and skills that people can use to overcome current challenges. Van Breda

(2001) describes resilience as the capacity for successful adaptation, positive functioning or competence despite high-risk status, chronic stress, or following prolonged or severe stress. For this study the term coping strategies will be used to describe those behavioural and psychological means (inherent and learned) that people employ to surmount difficulties and meet challenges.

Coping strategies can primarily be defined in terms of the protective factors (personal, family, community) that enable the individual to resist life stress (Taylor, 1998; Van Breda, 2001). An important component of coping strategies is the hazardous, adverse or life-threatening circumstances that result in individual vulnerability (Taylor, 1998; Van Breda, 2001). The effectiveness of an individual's coping strategies at any moment is determined by the ratio between the presence of protective factors and the presence of hazardous circumstances. This would mean that the more protective factors or coping strategies a person has that is effective in a specific situation, the better the person will be able to overcome the challenge or stressful situation.

Four patterns or sources of coping strategies are identified by Polk (1997):

- 1) Dispositional pattern refers to the physical and ego-related psychosocial attributes that enhance the coping ability of the individual. Examples of this are positive self-concept, independence, self-resiliency, physical fitness and health.
- 2) Relational pattern refers to the roles and relationships that the individual has in the society. These roles and relationships can range from intimate and close relationships to more broader and distant relationships.
- 3) Situational pattern can be related to the link between the individual and a specific stressful situation. These can include a multitude of stressful situations and can include a person's judgment, problem-solving ability and the ability to respond to the stressful situation.
- 4) Philosophical pattern refers to the worldview or perception of life that the individual has. This pattern has a major impact on the individual's capacity to overcome challenges and adversity. A belief system that sees problems as

challenges and learning opportunities will promote the individual's coping capacity.

From these patterns, the deduction can be made that coping strategies function at different levels and have distinct applications. It would seem that athletes and especially successful athletes vary their coping strategies to cope with different situations, but that all have specific strategies that are used when needed (Weinberg & Gould, 2003). Some are very specific while others are all encompassing and is more an attitude than a specific strategy. It is also possible to identify strategies that can be linked to personality, cognition, social strategies and affective or emotional strategies. As such, coping strategies can therefore be defined as: ... *those strategies (cognitive, emotional, behavioural and social) that individuals use to successfully adapt to stressors or adversity in their present or future situations and thereby continue to function at the same or better level of functioning/performance than before the adverse or stressful situation.*

A distinction can be made between the focus of coping strategies: problem solving focused strategies and emotion-focused coping strategies. Problem-solving strategies actively try to overcome the challenge or alleviate stressful circumstances. Emotion-focused strategies are efforts to regulate the emotional consequences of stressful or potentially stressful situations (Jones & Hardy, 1990; Taylor, 1998; Cox, 2002; Weinberg & Gould, 2003). A person may use both strategies to cope with stressful situations. Predominance of either strategy is determined by personal style or the type of situation the person finds himself in (Jones & Hardy, 1990; Taylor, 1998; Cox, 2002; Weinberg & Gould, 2003).

Taylor (1998), Cox (2002) and Weinberg and Gould (2003) also identified two other styles: active and avoidant. Active coping strategies usually involve either behavioural or psychological responses that attempt to change the nature of the stressful situation or the perception of the individual about the stressor. Avoidant strategies are behavioural or psychological strategies that keep them from addressing the stressors directly. Reber (1995) supports the notion of active and avoidant coping strategies. He uses the term to refer to coping strategies and defence mechanisms.

"Coping strategies are conscious, rational ways of dealing with the anxieties of life. The term is used for those strategies designed to deal with the source of the anxiety.

Defense mechanisms *...are designed unconsciously to deal directly with the anxiety itself rather than with the source... Furthermore it is ...processes (or behaviours) that are unconsciously motivated, unconsciously acquired, and developed to protect the self or ego from unpleasantness of many kinds. Literally dozens of defence mechanisms have been hypothesized; some of the most commonly cited include repression, regression, rationalization and projection”* (Reber, 1998: 164, 187 – 188).

Active coping strategies, where the source of the anxiety or stress is positively solved or removed are better than avoidant strategies where the anxiety itself is dealt with (Aldwin, 1993; Reber, 1995; Lingren, 1998; Taylor, 1998; Van Breda, 2001; Levin, 2003; Fryenburg, 2004; Lopez-Vazquez & Marvan, 2004).

In summary, the following deductions can be made about coping strategies:

Coping strategies are efforts or actions by an individual to minimize the negative effect of stressors. They function at different levels, including personality, cognition, social and affective or emotional levels – each with its distinct functions. Coping strategies can be described as skills, techniques, attitudes and behaviour learned in an ongoing process through life. They can be either active (conscious/rational) or avoidant (unconscious) behavioural or psychological responses. For a person to use coping strategies, the individual must perceive (consciously or unconsciously) that a threatening, dangerous or hazardous situation or condition is present. When a threatening, dangerous or hazardous situation or condition is perceived, the individual must be motivated to overcome the threatening situation or condition before active coping strategies can be used.

In this study, a distinction will be made between active coping strategies and avoidant coping strategies.

Active coping strategies are conscious, rational learned behavioural, emotional, cognitive or social responses used to minimize the effect of or the sources of stress and anxiety.

Avoidant coping strategies are learned processes (or behaviours) that are unconsciously motivated, unconsciously acquired, and developed to protect the self or ego from anxiety itself.

More specifically this study focuses on the active coping strategies that athletes use during endurance sport. Avoidant coping strategies are viewed and described as coping strategies (also it includes strategies that enable the individual to cope and protect the ego from anxiety). However, active coping strategies focus on problems related to the external environment, which is the focus of this study.

Before active coping strategies can be discussed in more depth, it is important to understand the theoretical perspectives and approaches to coping and coping strategies.

4.3 COPING THEORIES

As seen in chapter 2, the theoretical approach used in this study when studying the development of coping and motivational strategies is the Salutogenic Model of Health. This model basically studies the reasons why people are able to cope with the stressors of different situations as opposed to the pathogenesis approach that focus on the reasons why people are unable to cope. This is also the basic approach of the researcher in this study.

Five theories with a similar basic approach as the Salutogenic approach will be discussed. They include, sense of coherence (SOC), thriving, hardiness, self-efficacy and locus of control (LoC).

4.3.1 SENSE OF COHERENCE

Sense of coherence (SOC) is the central contribution to Antonovsky's Salutogenic theory. Ongoing research has shown that SOC contributes substantially to people's ability to cope (Van Breda, 2001). It is not a specific coping style; method or technique but is rather a general approach to life that enables the individual to cope with challenges. A person with a strong SOC, may understand a situation, the stressors involved and will see it as a challenge that can be solved with the correct coping techniques.

Antonovsky (1979: 123) defines SOC in the following manner:

“The sense of coherence is a global orientation that expresses the extent to which one has a pervasive, enduring, though dynamic feeling of confidence that one's

internal and external environments are predictable and that there is a high probability that things will work out as well as reasonably can be expected ”.

Accordingly, SOC is in essence a life philosophy or an attitude that perceives life and problems or challenges in a positive light. It is furthermore an attitude or belief in the individual's own ability to overcome most problems by means of understanding of problems and the mobilization of the correct coping strategies.

Antonovsky identified three concepts or main components of SOC to formulate coping better (Van Breda, 2001):

- 1) Stimuli derived from the individual's internal and external environments are structured, predictable and understandable;
- 2) Resources are available to meet the demands posed by these stimuli;
- 3) These demands are challenges that are worth the individual's time and effort.

Antonovsky called these components comprehensibility, manageability and meaningfulness (Van Breda, 2001).

Comprehensibility can be described as the cognitive dimension of SOC whereby the individual makes sense of or thinks about internal and external stimuli or situations. This component is based on the belief that the current situation is comprehensible and that future situations would also be comprehensible. Although future situations might be challenging and even difficult to comprehend, the situations will still be comprehensible and still make sense.

Manageability can be described as the extent of the individual's belief that he/she not only understands the situation but is also able to control the situation to such an extent that the outcome is within the reasonable expectations of the individual. This component refers to the fact that the individual perceives that the resources needed to overcome the situation are available to the individual. Although there seems to be some similarities with the locus of control theory, Antonovsky (Van Breda, 2001) proposes that the two concepts are quite different. Locus of control refers to the resources that *an individual* controls to overcome the situation. Manageability, as proposed by Antonovsky, refers to all resources that are controlled by the individual

as well as by legitimate others – friends, colleagues, and family – on which one can depend to help overcome the challenges. Manageability refers to a realistic expectation that difficulties and challenges will occur in life, but also that the individual will be able to overcome these difficulties by the use of own resources and/or the help of legitimate others.

Meaningfulness can be described as the emotional dimension of comprehensibility. Where comprehensibility means that the individual makes cognitive sense of life and the specific challenges that confront him/her, meaningfulness means that life and the specific challenge is worth the effort to overcome it. In other words, it has a specific emotional meaning for the individual to overcome the specific challenge. In this sense meaningfulness accounts for an individual's motivation to overcome a difficult situation. When a difficult situation is perceived to be meaningful, the individual would invest emotional energy into the overcoming of the situation and would see it as a challenge and not a burden. Therefore, the resolution of the problem or the overcoming of the challenge provides the individual with rewards that makes the effort worthwhile.

Antonovsky makes the assumption that SOC is established at the age of 30 and that it remains stable thereafter. An individual that enters adulthood with a strong SOC will continue to search out life experiences that will reinforce and even enhance his/her SOC. Even extremely traumatic experiences will be overcome with SOC still intact. Antonovsky argues that people with a strong SOC will get more SOC, while individuals with a low SOC will develop a pattern of deteriorating health and weakening SOC (Van Breda, 2001).

However, Antonovsky (Van Breda, 2001) also points out that SOC is dynamic and that his position on the development of SOC is theoretical and not empirical. He proposes that due to the dynamic nature of the construct, SOC can change throughout an individual's life. He proposes that change and even significant change can take place when people frequently seek out SOC-enhancing experiences over a sustained period of time.

4.3.2 THRIVING

Thriving, a concept developed by Ickovics and Park (Van Breda, 2001), goes further than coping or resilience in the sense that stressors or challenges may enhance the

functioning of an individual. Ickovics and Park (Van Breda, 2001:237 - 238) define thriving as:

“The effective mobilization of individual and social resources in response to risk or threat, leading to positive mental or physical outcomes and/or positive social outcomes. We suggest that thriving represents something more than a return to equilibrium following a challenge... We propose a “value-added” model, whereby an individual or community may go beyond survival and recovery from an illness or a stressor to thrive”.

Thriving is more than mere coping with stressors. It entails the mobilization of all individual and social resources (coping strategies) to not only survive a threat, but to overcome the stressor or challenge stronger than before.

As with SOC, the individual who thrives, does so by means of a cognitive attitude or belief that adversity is not a burden but something that is a challenge worthwhile (emotional dimension) to overcome by means of individual and social coping strategies. This mental or cognitive attitude can be seen in the four possible responses to adversity as proposed by Carver (in Van Breda, 2001). All of these responses assume an initial deterioration of functioning (see Figure 4.1).

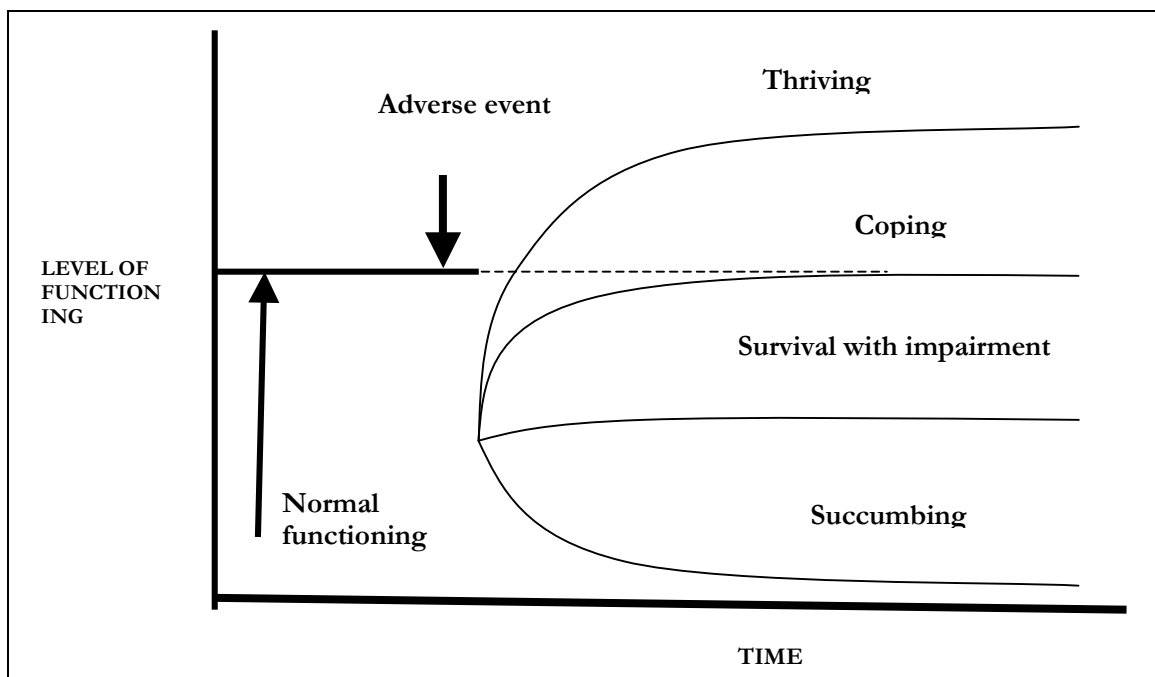


FIGURE 4.1: RESPONSES TO ADVERSITY (VAN BREDA, 2001)

Firstly, the individual's functioning may continue to fall below the initial level of deterioration induced by the crisis. In this response the individual *succumbs* to the stressors. The second response is where the individual's performance improves but is still below the level it was before the crisis. In this response the individual *survives* but his/her capacity is *diminished* or *impaired*.

The third response is where the individual's performance improves to the same level of functioning that it was before the adverse event. The individual therefore coped effectively with the demands or stressors of the event and is not impaired in any manner. This response is called *resilience* or *coping*. Lastly, the individual's performance not only returns to the level of functioning that it was before the adverse event. Here the level of functioning exceeds the normal levels. This response is called *thriving*. Whereas coping attempts to return the individual to the equilibrium or balance that existed before adversity, thriving is the acquiring of new skills and knowledge (about the self, new coping techniques), of new confidence and mastery and new interpersonal skills. Thriving is best understood by focusing on the processes whereby people recover or thrive from adversity (Van Breda, 2001). These three processes are adaptation by desensitisation, adaptation by enhanced recovery potential and adaptation by thriving.

The first process or adaptation by desensitisation the individual becomes desensitised to adverse events or stressors through continued exposure to these stressors. By continued exposure to these stressors the deterioration of performance or functioning as well as the recovery time will become less. Eventually the individual will become so inoculated against the stressors that it will have no noticeable effect. This process will not enhance performance above the baseline and is therefore a form of coping.

In the second process, the individual learns to cope more efficiently with the stressors. Although the stressors are experienced each time are just as severe and disruptive for each event, the recovery time is reduced. As with the previous process the baseline functioning does not improve. Therefore, this process is also an example of coping and not thriving.

The third process, adaptation through thriving, is where the individual's performance (after an initial deterioration) is raised to a level above the initial baseline. When the event or stressor is experienced again, the loss of performance or functioning is

equally disruptive as the first time. However, the baseline of functioning has been raised and the event or stressor can further enhance the individual's performance or functioning to an even higher level. In this process the individual's performance or functioning is continually enhanced above baseline levels. Therefore, this is not only coping with the stressors but also thriving.

Thriving not only requires challenges or adversity but also an individual with certain qualities that will be able to utilize the challenge or adversity to thrive. According to Van Breda (2001), these qualities are cognitive, emotional, personality and social resources such as accurate threat appraisal and perceived personal risk, self-efficacy, social support systems, problem-solving skills, self-motivation and the ability to integrate the meaning attached to adversity and stressors, and social processes and rituals that facilitate life-transitions.

4.3.3 HARDINESS

The construct, hardiness, was developed following several studies that focused on the relationship between stress and well being that showed only moderate correlations. One of the reasons for this was the presence of subjects with high stress scores who were not getting ill. Kobasa (1979), conducted studies on middle and upper executives and found that high stress/low illness executives could be distinguished from high stress/high illness executives on a construct called hardiness. These executives had a stronger commitment to the self, an attitude of vigorousness toward the environment, a sense of meaningfulness and an internal locus of control.

Hardiness was posited as the mediating factor between stress and illness, potentially reducing the negative effects of stress. According to Van Breda (2001), hardiness comprises three subconstructs; commitment, control and challenge.

Commitment refers to the positive value that the individual places on his life and activities, himself, his relationships as well as the investment (effort) of himself in these valued dimensions. Commitment results in a self-perceived sense of purpose in the individual's life that can carry him/her through difficult times or adversity.

Control refers to the perceived sense of control that the individual has over a situation. It entails the belief and consequent actions that the individual has that the

situation is controllable and changeable through the individual's own actions and attitudes. Therefore, people with control are able to change situations by developing and implementing action plans that transform adversity and stressors into positive outcomes.

Challenge as opposed to threat is the belief that change is a normal part of life. Individuals with this attitude view stressful life events and situations as normal (they are anticipated). Nor are these stressful events or even adversity viewed with dismay as they are seen as exciting opportunities for growth and development.

According to this theory, hardy individuals have considerable curiosity and tend to find their experiences interesting and meaningful. Furthermore, they believe that they can control the outcome of situations by their words, actions or ideas. At the same time they expect change and regard it as an important stimuli for development.

These beliefs and tendencies are useful in coping with adversity and difficulties. Hardy people make optimistic cognitive appraisals; perceive changes as natural and meaningful and even interesting despite the stressfulness. This helps the individual to keep the situation within perspective. Furthermore, they take decisive action to understand changes better and to learn from previous mistakes. Thereby, they are able to incorporate these lessons in an ongoing life plan.

4.3.4 SELF-EFFICACY

This theory developed by Albert Bandura (Meyer, Moore & Viljoen, 1997), has its roots in the social-cognitive learning school. According to Bandura (1984), individual coping depends on the individual's sense of personal efficacy or ability to produce and control events or situations in his/her lives. This would mean that self-efficacy is personal evaluations by the individual to determine how well the person expects to be able to handle present or future situations.

According to Meyer *et al.* (1997), people are constantly busy with a process of self-evaluation and that the outcome of this self-evaluation would determine whether they would actively try to handle a situation or not. When an individual decides that he has the necessary abilities to cope with a situation, he would make an attempt to control the situation. If the individual perceives that he does not have the necessary abilities, he would not even try to make an attempt. According to Van Breda (2001), it is

therefore important that the individual is able to make accurate and reliable self-assessments. According to Bandura (1984), people form judgements of their own abilities based on information derived from four sources:

Enactive attainments that refer to previous experiences and successes. At the same time previous failures decrease perceived ability and increase the likelihood of future lower self-efficacy in those situations. Vicarious experiences refer to the observation of success of attempts by people of perceived same competence as the individual making the observations. When these individuals are successful it would increase their own perception of self-efficacy. Verbal persuasion refers to attempts by others to verbally persuade an individual to believe in their own ability. These attempts have limited effect but such persuasion may have the result that the individual will actually attempt or try harder, thereby increasing the chances of success. Success then enhances the individual's perception of self-efficacy.

Physiological state refers to the excess or aversive arousal that informs the individual that success or failure is imminent. Consequently self-efficacy increases or decreases, depending on how the individual evaluates the arousal state. If arousal were perceived to be positive, the individual's self-efficacy would increase. If arousal were perceived to be negative, the individual's self-efficacy would decrease.

Thus, self-efficacy perception has a strong influence not on the actions that people will take in situations but also in what type of situations they would choose to become involved in. People tend to choose situations where they believe that success is possible (Meyer *et al.*, 1997). In these situations, people with high self-efficacy are more motivated and tend to persist longer in their attempts to overcome adversity or master a situation than people with low self-efficacy. Therefore, high self-efficacy can increase the possibility of success, thereby increasing self-efficacy.

4.3.5 LOCUS OF CONTROL

Locus of control (LoC) is a construct that was developed by Rotter. It also has its roots in the social-cognitive learning school (Meyer *et al.*, 1997). This construct refers to the extent to which people believe that their lives are controlled by internal (themselves) or external factors. Rotter (Van Breda, 2001) argues that behaviour is reinforced to the degree that individuals believe that their behaviour and the

consequences of their behaviour are under their own control or under the control of external forces.

Rotter (Meyer *et al.*, 1997) made a distinction between internal LoC and external LoC. Internal LoC refers to where people believe they are to a large extent in control of their lives, that they are largely responsible for the consequences of their actions and that they can change their present and future situations by their own actions. People with an external LoC believe that they have very little control over their lives and that things that happen to them are the result of factors external to them, such as luck, coincidence, and actions of other people or fate. Research indicates that people with a strong sense of external control are more susceptible to external influences, while people with a strong sense of internal control are strongly motivated to achieve (Meyer *et al.*, 1997).

According to Rotter (Van Breda, 2001), the individual with a strong sense of internal control is likely to be more alert to clues in the environment that would prove useful for future behaviour, takes action to improve his environmental condition, is more concerned with his own skills and abilities (and place more value there) especially failures and is resistant to attempts to influence him.

In summation, these five theories propose the following about coping and people that are able to cope with adversity or stressors in situations.

It is a generalised approach/orientation, attitude or belief towards life and difficult situations experienced in life. This belief or attitude is that difficult situations should not be viewed with despair, but as challenges and problems that can be overcome or solved. These challenges or problems are a normal part of life and should be expected as learning and development opportunities. This attitude is based on a belief in the individual's own abilities, skills and experience as well as the access to resources held by legitimate other people that will enable the individual to understand the situation and/or nature of the stressors. Once understanding is reached, the individual can use personal and other resources to actively change the difficult situation.

This belief in own abilities is developed (not inherited) since early childhood. Once a person has developed (or not developed) these beliefs, they remain relatively stable but are dynamic and can be learnt or enhanced. People who believe in their own

abilities are motivated to seek out opportunities to test these abilities and to develop new skills from their failures to enhance their coping abilities. These individuals are motivated not only to survive adversity but also to cope and to thrive.

Apart from testing their abilities, this motivation stems from the individuals' belief that they as well as their lives and activities are inherently valuable and that the overcoming of adversity or challenges is worthwhile and meaningful. From these theories, it is seen that coping entails rational, conscious strategies or actions that individuals use to overcome adversity and challenges. Only when they perceive the stressors of a situation too big or their self-perceived abilities too small will they fall back to avoidant coping strategies.

In the following sections, each of these two types of coping strategies, active and avoidant, will be briefly discussed.

4.4 AVOIDANT AND ACTIVE COPING STRATEGIES

Avoidant coping strategies are learned processes (or behaviours) that are unconsciously motivated, unconsciously acquired, and developed to protect the self or ego from anxiety itself. It is important to focus on the fact that these strategies are unconsciously learned cognitive processes or behaviour. It is also important to notice that these strategies are unconsciously motivated and developed. This means that the individuals using these strategies are not consciously aware of the fact that they are using the strategies and will be unable to trace the origin of the strategy.

Some of the avoidant strategies that are used by individuals are the following; reaction formation, identification, displacement and sublimation, denial, conversion, isolation, repression, fixation and regression, rationalization and projection (Meyer *et al.*, 1997).

The term avoidant coping strategies might be misleading. Avoidant does not necessarily mean that the individual avoids coping with the stressors of the situation. By the term "avoidant" is meant that the individual would avoid coping with the cause of anxiety and focus on coping with the anxiety itself. Therefore, the individual is coping with the stressors but by using unconscious strategies.

As seen in this section, the cause of the anxiety can be varied and the individual is not always consciously aware of these causes. The anxiety is due to a threat to the individual's ego or to certain needs and desires that, if expressed or met would be socially unacceptable. However, these desires and needs as well as the conflict still remain and the individual has developed several unconscious strategies that avoid the anxiety caused by this internal conflict. To avoid threats to the ego or (perceived) social disapproval, the individual would behave in such a manner as to avoid, suppress, project, isolate or rationalize the anxiety and transform it to acceptable behaviour. This behaviour could be an avoidance of certain situations or a succumbing to stressors. This would then be an avoidance of coping. However, this behaviour could also mean that the individual exhibits behaviour where he/she copes and even thrives in adverse situations. The important fact to remember is that avoidant coping strategies are strategies and behaviour that avoid internal anxiety caused by threats to the ego or because of needs and desires that are perceived to be socially unacceptable. These threats may be triggered by external stimuli, but are not strategies or techniques designed to cope with external stressors. Avoidant coping strategies can therefore also be powerful motivators for behaviour as will be seen in section 5.5, motivational strategies.

On the other hand, active coping strategies are conscious, rational learned behavioural, emotional, cognitive or social responses used to minimize the effect of or the sources of stress and anxiety. More specifically this study focuses on the active coping strategies that athletes use during endurance sport. Avoidant coping strategies are viewed and described as coping strategies (also it is strategies that enable the individual to cope and protect the ego from anxiety). However, active coping strategies focus on problems related to the external environment, which is the focus of this study.

Various authors (US Army, 1999; Van Breda, 2001), identified three main types of coping responses that serve distinct functions:

- a. Responses that change the source of the stress or the situation out of which the strainful experience arises.
- b. Responses that change the individual's perception of the stressor or that control the meaning of the strainful experience after it happened but before the emergence of stress.

- c. Responses that control the symptoms of stress itself after they have emerged.

4.4.1 RESPONSES THAT CHANGE THE SOURCE OF THE STRESS OR THE SITUATION OUT OF WHICH THE STRESSFUL EXPERIENCE ARISES

According to Van Breda (2001), this strategy is not widely used. People must recognise the situation or factor that causes the stress before they are able to change it. However, this is not always possible or people might not know how to change the situation directly. Trying to change a situation might lead to more stressors that might inhibit further efforts.

Van Breda (2001) makes a note of the fact that most research done on resilience and coping revolved around situations such as concentration camps, terminal illness, growing up in poverty or being in a war where very little could be done to remove the source of stress.

This is one of the reasons why this study is so important. All the respondents used in this study participate in stressful, hazardous and even dangerous situations and conditions out of their own free will. They actually choose to be in these situations. The importance of this is that these people are all able to remove the source of stress – yet they do not. They are all motivated by some need or reason to expose themselves to these stressful and dangerous situations.

However, there seems to be disagreement with the statement by Van Breda (2001) that this style is not commonly used. In the literature various authors (Antonovsky, 1984, 1998; Kreitner & Kinicki, 1992; Gill, 2000; Cox, 2002; Potgieter, 2003; Weinberg and Gould, 2003) propose that stress is not only necessary for optimal functioning but developed problem-solving and stress management techniques, either individually or for teams, to control themselves and the situation or environment.

Therefore, although there is some disagreement, the majority of researchers holds the view that certain personality predispositions and attitudes, cognitive techniques

such as problem-solving and social skills such as networking or teamwork enable individuals to control the source of stress.

4.4.2 RESPONSES THAT CHANGE THE INDIVIDUAL'S PERCEPTION OF THE STRESSOR OR THAT CONTROL THE MEANING OF THE STRESSFUL EXPERIENCE AFTER IT HAPPENED BUT BEFORE THE EMERGENCE OF STRESS

According to Pearlin and Schooler (Van Breda, 2001), this is the most commonly used coping strategy. This coping style can entail paying selective attention to relevant stimuli and thereby concentrating on the less stressful aspects of the situation, positive comparisons that reduce the perceived severity of the stressful situation and to reduce the perceived importance of the stressful situation or the outcome of the situation in relation to one's overall life situation.

Many of the sport psychological interventions and Neuro Linguistic Programming (NLP) techniques, especially those relating to arousal control and attentional strategies such as dissociation, realistic expectations, simulation training, imagery, distraction, physical techniques and self-talk are examples of this style (Horn, 1992; Gill, 2000; Cox, 2002; Potgieter, 2003; Weinberg & Gould, 2003).

4.4.3 RESPONSES THAT CONTROL THE SYMPTOMS OF STRESS ITSELF AFTER THEY HAVE EMERGED

According to Van Breda (2001), this coping style does not focus on the situation itself, either directly or by changing the meaning or perception. The focus is rather on the resultant stress itself and entails basic stress management techniques.

These strategies attempt to decrease the negative effects of physiological and behavioural symptoms of stress such as palmer sweating, increased skin conductance, increased rapid respiration, increased heart-rate, higher blood pressure, tensed muscles, dryness of mouth, numbness and tingling of limbs, decreased metabolic rate, dilation of the eyes, frequent urination, nausea, vomiting or

diarrhoea, pacing, trembling, restlessness, hand wringing, pressured speech, withdrawal, confusion, inability to concentrate, emotional outbursts or aggressive behaviour.

As seen in chapter 3, stress is the internal psychological tension caused by internal and external stressors that change or are perceived to change the nature of the present and/or future situation to such an extent that it forces the individual to adapt by means of physiological and psychological responses.

Therefore, this strategy focuses not on stress itself or the sources of stress but on the behavioural and physiological symptoms of arousal. Examples of these are hypnosis, self-hypnosis, progressive muscular relaxation, biofeedback, centering, autogenic training, meditation and imagery (Horn, 1992; Woods, 1998; Cox, 2002; Potgieter, 2003; Weinberg & Gould, 2003).

Whichever type of response is used, the fact remains that individuals use learned coping strategies, responses and techniques to consciously overcome adversity or challenges as well as the psychological pressure caused by either internal or external stressors. In other words, once an individual becomes aware of some psychological pressure or stress, usually manifested as physical or behavioural symptoms. They are sometimes able to determine the source of the stress or change their perception or focus on stress symptom management or use a combination of responses and techniques to overcome these stressors.

As seen in this section, each response would have different techniques that could be categorized under that response. Under responses that focus on the source of the stressor could fall the technique of visualization, if the source of the stress is uncertainty. However, it is possible that one technique could also be categorized under more than one response. The technique of visualisation could also be used under the response that changes the perception of the stressor. If, for example, the athlete has previously failed in a task or skill and has the perception that he/she is not able to execute the skill, visualisation can be used to change that perception.

To summarize, active coping strategies are conscious, rational learned behavioural, emotional, cognitive or social responses used to minimize the effect of or the sources of stress and anxiety.

Responses used to cope with stressors can be described as responses focusing on the source of the stress, responses changing the individual's perception about the stress and/or situation or his/her ability to cope and responses that focus on the symptoms of the stress itself.

People usually use one or a combination of these responses to cope with the situation. Under each response several techniques such as problem solving, progressive muscular relaxation and visualisation are found, categorized under a response depending on the use of the technique. See figure 4.2 for a schematic representation of active coping strategies.

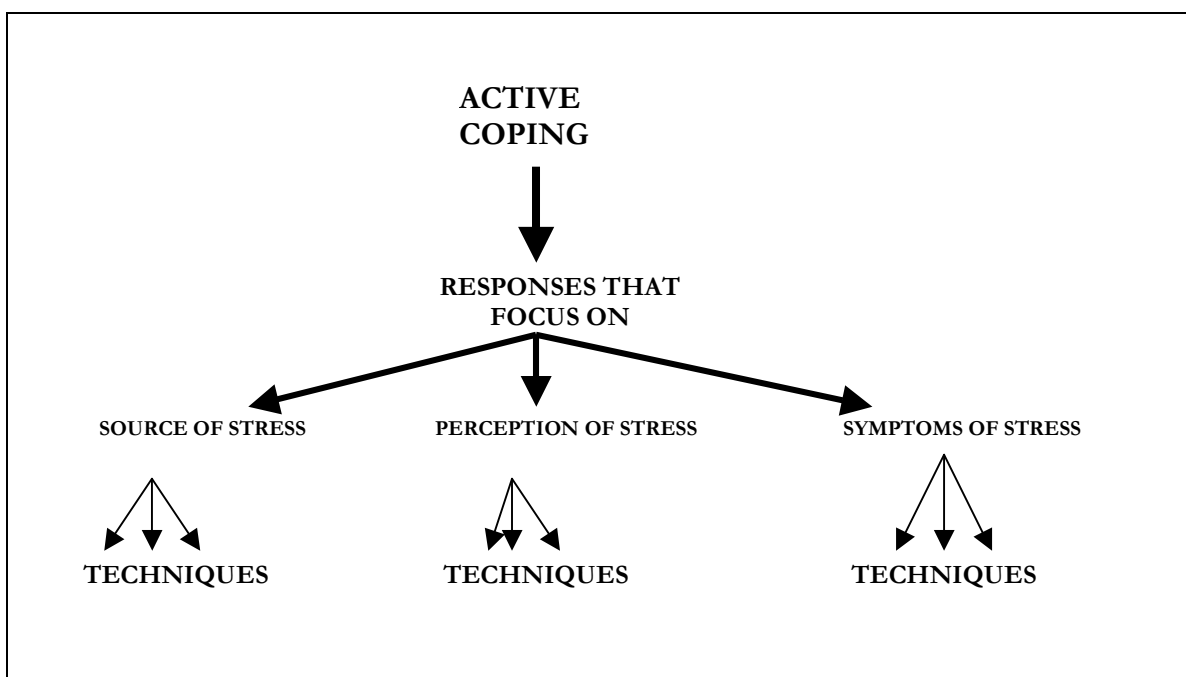


FIGURE 4.2: ACTIVE COPING STRATEGIES

4.5 INTERACTION OF ACTIVE AND AVOIDANT COPING STRATEGIES

A straightforward and simple explanation would be that some individuals use active coping strategies and that other individuals use avoidant coping strategies to overcome stressors and to avoid stressors. However, it is not as simple as that. Active and avoidant coping strategies focus on two different types of stressors and have two completely different but interlinked functions.

Avoidant coping strategies have the function to help the individual cope with threats to the ego or needs and desires that would be socially unacceptable should they be

met. This may be triggered by external stimuli. Depending on the nature of the internal conflict, the individual would have developed certain coping techniques such as projection, reaction formation, rationalisation, regression, isolation, conversion and sublimation. The conflict as well as the coping techniques will always be at the unconscious level.

These coping techniques would lead to behaviour that would meet individual needs in socially acceptable ways or avoid threats to the ego. This might entail the use of active coping strategies to overcome external stressors and even thrive in adverse conditions or it might lead to behaviour that avoid stressors or that the individual succumbs to the stressors.

4.6 SUMMARY

This chapter focused on the strategies that people use to adapt to extreme environments and the stressors found in these situations. Coping strategies were defined as the psychological strategies (cognitive, emotional, behavioural and social) that individuals use to successfully adapt to stressors or adversity in their present or future situations and thereby continue to function at the same or better level of functioning/performance than before the adverse or stressful situation.

Two types of coping strategies were identified; active coping strategies and avoidant coping strategies. Both of these strategies are interlinked but focus on different stressors and have different functions. Active coping strategies are conscious, rational learned behavioural, emotional, cognitive or social responses used to minimize the effect of or the sources of stress and anxiety. Avoidant coping strategies are learned processes (or behaviours) that are unconsciously motivated, unconsciously acquired, and developed to protect the self or ego from anxiety itself.

Before these two coping strategies were discussed, the theoretical perspectives to what coping and coping strategies are, were briefly explained. Five theories were briefly discussed: sense of coherence, thriving, self-efficacy, locus of control and hardiness.

The theoretical perspectives discussed in this chapter propose that coping is a generalised approach/orientation, attitude or belief towards life and difficult situations

experienced in life in that difficult situations should not be viewed with despair, but as challenges and problems that can be overcome or solved.

Furthermore people with this perception view challenges or problems as a normal part of life and should be expected as learning and development opportunities. This attitude is based on a belief in the individual's own abilities, skills and experience as well as the access to resources held by legitimate other people that will enable the individual to understand the situation and/or nature of the stressors. Once the individual understands the problem, he/she can use personal and other resources to actively change the difficult situation or overcome the challenge. People with this attitude or belief in own abilities developed it (not inherited) since early childhood. Once a person has developed (or not developed) these beliefs, they remain relatively stable but are dynamic and can be learnt or enhanced.

People who believe in their own abilities are motivated to seek out opportunities to test these abilities. By learning from their failures they develop new skills to enhance their coping abilities. These individuals are motivated not only to survive adversity but also to manage and to thrive. By believing that they as well as their lives and activities are inherently valuable and that the overcoming of adversity or challenges are worthwhile and meaningful are these individuals motivated to do so.

It is seen that coping entails rational, conscious strategies or actions that individuals use to overcome adversity and challenges. Only in situations where they perceive the stressors of a situation too big or their self-perceived abilities too small, will they fall back to avoidant coping strategies. Active coping strategies are conscious, rational learned behavioural, emotional, cognitive or social responses used to minimize the effect of or the sources of stress and anxiety.

Responses used to cope with stressors can be described as responses focusing on the source of the stress, responses changing the individual's perception about the stress and/or situation or his/her ability to cope and responses that focus on the symptoms of the stress itself.

People usually use one or a combination of these responses to cope with the situation. Under each response several techniques such as problem solving, progressive muscular relaxation and visualisation are found, categorized under a response depending on the use of the technique.

Lastly, avoidant coping strategies as well as the interrelationship between active and avoidant coping strategies were discussed. Avoidant coping strategies help the individual to cope with threats to the ego or needs and desires that would be socially unacceptable should they be met. Depending on the nature of the internal threat, the individual would have developed certain coping techniques such as projection, reaction formation, rationalisation, regression, isolation, conversion and sublimation. The threat as well as the coping techniques will always be on the unconscious level.

In the next chapter the focus would be on defining motivation, motivational theories as well as motivational strategies used by endurance athletes to overcome extreme environmental conditions associated with endurance events.

CHAPTER 5

MOTIVATIONAL STRATEGIES

***“If you want something to happen with all your heart, you will find ways to make it happen: If you do not really want it with all your heart, you will find an excuse to explain why it didn’t happen!” – Steve Waugh,
Australian cricketer***

5.1 INTRODUCTION

Motivation refers to the *why* athletes participate in a particular sport and their performance. According to Potgieter (2003) all forms of sport participation can be explained in terms of individual motivational levels. Motivation for participation in endurance sport is a key concept in this study also.

In part this study aims to determine what motivational strategies and techniques do endurance athletes use to ensure that they perform well. In this chapter, the term motivation is defined. Furthermore, the theoretical approaches of motivation that describe motivation of endurance athletes will be discussed briefly. Lastly, the motivational strategies and techniques used in sport will be briefly discussed.

5.2 MOTIVATION DEFINED

According to Potgieter (2003), motivation is a term that is widely and often used but seldom understood and then only vaguely. According to Smith (1992) it is obvious that there is no consensus about the nature of motivation. This dilemma exists due to the fact that motivation is such a multi faced and complex phenomenon (Smith, 1992). Therefore, there are several definitions and theories to explain this phenomenon.

Helms (1987) explain motivation in terms of the following characteristics:

- o It is an activation drive that forces people to behave in certain ways;
- o It is a purpose driven process that forces behaviour into a specific direction;

- o It is a feedback process that relieves inner tension when the direction of behaviour is successful. When the behaviour does not relieve inner tension, this process changes behaviour in a different direction.

Motivation is therefore neither behaviour nor performance (Helms, 1987). Motivation is the internal and external forces that influence people's choices as well as the intensity and direction of behaviour.

Potgieter (2003) also identified the following three aspects of motivational behaviour:

- o **Direction** or choice of behaviour;
- o **Intensity** or the level of effort that is displayed in a specific action;
- o **Persistence** or the duration of time that an individual would spend on a specific activity.

Motivation is therefore a function of drive and energy (Potgieter, 2003; Weinberg & Gould, 2003).

Reber (1995) defines motivation as an internal state of an organism that impels or drives it to action. In this sense it is an energizer of action. Reber (1995) makes a distinction between a generalized state of motivation (*generalized energizer or generalized drive*) and motivational states that are specific to particular needs and drives. Generalized motivation state is one of general arousal without a specific goal or direction. The behaviour that occurs is then the learned behaviour that is dominant or most applicable in that situation.

Specific motivational states refer to the motivational states that must be analysed in terms of individual needs and drives. In other words, the specific need or drive that would motivate the individual into action. Weiss and Ferrer-Caja (Horn, 2002) call these needs or drive the source of motivation. The source of motivation would be different between individuals, as each has different needs although similarities would exist within specific groups such as endurance athletes.

Reber (1995) further states that motivation should not be seen as a singular explanation of behaviour, but rather that motivational states stem from the multitude

of interactions of a large variety of variables, such as the need or drive level, the incentive value of the goal, the expectations of the individual, the availability of appropriate responses, the possible presence of conflicting motives and unconscious factors.

The aforementioned leads to the following deduction: *Motivation is the (conscious or unconscious) internal tension due to several factors (such as drives, needs and learned behaviour) that impels the individual into action and determines the intensity and duration of this action to relieve this tension.* This definition will be used as the operational definition of motivation for this study.

According to Weiss and Ferrer-Caja (Horn, 2002), the topic of motivation in sport has been studied from two perspectives. Motivation as an individual difference focuses on how individuals vary in certain motivational characteristics and how these variations would influence psychological outcomes (such as self-efficacy and affect) and physical behaviour (such as participation or intensity of training). The second perspective in the study of motivation in sport focuses on the role of motivation as an outcome variable. When studied from this perspective the sources of motivation become the primary focus area. For example, what social-environmental and individual factors influence motivation directly or indirectly through some mediating variable? In this study, an example of this would be how individual attitude towards challenges would influence the motivational strategies that are used to overcome environmental challenges. To fully understand motivation in sport, it is almost impossible to focus solely on motivation as an individual difference (Horn, 2002), but it should be seen as an outcome variable where the links between motivational states, social-environmental factors, self-perceptions and motivated behaviour are the focus of study. Therefore, this study will focus on the role of motivation as an outcome variable and how motivational strategies are used to influence performance of athletes in endurance events. As an outcome variable, it is important to understand that motivation will determine why the athlete participates in endurance sport. This will be the sources of motivation (Horn, 2002). Secondly, the nature of sport is competitive and the achievement of goals is important (Gill, 2000). The reason or motivation for the individual to achieve goals would be an important focus area.

The primary aim of this study is not to determine the sources of motivation to participate in endurance sport; rather it is to determine the motivational strategies of

athletes when they are participating in endurance events. It would therefore be important to determine the sources of motivation of these athletes to achieve their goals, while they are participating in endurance events. Therefore, the theoretical approaches to achievement motivation in sport will be discussed.

Before the theoretical approaches to motivation can be discussed, it is important to clarify three terms often used in Sport Psychology: intrinsic motivation, extrinsic motivation and psychological hedonism. These terms are used not only in sport psychology but also in most studies that involve motivation.

5.3 INTRINSIC AND EXTRINSIC MOTIVATION

According to McClelland (1987), Cox (2002), Potgieter (2003) and Weinberg and Gould (2003), some people are motivated by internal or intrinsic factors, while external or extrinsic factors and some by a combination of both motivate some people. Internal and external motivators refer to those factors or rewards that motivate the individual to participate and perform in sport. According to the literature (Bakker, Whiting & Van der Brug, 1990; Horn, 1992; Potgieter, 2003), intrinsic motivation refers to behaviour that is the result of interest or enjoyment. In other words, the individual derives pleasure or enjoyment from the action itself and this enjoyment is enough reward for the individual to repeat the behaviour. In the sport setting intrinsic motivation would be the result of interest or enjoyment derived from participation in the sport itself.

Extrinsic motivation refers to behaviour that is motivated by the external rewards associated with that activity (Bakker *et al.*, 1990; Horn, 1992; Cox, 2002; Potgieter, 2003; Weinberg & Gould; 2003). Therefore, the individual motivated by external factors does not behave in a certain way due to enjoyment or interest in the activity *per se*, but rather for the external rewards

Extrinsic rewards in sport include prestige, honours and prizes, prize money, medals and approval by significant others (Horn, 1992; Cox, 2002; Potgieter, 2003; Weinberg & Gould, 2003). Intrinsic rewards or motivators would include factors such as winning, feelings of success (not necessarily winning), feelings of achievement and mastery of skills, self-knowledge, self-actualisation, self-control/discipline.

Another concept that is closely related to intrinsic motivation is psychological hedonism (Anthony, 1996; Cox, 2002; Potgieter, 2003; Weinberg & Gould, 2003). Psychological hedonism refers to the tendency of people to do what they intrinsically find pleasurable and to avoid unpleasant or painful experiences. This pleasure-pain principle served as the basis for several theories of motivation (Anthony, 1996). According to this principle, people would repeat behaviour that they derive pleasure and reward from. Furthermore, behaviour that is not rewarded, incurs punishment or pain is likely not to be repeated.

Psychological hedonism does not sufficiently explain the fact that many endurance athletes have to endure hours and even days of pain, discomfort and even injury and in some cases death, to participate in their events. This excludes the months and years of training that precludes the actual event. Many of these endurance athletes never receive external rewards such as prizes or prize money. (most do receive finisher medals – but then everyone receives them!). The answer to this complex problem must lie somewhere in between the theories of intrinsic motivation, extrinsic motivation and psychological hedonism. Some athletes are motivated by external rewards (initially and to some extent over the long term). However, the intrinsic rewards of completing a difficult endurance race such as feelings of success (not necessarily winning), feelings of achievement and mastery of skills, self-knowledge, self-actualisation and self-control/discipline overshadow the pain and discomfort experienced during the event (Stroud, 1998; Mann & Schaad, 2001; Senk, 2001; Rawling, 2003; Williamson, 2003).

Endurance sport is essentially about self-discovery. The amount of discomfort and pain that the endurance athlete has to undergo, continuously test levels of endurance.

“Perhaps one of the most profound aspects of an adventure race is the discomfort it breeds. When you are out on a course, particularly for more than one night, your level of discomfort escalates as the hours trickle by. The dirt and sweat you accumulate magnify the cold hard fact that you are living outdoors. Furthermore, your usual eight hours of sleep are often reduced to three or less in each 24-hour period. How much discomfort can you tolerate? To succeed, you must be able to endure tremendous distress” (Mann & Schaad, 2001: 11).

According to Williamson (2003: 203 - 204), every runner experiences this mental battle between completing the challenge and the pain involved in doing so:

“Every ambitious Comrades runner wanting to achieve his potential, experiences a point in the race where pain dogs every footfall. There is no injury; it is simply the muscle damage of the previous kilometres. It is unchanging in intensity, and to continue, the mind must accept this ‘sentence’ of pain until the finish line is crossed. Ultimately, your ability to meet this pain ‘head to head’ will determine your performance in the race. If it becomes the focus of your existence at that time, if you permit it to erode the importance of the task at hand, you will compromise your goal or finish time. In many respects, it is the desire to test ourselves against this mental battle that entices us to enter races”.

“In a nutshell, the racers who possess a high tolerance for pain and discomfort and are still able to perform at a high intensity become the victors” (Mann & Schaad, 2001: 12).

Bicycling Magazine (March/April 2003: 87) on the Pick ‘n Pay Cape Argus Cycling Classic:

“Expect the most wonderful feeling of achievement when you crest the summit (of Ou Kaapse Weg)” and “Do savour the feeling of accomplishment as you cross the finish line. Remember, the pleasure lasts much longer than the pain”.

It would seem that endurance athletes are motivated by a combination of extrinsic and intrinsic rewards. The more elite an athlete becomes, the greater is the probability of receiving cash prizes, winning or gold medals. However, for most endurance athletes participating in races such as the *Comrades*, *Two Oceans*, *Eco-Challenge*, *Cape Argus* (to mention but a few), there are very little external rewards. These athletes seem to be primarily motivated by intrinsic factors such as overcoming challenges, self-discovery and the intrinsic enjoyment of these events. Based on this assumption, certain theoretical approaches that describe motivation seem more applicable to endurance athletes than others and will therefore be briefly discussed in the next section.

5.4 THEORETICAL PERSPECTIVES OF MOTIVATION

From the literature (Smith, 1992; Gill, 2000; Horn, 2002; Potgieter, 2003) it seems as if there is a lack of consensus about the term motivation. When studying the definitions and theories of motivation, it seems as though the confusion does not revolve around what motivation is, but rather the sources of motivation.

Motivation theories lie on a continuum from mechanistic or needs approaches to cognitive or organismic approaches as identified by several authors (Maslow, 1954; Lindzey, 1958; Madsen, 1959; Fraisse & Piaget, 1963; Russell, 1970; Korman, 1974; Ferguson, 1976; Anthony, 1996; O'Neil, 1999; Roberts, 2001; Potgieter, 2003). Mechanistic approaches include theories such as the mechanistic behaviourism of Watson and neo-behaviourism of Hull, Berlyn and Spence. This approach focuses on the stimuli-response (S-R) of mechanisms. According to this approach all behaviour are the result of mechanistic learned behaviour where specific stimuli would trigger specific behaviour or responses.

Cognitive approaches include the cognitive social learning theory of Rotter and Bandura (O'Neil, 1999). Cognitive theories of motivation imply that some source of information, not stimulation, inspires behaviour. External and internal information is cognitively processed into a belief or idea such as "I am tired" or "It is hot". This idea or belief then motivates action or behaviour. Higher mental processes intervene between inputs or stimuli and behavioural outputs or consequences. Therefore, the structure of thought processes determines action.

Needs approaches include, among others, the psychoanalytical theory of Freud, the hierarchy of needs theory of Maslow, the achievement need theory of McClelland, Atkinson's theory of achievement motivation and the need theory of Murray. Motivation, according to the needs approach can be traced to the conscious and unconscious desires or needs that people have. These needs range from basic physiological needs such as nutrition and survival to complex psychological needs such as self-actualisation. Some of these needs are genetically part of the individual whereas others are learned.

In Sport Psychology, the most prevalent theoretical approaches are the cognitive and needs approaches (Carron, 1980; Horn, 1992; Gill, 2000; Cox, 2002; Horn, 2002; Potgieter, 2003; Weinberg & Gould, 2003). Some of the theories that have been

used extensively in Sport Psychology include the instinct theory, drive theory, psychoanalytical theories, Maslow's hierarchy of needs, achievement needs theory, attribution theory, goal orientation theory, self-efficacy theory and competence motivation theory. All of these theories were (and are still) used with varying degrees of success to explain motivational aspects of sport. Some of these theories focus on one specific area of motivation, while others are more comprehensive.

Motivation determines why the individual participates in a specific sport, it determines the intensity with which the individual participates in the sport as well as the duration of participation and intensity of participation. In keeping with the aim of the study, which focuses on motivation in sport, three theoretical perspectives are emphasized: achievement needs approach, the cognitive approach (social-learning theory) and the person-orientated/humanistic approach. A fourth theory that is part of the cognitive approach namely the self-efficacy theory is also used to explain motivation and coping. The latter mentioned theory has been discussed in chapter 4 (Section 4.3.4).

5.4.1 ACHIEVEMENT NEEDS APPROACH

According to Williams and Gill (Gill, 2000) achievement behaviour is central to sport and the understanding of individual differences in motivational orientation is vital in understanding achievement. The basic assumption of all achievement theories is that individuals are intentional, goal-directed organisms that operate in a rational manner. Achievement goals are determined by the individual's achievement beliefs and these beliefs will guide subsequent decision-making and achievement behaviour. A theory that illustrates this approach is that of Atkinson.

5.4.1.1 ATKINSON'S THEORY OF ACHIEVEMENT MOTIVATION

According to Atkinson achievement motivation is the result of interaction between personality and situational factors (Gill, 2002).

A. PERSONALITY FACTORS

Achievement motivation is a personality factor first identified by Murray in 1938 and subsequently extended by Atkinson (Gill, 2000; LeUnes & Nation, 2002). According

to Murray (Gill, 2000; LeUnes & Nation, 2002) achievement motivation is the need to accomplish something difficult. To master, manipulate or organise objects, human beings or ideas and to do this as quickly and as independently as possible. Furthermore, it is the need to overcome obstacles and attain a high standard. It entails excelling own previous standards or achievements and to rival or surpass others by the successful exercise of talent. The consequence of this would be an increase in self-regard. According to Atkinson (Gill, 2000; Potgieter, 2003) achievement motivation is the result of two personality constructs: the motive to approach success and the motive to avoid failure.

The motives to approach success and to avoid failure are present in all individuals existing independently of each other. The one cannot be predicted on the basis of the other and should be seen as separate achievement-related dimensions or characteristics. However, poor competitors usually have a strong need to avoid failure and achievement situations in sport, while strong competitors have a strong motive to strive for success and a weak motive to avoid failure. According to Potgieter (2003), achievement orientated athletes are enthusiastic competitors who have a desire to excel where they enjoy challenges, thrive on competition and derive great satisfaction from success. This satisfaction is not necessarily derived from proving their superiority over others, but rather from successfully achieving the goals that they set for themselves.

Individuals whose need to avoid failure is dominant often have high levels of anxiety and they try to avoid competitive situations such as competitive sport. Their fear is not necessarily failure but rather that their failure would be seen as incompetence. In other words, they fear the negative evaluation that they perceive is associated with failure. Both groupings want to be positively evaluated. However their focus differ; those with a motive to approach success focus on the pride of achieving success, whereas those with a need to avoid failure focus on avoiding the shame and humiliation associated with failure.

B. SITUATIONAL FACTORS

The main situational factor is the probability of success or task difficulty that can range from impossible to certain success (Gill, 2000; Potgieter, 2003). The second factor is the incentive value of success or failure. The incentive value of success is determined by the significance of the task for the individual as well as the difficulty of the task. If the probability of success is high (easy task) the reward (or incentive

value) of the task decreases. According to Gill (2000) and Potgieter (2003) athletes with a motive to approach success are not strongly attracted to extremely easy or extremely difficult tasks as too easy a task will lead to a loss of interest whereas a person with a strong motive to avoid failure would be motivated by easy initial success.

Sport participation can be seen as one of the ways in which an individual can strive to achieve. Individuals who, despite difficulty, continuously attempt to improve their performance (although not necessarily to win) can be seen as striving to reach their potential and who have a motive to approach success. This motive to approach success is further reinforced by the situational factors of incentive value of success and the probability of success. They set their own goals and their perception of own performance and potential will determine their feelings of achievement.

This is especially true of endurance athletes. These athletes have to overcome enormous pain, discomfort and other challenges in their preparation for a single event. During this event the athlete has to overcome even more pain and discomfort, environmental challenges and internal conflict just to complete the event. These athletes do so willingly (in their striving to reach and transcend their potential) and continue to do so. Once a goal has been achieved, many endurance athletes are not only happy to stay at that level, but seek out more difficult challenges. Why specific goals and ways of achieving these goals are chosen is not fully explained by Atkinson's theory. A possible explanation for this might be found in the cognitive and humanistic approaches of motivation.

5.4.2 COGNITIVE APPROACH/SOCIAL LEARNING

THEORIES

5.4.2.1 SOCIAL LEARNING THEORY

According to Meyer *et al.*, (1997) and Roberts (2001) the social cognitive learning theories share the behaviourists' view that all behaviour is learned and the importance of studying observable behaviour. In contrast with extreme behaviourists such as Skinner they not only acknowledge but also use non-observable factors such as thoughts, symbolic processes, expectations and beliefs extensively to explain human behaviour. Although these theorists hold a positivistic view of behaviour, i.e.

people have a large amount of control over their behaviour and goals; they also emphasize the role of environmental factors (social and physical) (Meyer *et al.*, 1997; Roberts, 2001).

Although these theorists stress the importance of the environment, it is not environmental determinism as human freedom of choice plays an equally important role. Humans, as well as the environment, are seen as equally important determinants of behaviour. Humans are therefore capable of self-regulation, but always in interaction with the situation. The basic assumption of these theorists is that of reciprocal determinism (Meyer *et al.*, 1997; Roberts, 2001). According to this approach, behaviour is determined by the interaction between the individual, the situation and the behaviour that result from the situation. In other words, behaviour is both the result of and part of the continuous process wherein the individual, the situation and the individual's behaviour influence each other. An example of this might be the elite cyclist who is confident in his own ability to win races. The other competitors and the physical environment are perceived by the athlete to be a challenge but one that he confidently expects to be able to handle if he does his best. His behaviour in this situation is to perform as best as he can. As he sees himself beating both the other competitors and the physical environment (heat, wind and terrain), his confidence and expectations of winning increase and consequently his performance increases as well.

As seen in this example, the individual has the ability to evaluate the environment as well as his own capabilities and expectations and to change these according to the evaluation. This is in sharp contrast to extreme behaviourists that see humans as passively reacting to internal needs or environmental factors. According to the social cognitive learning theory (Meyer *et al.*, 1997; Roberts, 2001), humans are active participants that observe and evaluate external and internal stimuli, strive towards goals and develop plans to reach these goals. Furthermore, they can proactively foresee and plan for difficulties and evaluate the effectiveness of their behaviour and accordingly change their behaviour.

According to these theorists, humans will react differently in situations and even differently in similar situations. The behaviour of an individual would depend on the interaction between the following factors:

- The precise nature of the situation;

- The individual's previous experiences;
- The individual's future expectations and goals;
- The behaviour produced in the situation.

According to Meyer *et al.*, (1997) the social cognitive learning theorists see human motivation as more than only the gratification of needs. Humans have the ability to determine their own goals, lives and development within certain bounds. They can therefore determine what they see as meaningful and important. According to Maddi (in Meyer *et al.* 1997), the social cognitive learning theorists implicitly accept that the basic motive of humans is to search for meaning in life and in their own actions. Motivation is the result of two processes – interaction and learning. People are not only motivated by internal needs or by external stimuli, but rather by the interaction between the individual and the situation. People are motivated by the possible consequences of their behaviour or in other words their expectations of consequences. People behave in a specific way because they expect their behaviour to have positive, neutral or negative consequences. These expectations are developed through a process of learning. Learning from own experiences or from observing the consequences of other people's actions. People play an active role in this learning process through their perception and evaluation of their own behaviour. Although people are influenced by their expectations of the external consequences of their actions, they are strongly influenced by their own self-evaluation.

People have the ability to determine internal standards according to which they evaluate their own behaviour and performance. The consequence of this is that their behaviour is not only determined by external conditions or expected external conditions. In this people show remarkable consistency in their behaviour. Individuals would behave in manners that result in discomfort and even physical pain and death to achieve their expected internal standards. It can be deduced that people are motivated to behave in a manner that leads to self-gratification (feelings of accomplishment) and in the process endure physical and mental pain and discomfort to avoid self-punishment (feelings of shame and failure).

Mischel (in Meyer *et al.* 1997: 347) describes this phenomenon:

“The human ability to self-regulate and purposefully self-control is reflected in such diverse concepts as willpower, mastery, and competence, and in their psychological opposites, such as helplessness and hopelessness. All of these concepts involve

the idea of volition (will) and deal with the ability of individuals to self-regulate to increase mastery in the light of particular goals”.

As such human motivation is the result of the interaction between humans and the situation where humans have the ability to determine their own motivation. This is learned through the individual's lifetime of own experiences and the observation of other people's behaviour. The individual would throughout his life learn that certain behaviour lead to certain consequences that may be positive, neutral or negative. By behaving or avoiding certain behaviours or situations the individual is able to satisfy not only social expectations but also (and usually more importantly) internal standards. Fulfilling these internal expectations leads the individual to self-gratification and the avoidance of self-punishment.

Athletes who participate in endurance sport probably do so due to internal needs or values of self-control, the need to achieve in physically demanding situations, endurance and competence. These athletes do not necessarily have to come from families or environments where, as a child or adolescent, they were exposed to endurance sports. However, they probably grew up in families or environments where these needs or values were very prevalent. Therefore, they learnt these needs or values and they became part of their internal value and standard system. When deciding to participate in a sport, they probably chose the sport that had the best chance of gratifying these learned needs and gave them the biggest chance of exhibiting corresponding behaviour – behaviour in which they can expect positive outcomes (Bandura's self-efficacy theory is described in chapter 4).

5.4.3 PERSON-ORIENTATED / HUMANISTIC APPROACHES

According to Meyer *et al.*, (1997), the humanistic approach does not consist of one perspective but rather a grouping of perspectives that share broad assumptions that differ radically from the psychoanalytical and behavioural schools. In fact, the person-orientated school developed as a “third force” or school in reaction to the reductionist and mechanistic views of humans by the psychoanalytical and behavioural schools. According to theorists from this approach the view of a human as a passive, segmented puppet that is regulated by environmental factors and genetically programmed biological functions is totally unacceptable. According to this approach

humans differ from any other organism (even animals) in the sense that humans have unique qualities that enable them to function at higher levels than any other organism. Humans have the ability to act and think at conscious levels, even proactively – in contrast to other organisms that function at instinctive levels. They have the ability to actively determine their own actions, behaviour, goals and future. Although this school does not disregard unconscious needs or processes, it postulate that humans have control over their actions and behaviour.

Theorists from this school emphasize the active role and responsibility that humans have in the determination of their lives and development (Maslow, 1954; Lindzey, 1958; Madsen, 1959; Fraisse & Piaget, 1963; Russell, 1970; Korman, 1974; Ferguson, 1976; Meyer *et al.*, 1997). Maslow (1954: 92) best describes this in his description of his higher order need self-actualization:

“It refers to man’s desire for self-fulfillment, namely, to the tendency for him to become actualised in what he is potentially. This tendency might be phrased as the desire to become more and more what one is, to become everything that one is capable of becoming”.

For theorists from this approach, human motivation is based on the striving to attain full potential. Although lower order needs such as hunger, procreation, security, love and even esteem are needs that should be gratified from time to time (at least partially), all behaviour is a striving to attain their full potential. Rogers (Russell, 1970: 372 - 373), illustrates this actualising tendency with a personal experience during a holiday on the coast of Northern California;

“As I watched the waves breaking over these large rocks in the distance, I noticed with surprise what appeared to be tiny palm trees on the rocks, no more than two or three feet high, taking the pounding of the breakers. Through my binoculars I saw that these were some type of seaweed, with a slender ‘trunk’ topped of with a head of leaves. As one examined a specimen in the intervals between the waves it seemed clear that this fragile, erect, top-heavy plant would be utterly crushed and broken by the next breaker. When the wave crashed down upon it, the trunk bent almost flat, the leaves were whipped into a straight line by the torrent of water, yet the moment that the wave had passed, here was the plant again, erect, tough, resilient.

It seemed incredible that it was able to take this incessant pounding hour after hour, day and night, week after week, perhaps, for all I know, year after year, and all the time nourishing itself, extending its domain, reproducing itself; in short, maintaining and enhancing itself in this process which, in our shorthand, we call growth.

Here in this palm-like seaweed was the tenacity of life, the forward thrust of life, the ability to push into incredibly hostile environment and not only to hold its own, but to adapt, develop, become itself”.

Maslow also holds this opinion that some people that attain higher levels of need-fulfillment do so through difficulty and suffering. Maslow (in Meyer *et al.* 1997: 59) states that: “... *higher needs may occasionally emerge, not after gratification, but rather after forced or voluntary deprivation.*” This explains why people would be motivated to deliberately place themselves in situations where they have to endure pain, discomfort, deprivation of lower needs and even injury. Through this process the individual is striving to attain his full potential. The assumption that can be made from the humanistic approach is that people not only have the ability to endure and even thrive in adverse conditions, but that they frequently and consciously choose to place themselves in adverse or difficult situations. Their motivation for doing this, according to the humanistic approach, would be to grow and to reach their full potential or self-actualisation. Therefore, an individual is probably motivated to participate in endurance sport by the perceived potential for individual self-actualisation. As seen previously, endurance sport has the intrinsic incentives of self-discovery, overcoming challenges and the feeling of achievement that comes with the enduring of and overcoming of adverse conditions or in other words self-actualisation. Therefore, the individual continues with endurance sport as each time a personal goal is achieved the individual realises that he/she has not yet reached his/her full potential and can only do so by challenging him/herself to greater heights.

Although the three theoretical approaches, needs, cognitive and humanistic (and specifically the approaches of the theorists described in this study) differ widely in their basic assumptions, they have one common denominator when describing human motivation: The individual is much more than just a passive “reactor” to either unconscious needs or external stimuli. The individual has a certain amount of control over what he/she do, what he/she thinks, how he/she will behave in situations as well as the situations he/she choose to be in.

People are not only passive in their reaction to unconscious needs or external environment but can proactively change the outcome of possible situations. They might even choose to place themselves in adverse or challenging situations and when they find themselves in these situations not only overcome the adverse conditions and challenges but also thrive. Even when persons find themselves in situations not off their own choice, they still have the ability to actively choose their own behaviour and change the outcome in their favour. The achievement needs approach of Atkinson (Gill, 2000) saw all behaviour stemming from the motivation of the individual to not only achieve their potential but also to transcend this potential.

This approach to motivation is similar to those of humanistic theorists such as Maslow and Rogers that have the opinion that the ultimate goal and motivation of all humans is to achieve their full potential or what they called self-actualisation. These humanistic theorists believe that this state of self-actualisation is not necessarily achieved under ideal conditions but rather because of adverse conditions. According to the social learning approach human motivation is the result of the interaction between humans and the situation where humans have the ability to determine their own behaviour. This is learned through the individual's lifetime of own experiences and the observation of other people's behaviour.

The individual would throughout his life learn that certain behaviour leads to certain consequences that may be positive, neutral or negative. By exhibiting or avoiding certain behaviours or situations, the individual is able to satisfy social expectations as well as and more importantly internal standards. Fulfilling these internal expectations leads the individual to self-gratification and the avoidance of self-punishment.

The questions of why an individual would choose to participate in endurance sport, and more importantly, why the individual would continue with endurance sport in general and specifically during an event under difficult conditions can satisfactorily be answered by using the four theoretical approaches described in this study. Individuals choose to participate in endurance sport for various reasons. For example, some would participate to achieve or maintain physical fitness while others would like to lose weight or to be in the outdoors. However, at a certain psychological level of consciousness people choose to participate in endurance sport for three basic reasons; Firstly, endurance sport helps to facilitate the achievement or fulfillment of certain values or self-image learned during a person's life. Secondly, participation in endurance sport facilitates the achievement and transcendence of the

individual's full potential. Thirdly, successful experiences in similar sport events would build up the individual's self-perception of his/her own ability. If the individual is reasonably successful initially or finds the sport enjoyable he/she would be motivated to take up the sport seriously.

Once the individual starts with one or more types of endurance sports, the individual's success or progressive completion of more challenging events would probably increase the internal incentives of self-fulfilment, self-actualisation, sense of achievement, self-knowledge, self-confidence and self-efficacy as well as the continued achievement and reinforcement of learned values and self-image. These are the sources of motivation as identified by Weiss and Ferrer-Caja (Horn, 2002) or the incentives of success as identified by Atkinson (Gill; 2000; Potgieter; 2003). These sources of motivation can be intrinsic or extrinsic or a combination of both. However, it would seem as if endurance athletes are mostly motivated by intrinsic sources. As the endurance athlete continues to overcome more challenging physical and mental obstacles, he would probably develop the need to continue to do so to reinforce learned (since starting with endurance sport) values, attitudes and self-images thereby ensuring continued participation.

Apart from the enjoyment and other internal incentives for continued participation in endurance sport, the individual also develops internal standards of excellence. This can be positive in the sense that it would motivate the athlete to continue with the sport (Beaudoin, Dowd, Gill, Martin, & Williams, 1996). Should the athlete stop during an event or discontinue with the sport for any length of time it might lead to internal punishment. In order to avoid this punishment, the athlete would continue during a race despite physical and mental challenges and in the longer term with endurance sport. This is similar to the motive to approach success and to avoid failure as identified by Atkinson (Gill; 2000; Potgieter; 2003). The focus of the one (motive to approach success) would be on the positive outcomes of success whereas the focus of the other (motive to avoid failure) would be to avoid the negative consequences of failure. Therefore, both these focus areas would motivate athletes to perform but their focus of motivation would differ. By combining the focus areas with the sources of motivation, the result is motivational strategies or motivational styles.

5.5 MOTIVATIONAL STRATEGIES

Motivational strategies are those methods and techniques that athletes use before and during endurance races to motivate them to achieve their own objectives. Based on the theoretical approaches to motivation as discussed in section 5.3 as well various other authors (Singer, 1986; Horn, 1992; Potgieter, 2003; Williamson, 2003), these motivational strategies or motivational styles can be divided into four types of strategies: positive-internal, positive-external, negative-internal and negative-external. These four strategies are the result of two factors namely focus and source of gratification. Focus refers to the focus of the motivation. It can be on the successful achievement of goals and objectives set by the athlete or other relevant people and the consequent positive results. It may also be on the failure to achieve the goals and objectives set by the athlete or relevant others. In the latter mentioned, the focus of motivation is on the feelings of failure or loss of self-esteem that results from failure to achieve goals. Thus, the focus is on negative outcomes or results. To avoid these negative or unpleasant emotions, the athlete is motivated to achieve his/her goals and objectives.

Positive and negative refer to the focus of the strategies. When individuals focus on the positive outcomes of the sport, either internal or external, or use positive thoughts and self-talk to motivate themselves they are using positive strategies. When individuals focus on the negative outcomes or consequences, internal or external, or use visualisation and self-talk that reminds them of the negative consequences of quitting during or before endurance events to motivate themselves, they are using negative motivational strategies.

The source of gratification refers to the origin of the athlete's reward for the successful achievement of goals and objectives in endurance events. In other words, what type of incentives, internal or external or the combination of the two makes the effort of overcoming physical and mental challenges worthwhile? Internal and external refer to the source or origin of the incentives that motivate athletes to achieve their goals and objectives. External rewards such as money, titles, approval, status, medals or other people's perceived image of the athlete are incentives that can and do motivate endurance athletes. Internal rewards refer to those incentives that motivate endurance athletes to overcome physical and mental challenges to achieve their goals. Examples of internal rewards include self-image, internal standards of achievement, values or sense of achievement and attitudes.

The combination of these two factors, focus and source, leads to the identification of the four types of motivational strategies: positive-internal, positive-external, negative-internal and negative-external. Each strategy would have different techniques that can be more or less successfully applied depending on the athlete's previous experience and mastery of the technique.

Positive-internal strategies are those strategies through which the athlete motivates himself by focusing on the positive outcome or consequences of successfully completing an endurance event. The positive outcome of successfully achieving his goals would be internal rewards such as feelings of achievement, enjoyment or a reinforcement of a positive self-perception. By focusing on the positive-internal rewards of achieving his own goals (using various techniques), the athlete motivates himself to overcome challenges and obstacles to reach his goals. Examples of positive-internal techniques are positive self-talk, positive visualisation and goal-setting.

Positive-external strategies are where the athlete motivates himself by focusing on the positive outcome or consequences of successfully completing an endurance event. The positive outcome of successfully achieving his goals would be external rewards such as prizes, medals, approval and titles. Therefore, by focusing on the positive external rewards of achieving his own goals (using various techniques) the athlete motivates himself to overcome challenges and obstacles to reach his goals (Puca & Schmalt, 1999). Examples of positive-external techniques are positive self-talk, positive visualisation and goal-setting.

Negative-internal strategies are where the athlete motivates himself by focusing on the negative outcome or consequences of failing to achieve his/her goals and objectives. The outcome of failing to achieve his goals would be internal "punishment" such as feelings of failure, disappointment, regret or self-blame. The athlete motivates himself to avoid these negative outcomes by overcoming challenges and obstacles to reach his goals. Examples of negative-internal techniques are negative self-talk, visualising failure and goal-setting.

Negative-external strategies are where the athlete motivates himself by focusing on the negative outcome or consequences of failing to achieve his/her goals and objectives. The outcome of failing to achieve his goals would be external

“punishment” such as where the athlete perceives that “important others” such as family, friends or coaches would have feelings of failure, disappointment, regret and disapproval about the athlete. Some of the techniques that can be used are negative self-talk, visualising failure and goal-setting.

Although a distinction is being made here between the strategies to enable clear understanding, it must be remembered that athletes may use more than one strategy or a combination at different times during an endurance event and training. The techniques or combination of techniques will depend on the athlete’s previous experience and mastery of the technique.

5.6 RELATIONSHIP BETWEEN MOTIVATIONAL AND COPING STRATEGIES

The relationship between coping strategies and motivational strategies are complex and at times related and interlinked. Motivation refers to the manner in which an individual would exhibit certain behaviour or find themselves in certain situations. Coping and coping strategies refer to the manner in which a person is able to handle or manage challenges or the stressors of specific situations. This seems a clear enough distinction and when looking at many of the theories of coping and motivation, the answer would seem straightforward. People are motivated to be in a state of balance or equilibrium and are motivated to avoid pain and seek pleasure. They should be motivated to seek out situations with the least amount of stressors where the need for coping and coping strategies are minimal.

Although this seems like a reasonable explanation, it is too simplistic and does not apply to endurance athletes. As seen from chapter 5, people have a need for and strive to attain and even transcend their own potential. From the comments made by endurance athletes, it would seem that intrinsic needs and rewards such as accomplishment, pride, mastery, self-control and self-discovery are more important motivators of behaviour than external rewards such as medals or prizes. This is something that was probably learned and developed throughout their life, through experiences in many different situations.

These values became needs that individuals has to gratify by placing themselves in situations where they have to overcome challenges, stressors and difficulties. As

seen in chapter 4, for the individual to gratify these needs, it is necessary for him to do so virtually alone as this will reinforce his perception about his own abilities. Adversity and challenges are not seen as something negative, but rather as opportunities to test their abilities and to develop their own potential. Therefore, it would seem that endurance athletes are motivated to deliberately place themselves in situations where they have to cope with pain, discomfort, the environment and themselves as well as other competitors. The reasons for doing so is that they see this as opportunities for growth, development and self-actualisation and secondly, as opportunities to test their abilities (physical and mental) to cope with challenges, stressors and adversity. Accordingly they re-affirm their own belief in themselves and in Adlerian terms their ability to overcome their own weakness.

It is difficult to give a clear-cut cause-and-effect relationship between coping and motivation. Endurance athletes might be motivated to place themselves in difficult and challenging sport situations, because they expect that they will be able to cope well in these situations. Or because they are motivated to overcome difficulties, challenges and adversity to achieve self-actualisation, they also cope and perform well.

The exact relationship or interrelationship between coping and motivation is not important for this study. What is important is that it seems that endurance athletes are motivated to place themselves in challenging sport situations and that they are able to use coping strategies to overcome the stressors of endurance events.

CHAPTER 6

METHODOLOGY

“The heat, the view and my own suffering while dragging myself up that hill all contributed to the thrill.” – Adriaan Viljoen, South African International Cyclist on the Tour de France

6.1 INTRODUCTION

In this chapter, the research methodology used for this study is described and explained.

6.2 RESEARCH APPROACH

This study aims to explore and describe certain facets of athletes' experiences during endurance events. The facets under study include the environmental stressors, motivation to participate, motivational and coping strategies used by athletes during endurance events. The focus is therefore on individual experiences as well as the identification of themes and patterns of behaviour. Therefore, this study aims to gain insight and comprehension rather than to explain the phenomenon following an empirical approach (Rosnow & Rosenthal, 1996; Babbi & Mouton, 2003; Remenyi, Williams, Money & Swartz, 2005).

To achieve this aim a qualitative research approach was followed. Neuman (1997) and Hesse-Biber and Leavy (2004) state that qualitative methods focus on themes, motifs and patterns of behaviour. A qualitative approach focuses on the processes and meanings that emerge from the data, rather than the quantitative measurement of amount, intensity and frequency (Bolton, 2002). According to Neuman (1997), qualitative and quantitative research styles differ in several ways, but in many they are complementary. All social researchers systematically collect and analyse empirical evidence to understand and explain social life. When data is in the form of words, sentences, and paragraphs rather than numbers, researchers would use different research strategies and data collection techniques.

Neuman (1997: 328) states that a qualitative research style involves more than looking at qualitative data:

“Positivists often try to convert the data into a quantitative form or analyse it using quantitative techniques. For positivists, qualitative data are mental states or conditions that cause measurable behaviour. The issue is how to capture it with precise, reliable quantitative measurement. By contrast, qualitative researchers view qualitative data as intrinsically meaningful, not as deficient”.

Neuman (1997) states that the central issue in qualitative research is the accessibility to other (sub) cultures, the relativity of people's accounts of their social worlds and the meaning that people give to social situations and actions. In other words, qualitative researchers might focus on generating new concepts whereas quantitative methods are more suited to testing and verifying existing concepts. Qualitative results are useful in that they provide a deeper understanding of individual participants' mental processes, and individual areas of strength and weakness can be identified. Answers to 'when', 'what', and 'why' questions can be answered and the consequences of thoughts, emotions and behaviours determined. Results are situation-specific and consideration of external influences can be determined. The only problem is that qualitative research methods are time-consuming and therefore often impractical (Slogrove, 1998; Hesse-Biber & Leavy, 2004; Marschan-Piekkari & Welch, 2004).

Despite this shortcoming, a qualitative research approach seems to best fit the objective of describing the phenomena under discussion in this study. As an explorative study with the focus on determining individual reactions to stressors in endurance events as well as the individual mental processes to cope with these stressors makes this extremely suitable for qualitative research. Individual responses need to be studied to determine any similarities and differences. These patterns of behaviour and mental processes will enable the researcher to identify concepts and themes of behaviour. The basic approach of this study is not to verify or test known concepts, but rather to explore relatively unknown areas. To achieve this, a qualitative research approach is most suitable.

6.3 DATA COLLECTION

The most logical approach to identify typical behaviour would appear to be direct observation thereof in real life situations. This would allow for the most accurate and “typical” observations (Maloney & Ward, 1976; Graziano & Raulin, 1993; Babbi, 1995; Greenbaum, 1998). However, it is not practically feasible to observe people all

the time. Secondly, direct observation of behaviour does not give direct insights into the thought processes of the people being observed. Therefore, the next logical method would be to ask the individual directly about his/her typical behaviour. Two methods of doing this would be to use either questionnaires or interviews or a combination of both. As in all qualitative research, the question of what data gathering to use is closely linked to the state of theoretical development (Neuman, 1997; Terreblanche & Durrheim, 1999). For explorative research into relatively unknown phenomena such as this study, one can expect to have many cases or respondents to ensure that enough data that will generate sufficient information to cover the field of study. However, it is important to remember that the quantity of information (or respondents) is not as important as the quality of information gathered.

In order to make a choice on what data collection method to use, the researcher kept in mind that he was doing explorative research in a relatively unknown field of study and therefore, needed to have several participants, but also that the quality of the data should be of such a nature that it would satisfy the aims of the study. An interview would certainly have provided the quality and richness of information needed but would be time consuming and not practical for the number of participants needed (Babbi & Mouton, 2003; Terreblanche & Durrheim, 1999; Henning, Van Rensburg & Smit, 2004; De Vos, Strydom, Fouche & Delport, 2005). The use of a well-developed questionnaire would have enabled the researcher to reach the required quantity of respondents as well as delivered the required quality of information. Therefore, the researcher decided to use a questionnaire.

Questionnaires are used to sample many respondents that answer the same question or questions (Neuman, 1997). This is done to make deductions of behaviour. The questionnaire is developed based on a theoretical or applied research problem. The questionnaire used in this study asked respondents to report on the effect of environmental stressors, additional stressors, motivation to participate, motivational strategies and coping strategies during events. The advantage of this is that the individual can report on present and past behaviour. This method can be used to gather descriptive, explanatory and explorative data (Babbi, 1995; Terreblanche & Durrheim, 1999; Bryman & Bell, 2003).

The use of questionnaires has certain limitations also (Maloney & Ward, 1976; Babbi, 1995; Terreblanche & Durrheim, 1999; Frary, 2002; Babbi & Mouton, 2003; Polonsky

& Waller, 2005). In this study the respondents were from various cultural backgrounds and language groups. Therefore, the semantic meaning of words used in the questionnaire might not necessarily be the same for all respondents. The consequence of this is that respondents might misunderstand questions and provide responses that are of little or no use. To counter this, the questionnaire was first tested on individuals from similar language groups and cultural backgrounds. Additionally, responses were clarified after the questionnaires were completed.

Secondly, the nature of this questionnaire requires from the individual a certain level of intra-personal insight to accurately assess and perceive his or her “typical” behaviour to some extent. A lack of intra-personal insight or an inability to identify typical behaviour could lead to inaccurate descriptions or guesses. To counter this, clear descriptions of the circumstances of behaviour were given. Additionally, respondents were asked to report on past experiences under these circumstances.

Thirdly, any type of data gathering technique that relies on self-reports by respondents (such as questionnaires and interviews), the truthfulness and honesty of the answers is questionable to some extent. This is especially true for questions that seek answers to sensitive issues or issues that may have “socially acceptable or unacceptable answers”. An understanding of the reasons for the study as well as how their answers will contribute to the study might motivate respondents to answer honestly. By assuring participants of absolute confidentiality and anonymity it will further increase the willingness of respondents to participate more truthfully. In this study, the purpose of the study as well as how their responses would contribute to the study were explained verbally to the respondents. Furthermore, there was a written explanation of the study that formed part of the questionnaire that the respondents completed. In this written explanation the aim of the study, how their responses will contribute to the study as well as assurances of confidentiality and anonymity were given.

Lastly, the questions that form part of the questionnaire do not necessarily relate to the specific concepts that are being measured in the study. According to Frary (2002), the questionnaire developer should precisely define what information is required and write as few questions possible to obtain this information. A shotgun approach where too many peripheral and “might be nice to know” questions are asked must be avoided. This can be done when the researcher has done an extensive search of the literature and knows exactly which questions are important

and those that are not. In this study the questions and items of this questionnaire have been identified from extensive literature searches on the subject. Although there are always the possibility of some overlap, vagueness and mistakes, that is the aim of this study and research in general to identify and thereafter accept and discard information that relates or does not relate to this topic.

The aim of the questionnaire is to get basic biographical information about the respondent. Furthermore, the following research questions will be answered by this questionnaire:

- To determine the perceived impact of environmental stressors on athletes involved in endurance events;
- To determine the motivational strategies used by athletes participating in extreme endurance events;
- To determine the coping strategies used by athletes participating in extreme endurance events.

In other words, the questions in the questionnaire will focus on the athlete's conscious motivation(s) for participating in endurance sport, factors in the environment that increase stress levels, coping strategies used by athletes to overcome stressors and motivational strategies used by athletes to ensure continued performance during endurance events.

Open-ended, closed-ended and Lickert scale questions will be used with the emphasis on open questions. Open-ended questions are used to get respondents' views, opinions or descriptions of experiences (Babbi & Mouton, 2003; Polonsky & Waller, 2005). The reason for this is that open-ended questions can help to understand trends as it adds meaning to the responses. However, open-ended questions should have a specific purpose and should be worded in such a manner that it does not lead the respondent or presuppose an answer. This is done to ensure that the participant's has ample opportunity to record own views and perception. The advantage of open-ended questions is that the individual respondent has the opportunity to air his own opinions or describe his experiences without being restricted by limited choices as are often the case with closed-ended questions. The researcher is therefore able to get a wealth of information that can be used to create

meaning. The disadvantage of open-ended questions is that the responses have to be coded or grouped before they can be processed (Babbi & Mouton, 2003). This coding process requires of the researcher to interpret the meaning of responses leading to the possibility of researcher bias and misunderstanding. Furthermore, there is always the danger that some respondents will give irrelevant answers. In this study researcher bias and misunderstandings in the coding process was minimised by the clarification of responses where the researcher physically discussed the responses with every respondent once he/she completed the questionnaire. Closed-ended questions are mostly used to guide the respondent to make a choice between questions that were pre-determined by the researcher (Babbi & Mouton, 2003; Polonsky & Waller, 2005). This ensures a greater uniformity of responses and are easier to code and process. The one major shortcoming of closed-ended questions lies in the researcher's structuring of the responses. When the answers to questions are obvious and clear, there should not be any difficulties. However, when structuring closed-ended questionnaires, two structural requirements should always be kept in mind; the response categories should be exhaustive and the answer categories must be mutually exclusive (Babbi, 1995; Babbi & Mouton, 2003).

This questionnaire was developed by the researcher based on the findings in the literature (see Appendix B). The questionnaire consists of 27 questions. The questionnaire is structured in the following manner:

- Questions 1 – 3: Basic biographical data;
- Questions 4 – 5: Information on the type of endurance sport the athlete participates in;
- Question 6: Information on the frequency of participation;
- Questions 7, 9, 10, 14, 15, 19, 20, 21: Motivation to participate in endurance sport;
- Questions 8.1 – 8.12, 16, 17, 22, 26: Stressors involved in endurance sport;
- Questions 8.1 – 8.12, 13, 15, 16, 23, 25, 27: Coping strategies used before, during and after endurance events;
- Questions 8.1 – 8.12, 11, 12, 13, 14, 15, 19, 20, 21, and 24: Motivational strategies used before, during and after endurance events.

It might appear as if there are some duplications in the answers to the questions. However, this is not the case. In some of the questions there is some overlap,

especially in the case between some areas of coping strategies and motivational strategies.

However, as seen in chapter 5, the relationship between coping and motivational strategies is complex and often so integrated that it is difficult to make a clear distinction. Therefore, it is possible that some of the questions in the questionnaire might be related to both coping and motivation. To avoid duplication and misunderstandings, the researcher discussed each respondent's responses with him/her once he/she completed the questionnaire. This ensured the accuracy of the responses as well as the fact that the researcher clearly understood the meaning of each response.

6.4 DATA ANALYSIS AND INTERPRETATION

According to Polonsky and Waller (2005) the terms analysis and interpretation are often misused as being interchangeable whereas each have distinct meanings and roles. After data gathering, as with any research study, the researcher usually possesses a lot of data that on its own do not make much sense. Data analysis is the process whereby the researcher cleans and assembles the data, brings order and structures a mass of collected data (Marshall & Rossman, 1995; Polonsky & Waller, 2005). Therefore, the aim of this phase is to process or order the data into "logical" or more accurately – manageable data that can be interpreted (Stewart & Shamdasani, 1990; Baron & Byrne, 1991; Graziano & Raulin, 1993; Babbi, 1995; Singer, 1995; Hoepfl; 1997).

Data interpretation is the process whereby the researcher makes sense of the data or creates meaning from the structured data (Polonsky & Waller, 2005). In this process all the critical thinking abilities of the researcher come into play to interpret the data in order to find the actual meaning. It follows that data analysis will have to be done before data interpretation can take place. The main research approach of this study is qualitative rather than quantitative. Therefore, the focus will be on the content (what is being said) as well as the quality of the experience (how the respondent feels). However, this does not mean that quantitative methods will not be used to order or process the "raw" data. In this study, data that was derived from the closed-ended questions was processed using frequency analysis to develop a descriptive profile of the participants as well as to develop initial patterns of behaviour and specific themes. The aim of this phase is to order, identify themes and search for

patterns in the data that will answer the research questions of the study and can be communicated to the scientific community (Capra, 1983; Baron & Byrne, 1991; Graziano & Raulin, 1993; Babbi, 1995; Singer, 1995; Carney, Joiner & Tragou, 1997; Neuman, 1997; Van Schalkwyk, 1998; Denzin & Lincoln, 2000; Babbi & Mouton, 2003; Polonsky & Waller, 2005). This specific study focuses on the attitudes, experiences and typical behaviour of endurance athletes. The nature of the research questions is diverse ranging from simple descriptive data (types of stressors) to more complex relationships and patterns of behaviour such as the motivational and coping strategies used by athlete to overcome this. However, the basic approach of this study is to understand the individual athlete's experience during endurance events in terms of stressors, motivation to participate, coping with stressors and motivational strategies used to overcome stressors. To do this it is obvious that quantitative analysis would be unsuitable. Therefore, qualitative analysis will be used. Qualitative data analysis procedures fall into five distinctive modes: organising the data; generating categories, patterns and themes; testing the emerging themes against the data; searching for alternative explanations of the data; and report writing (Marshall & Rossman, 1995). In each phase of data analysis, data reduction is crucial as the mass of collected data is organised and ordered into manageable chunks or themes where after the researcher interprets the themes in order to give meaning and insight into the words of the respondents. The same distinctive five modes of data analysis procedure as described by Marshall and Rossman (1995) were followed in this study.

Organising the data. The researcher read the questionnaires several times in order to become familiar with the data. At the same time the researcher sorted the questionnaires according to broad categories such as gender, age, ethnic background, events participated in and types of endurance sport participated in. This was done to reduce the volume of data to a more manageable level. This also ensured that the researcher could start with the descriptive profile of the sample.

Generating categories, patterns and themes. This process involves the identification of regularities and similarities in the responses given by the participants. By grouping similar responses together, categories of meaning or themes emerge. In other words, by grouping and ordering the responses of the participants under certain specific themes (related to the theory and literature), the researcher was able to identify patterns of behaviour, individual differences between athletes and similarities of meaning and experiences. To determine this, the researcher did an initial coding of expected responses and themes. This changed as the analysis progressed – the

nature of qualitative research is fluid, adaptable and changeable to suit the nature of the data (Babbi, 1995; Neuman, 1997; Hesse-Biber & Leavy, 2004; Marschan-Piekkari & Welch, 2004). This initial coding did not restrict the researcher to dogmatically stick to the coding, but rather guided the researcher in the initial phases of the research. Figure 6.1 illustrates the first order coding process.

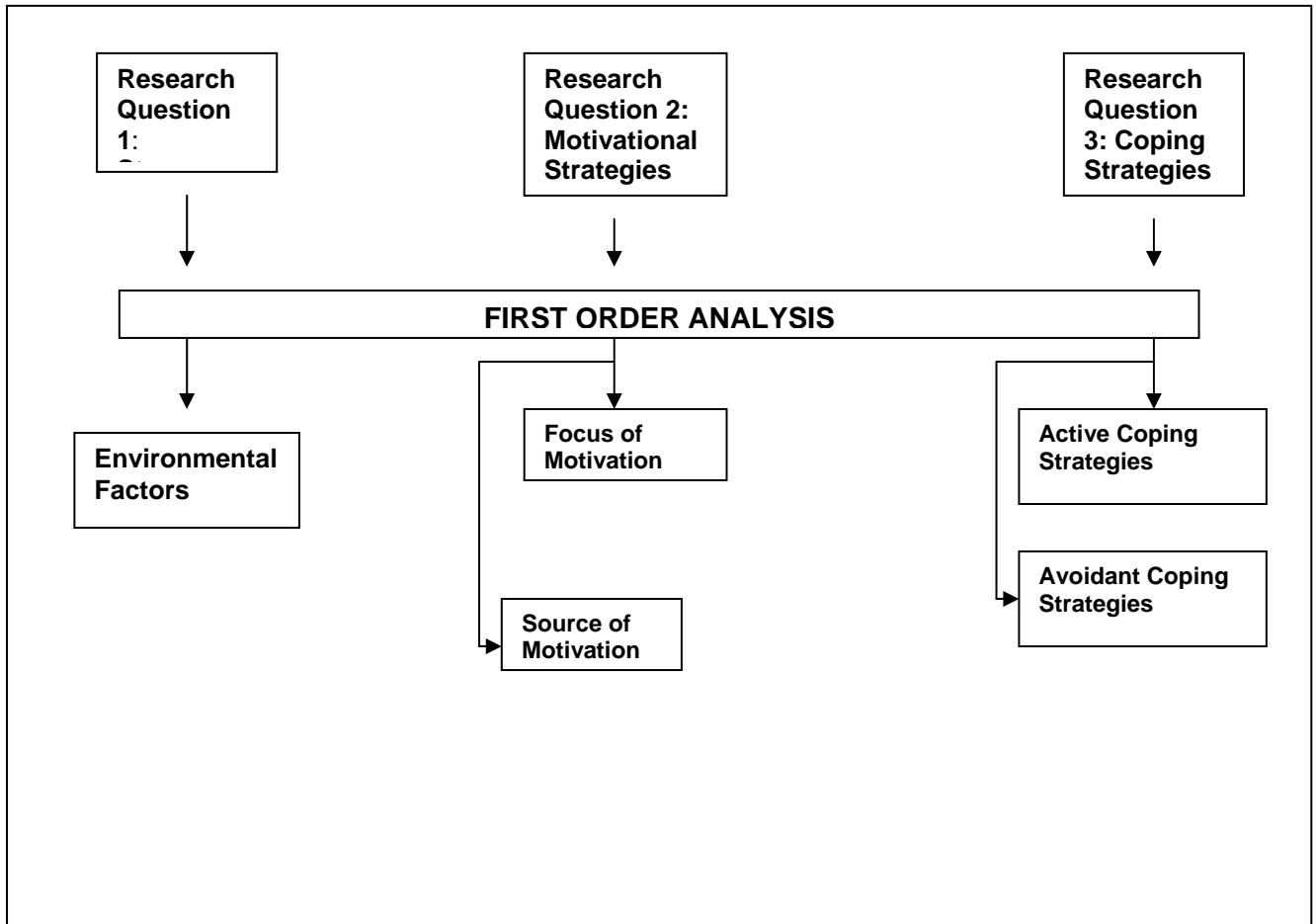


FIGURE 6.1: FIRST ORDER CODING PROCESS

Coding focused both on the manifest content (1st order analysis) – the visible, surface content as well as on the latent (2nd, 3rd and 4th order analysis) or underlying content and meaning. During the initial phase of analysis where the data from the questionnaire and clarification interviews was analysed to determine themes, the focus was more on the manifest content. The coding process of manifest content (2nd and 3rd order analysis) can be seen in figures 6.2, 6.3, 6.4, 6.5.

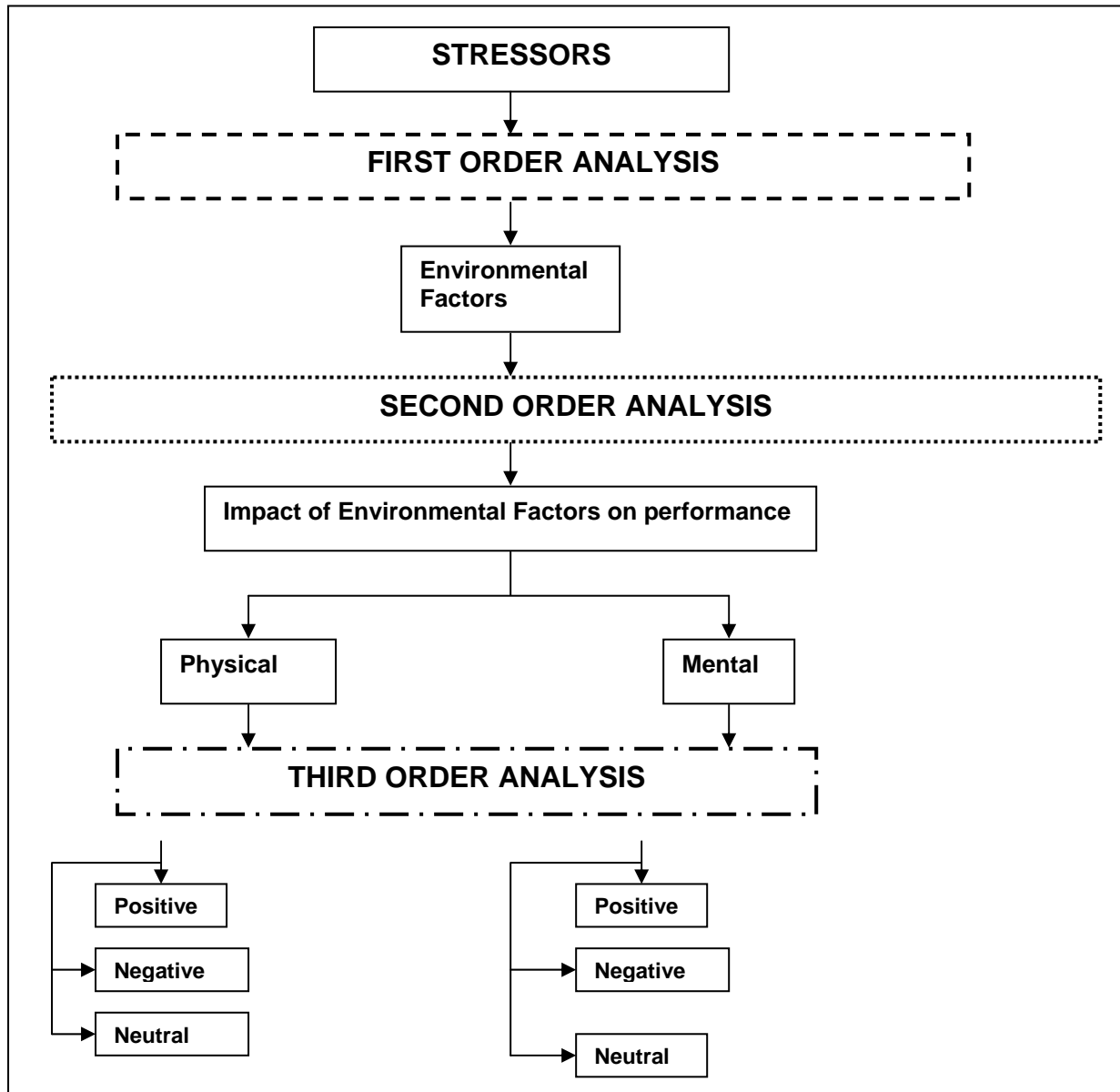


FIGURE 6.2: STRESSORS; 2ND AND 3RD ORDER ANALYSIS

Figure 6.2 illustrates the process followed to code and analyse the stressors involved in endurance events. Firstly, the first order analysis focused on separating stressors previously identified in the literature and additional stressors as it emerged from the data. The second order analysis focused on the perceived physical and mental impact of environmental factors on performance. Secondly, it focused on how additional stressors are perceived by endurance athletes. The third order analysis focused on the perceived positive, negative, and neutral impact of environmental factors on performance as these themes emerged from the data.

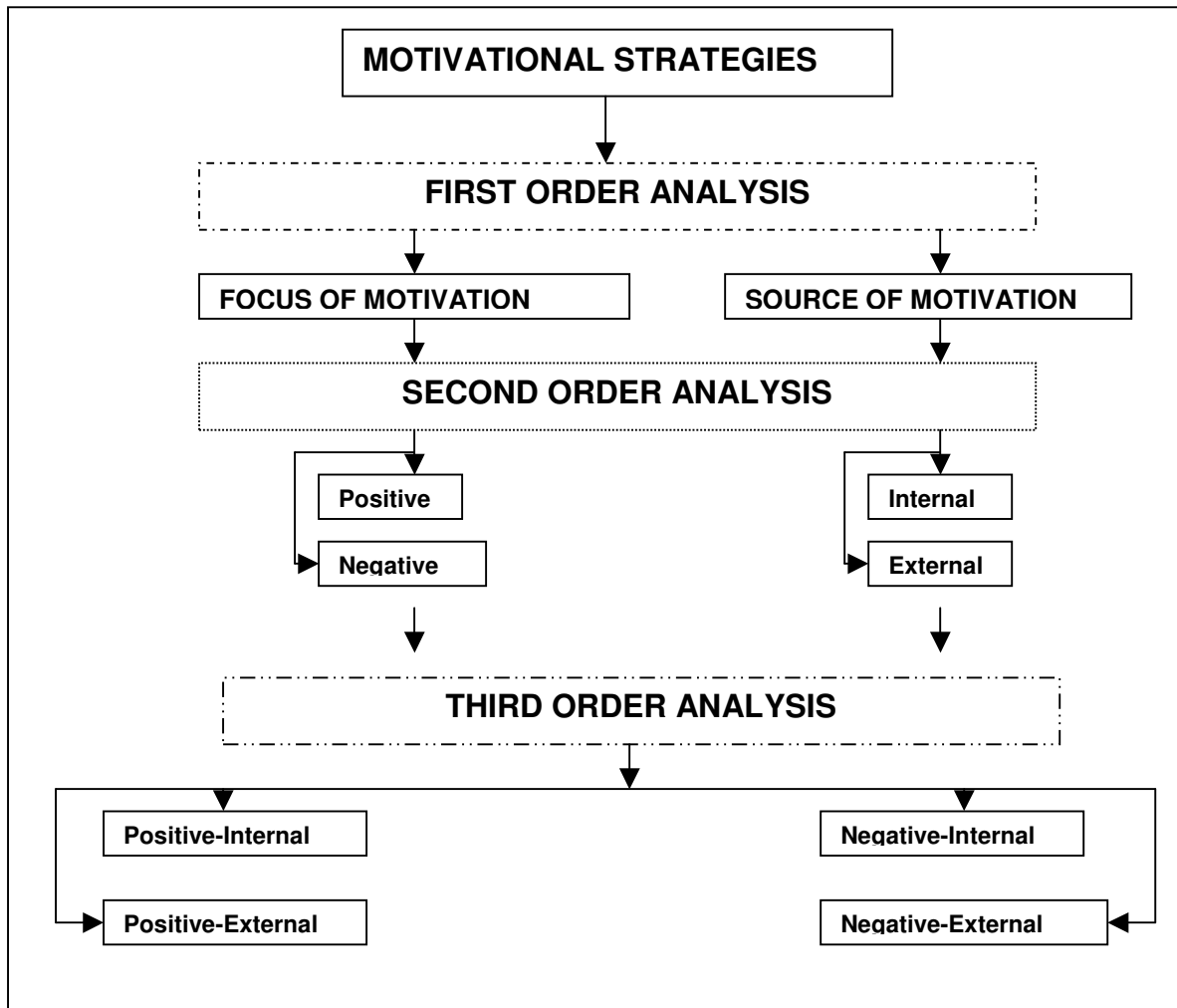


FIGURE 6.3: **MOTIVATIONAL STRATEGIES: 2ND AND 3RD ORDER ANALYSIS**

The first order coding and analysis of motivational strategies focused on two main themes that emerged from the data; focus of motivation and source of motivation. Second order analysis focused on positive and negative focus of motivation as well as on external and internal sources of motivation as these themes emerged, while the third order analysis focused on the combinations of motivational strategies as it emerged in the data.

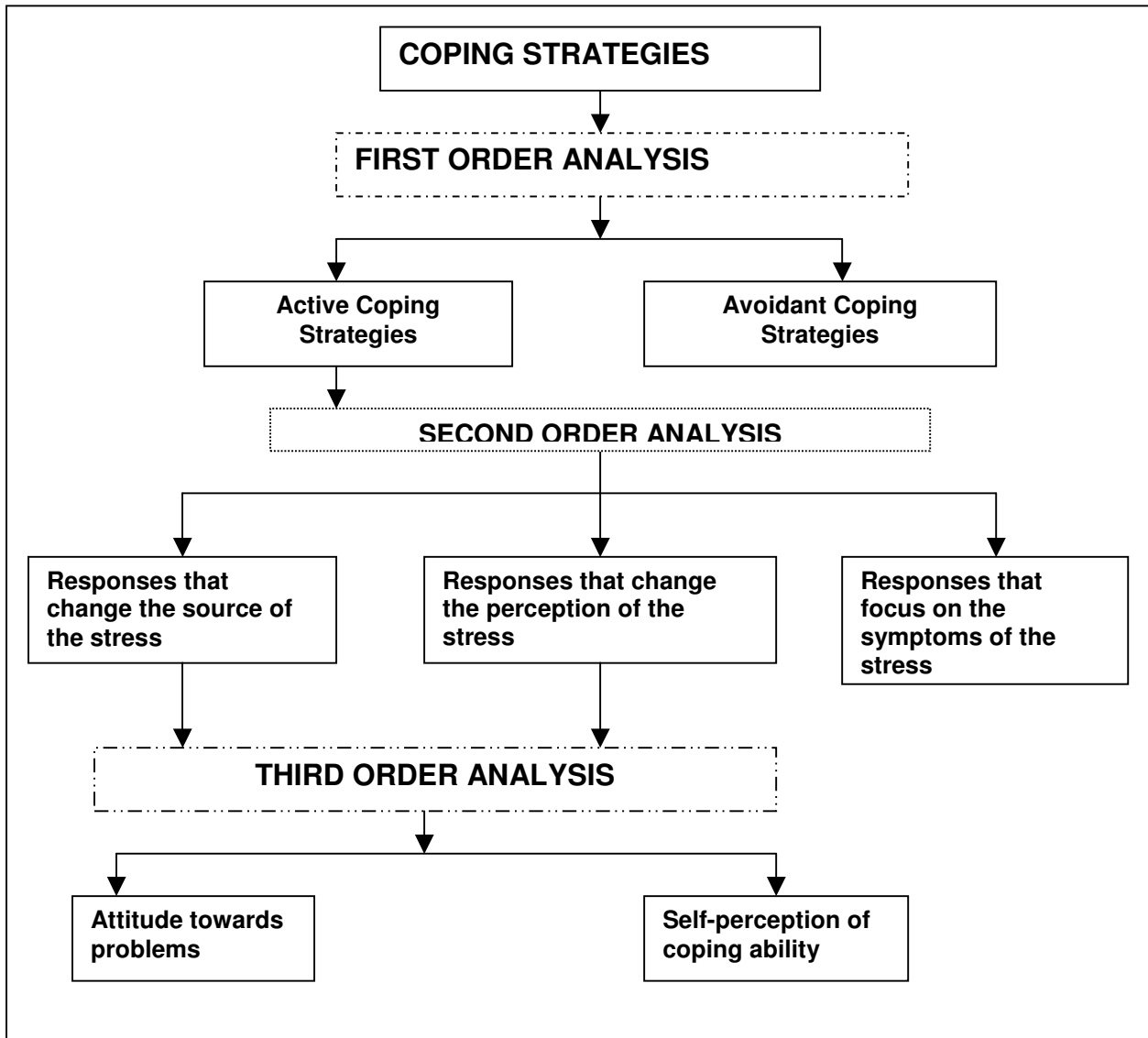


FIGURE 6.4: COPING STRATEGIES; 2ND AND 3RD ORDER ANALYSIS

Figure 6.4 illustrates the process followed to code and analyse the coping strategies and related themes involved in endurance events. The first order analysis focused on separating active coping strategies and avoidant coping strategies. The second order analysis focused on the three active coping strategies that were identified in the literature; responses that change the source of stress, responses that changes the perception of stress, and responses that focus on the symptoms of stress. Out of the analysis of these themes emerged, the third order categories that viewed the attitude towards problems and the perception of individual ability to cope with problems.

Once the coding was complete the researcher developed Excel spreadsheets for all the research questions as well as themes that were previously identified in the

literature. The responses for each of these questions were then grouped on the specific spreadsheet. Thereafter, the researcher then searched for similar responses and grouped these under subcategories or themes. The researcher already identified certain themes through the literature study. However, several themes emerged from the data that required the creation of new categories of meaning or themes that were not present in the literature. Excel spreadsheets were also created for these themes and sub-themes. This process continued until all the responses were grouped under specific themes or sub-themes. Once all the responses were grouped under the identified themes and sub-themes the researcher searched for those responses of which the *meaning* had internal convergence and external divergence, in other words where the meaning is internally consistent but distinct from each other. It is important to note that the focus was not on the face value of the response but rather on the inherent meaning of the response. Therefore, several responses that had the same wording had more than one inherent meaning and were therefore included in more than one theme or category (the seeming duality of meanings in some responses was clarified with each respondent after they completed the questionnaire).

Testing emerging themes. In this phase, the themes and patterns that emerged are evaluated by the researcher to determine the plausibility of these emerging themes (Marshall & Rossman, 1995). This process of evaluating or testing of the emerging themes entails a search of the data in order to challenge the themes. This is done by confirming the themes with positive comparisons in the data or by searching for negative instances of the patterns. In this study several initial themes and sub-themes were identified through the literature search. These themes and sub-themes can be seen in table 6.1.

TABLE 6.1: INITIAL THEMES IDENTIFIED THROUGH LITERATURE SEARCH

Nr	Theme	Sub-theme
1	Environmental Stressors	Heat, cold, altitude, wind, terrain, equipment, distance, sleep deprivation, nutrition, hydration and uncertainty.
2	Coping strategies	Responses that change the source of the stress or situation that causes stress; responses that change the individual's perception of the stressor or control the meaning of the experience after it happened; responses that control the symptoms of the stress itself after it emerged.

3	Motivational strategies	Positive-internal, positive-external, negative-internal, negative- external, and combinations.
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These initial themes and sub-themes were evaluated with the data to identify congruence as well as differences. Where congruence was found the themes and sub-themes were accepted. Where differences were found further analyses were done, alternative themes and sub-themes were identified and the process was repeated until all themes and sub-themes were acceptable. The same process was followed with new themes and sub-themes that emerged from the data.

Searching for alternative explanations. In this phase the researcher has to critically challenge the emerging patterns and themes. This very important process is done to ensure that the researcher is not biased in his interpretation of the data and to ensure that the interpretation is not superficial but has enough depth to achieves the research goals. In this process the researcher must search for and identify plausible alternative explanations, describe them and then demonstrate how the explanation offered is the most plausible. Therefore, in this phase the researcher has to interpret the data, challenge emerging themes, generate alternatives and argue to build a logical interrelationship that is supported by the data as well as by other studies.

In this study, this phase was followed meticulously. Each emerging theme was challenged. However, the results frequently concurred with the literature. In these cases the emerging themes were compared with the literature and where it concurred the theme was accepted. However, in those cases where the themes did not concur with previous studies or where new themes emerged, the researcher went back to the data and literature and generated alternative explanations. This was then noted, compared to the emerging theses and argued until an acceptable explanation was found.

Writing the report. According to Marshall and Rossman (1995) report writing about qualitative data cannot be separated from the analytic process. It is central to the process as the choice of words to summarise, explain and reflect the complexity of the data is in itself a process of analysis and interpretation.

In this study, the researcher attempted to report on his findings by giving a realistic account of the research phenomena that were studied. However, the researcher also

attempted to present the findings in a credible and respectable manner without boring the reader to death.

6.5 SAMPLING

The initial sample was 85 athletes. However, several of the respondents were found unsuitable due to the fact that they did not participate in endurance sport or were not experienced enough. The final sample for this study consisted of 53 experienced non-elite endurance athletes. These athletes were chosen on their availability and willingness to participate in the study.

An operational definition of experienced non-elite endurance athletes describes people who have participated in at least four endurance events (marathons – 10 km+, cycling – 30km+, mountain biking – 20km+, canoeing/kayaking – 30km+, backpacking – 30km+, adventure racing – 25km+, Iron Man etc.), two in the last year without being a professional athlete (non-paid).

For the first phase of data gathering (questionnaire), 53 experienced non-elite athletes completed the questionnaire.

For the second phase (informal interviews), the researcher discussed the responses to the questionnaire with 49 of available participants to clarify their responses as well as the specific meaning of each response.

6.6 ETHICAL CONSIDERATIONS

Ethics in research fulfill two basic roles; Firstly, the protection of people as research subjects and secondly, to ensure that good, quality research is done (Graziano & Raulin, 1993; Babbi, 1995; Marshall & Rossman, 1995; Carney *et al.*, 1997; Neuman, 1997; Van Schalkwyk, 1998; Denzin & Lincoln, 2000; Babbi & Mouton, 2003; Polonsky & Waller, 2005). The researcher met both these requirements in this study. Participation in this study was entirely voluntary. The participants never received nor were promised any form physical or psychological reward apart from the satisfaction of participating in this study. Care was taken to receive written consent from every participant to participate in this study and for the results of their participation to be used and communicated as part of scientific research (see Appendix A).

The researcher also promised and ensured that the confidentiality of participants in this study was protected. The information received was kept anonymous and confidential. The questionnaire and follow-up clarification interviews at no time, neither identify the participants nor are the results communicated in such a manner as to identify the individual respondents.

6.7 SUMMARY

This chapter outlined and described the methodological process that was used in this study. The chapter focused on factors such as the basic research approach, data collection, data analysis and interpretation, sampling as well as the ethical considerations. In the next chapter the results of the study and analysis will be presented.

CHAPTER 7

RESULTS

“It’s not the winning that’s important, it’s the taking part; it’s not the victory that counts, but the struggle”. – Baron Pierre de Coubettin

7.1 INTRODUCTION

The aims of this chapter are to clearly and systematically present the results of this study. In this chapter the results will be (as far as is possible) visually presented followed by a brief discussion. The aim of qualitative research and this study is to identify and describe patterns and relationships and it is therefore important not to focus on the obvious meaning of the results, but also its relationship to the literature as well as other results. This will be done in chapter 8 as the sole aim of chapter 7 is to present the results. It might seem to be duplication to have a separate chapter where the results are presented as well as another chapter where the results are discussed. Initially the researcher presented and discussed the results in one chapter. However, due to the large amount of information the chapter and discussion became cumbersome and confusing. It was therefore, decided to split the presentation and discussion of the results to make reading of the discussion easier.

The results will be presented under the following headings or themes that emerged from the data and were accepted after careful consideration:

- Description of the respondents;
- Perceived impact of environmental factors on performance;
- Motivational strategies used during endurance events;
- Coping strategies used during endurance events;
- Attitude towards problems/challenges;
- Self-perception of own ability to cope with the challenges of endurance sport.

7.2 DESCRIPTION OF RESPONDENTS

The respondents for this study consisted of 53 experienced non-elite endurance athletes. The respondents' biographical background will be discussed in terms of gender, race, age, types of endurance sport disciplines participating in, number of disciplines participating in, and events participated in during the last year.

7.2.1 GENDER DISTRIBUTION OF RESPONDENTS

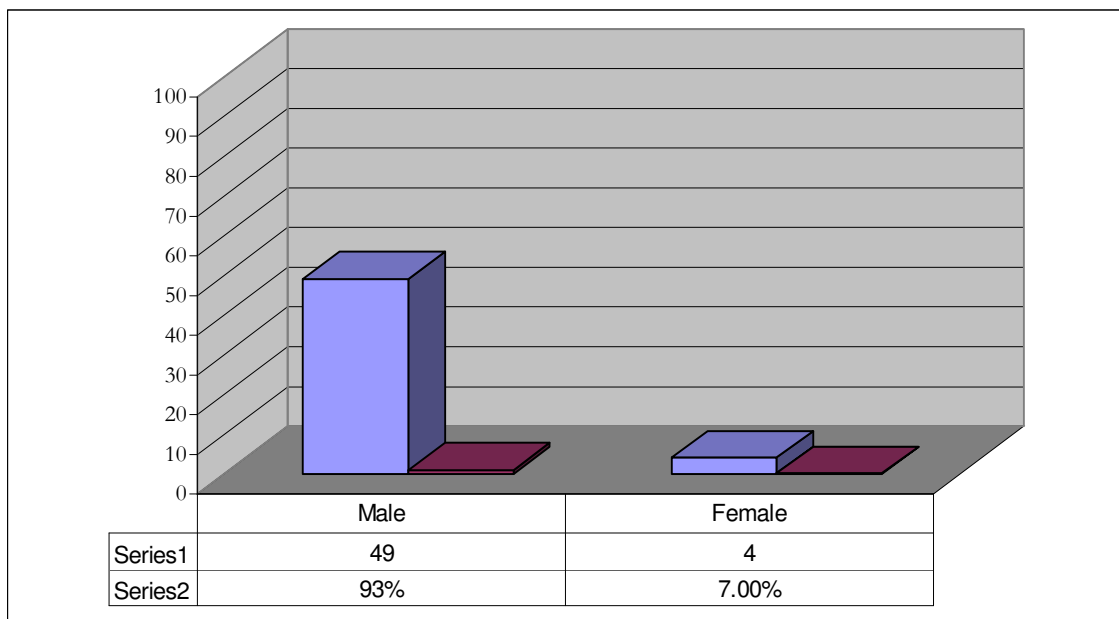


FIGURE 7.1: GENDER DISTRIBUTION OF RESPONDENTS

From figure 7.1 it is obvious that the greater majority of respondents are male (93%), whereas female respondents for this study number 7% of the total.

7.2.2 RACE DISTRIBUTION OF RESPONDENTS

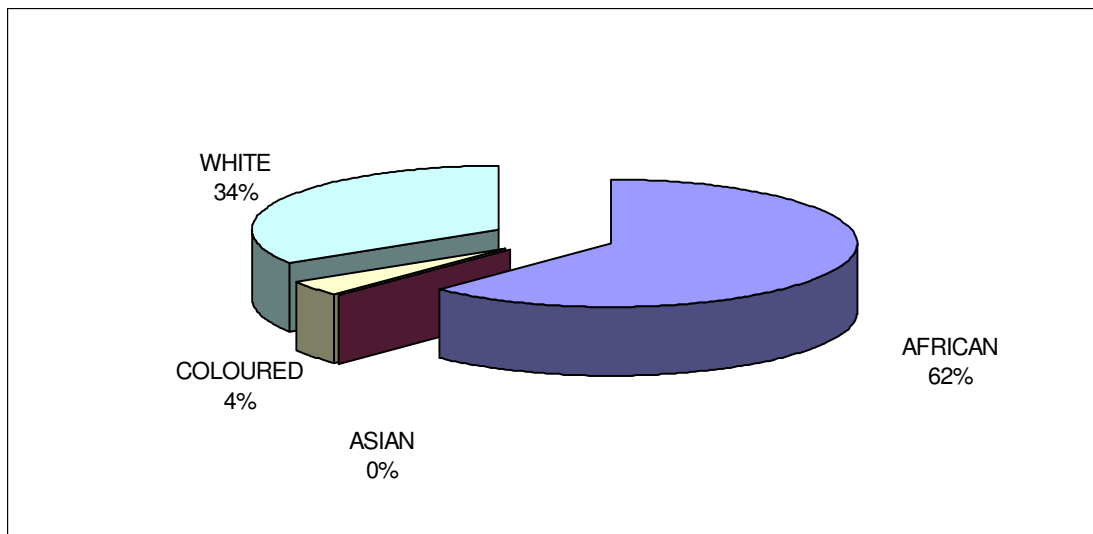


FIGURE 7.2: RACE DISTRIBUTION OF RESPONDENTS

The race distribution of respondents generally reflects the population of South Africa. Of the 53 respondents, 62% are African, 34% are White and 4% are Coloured. Unfortunately no Asian respondents were available.

7.2.3 AGE DISTRIBUTION OF RESPONDENTS

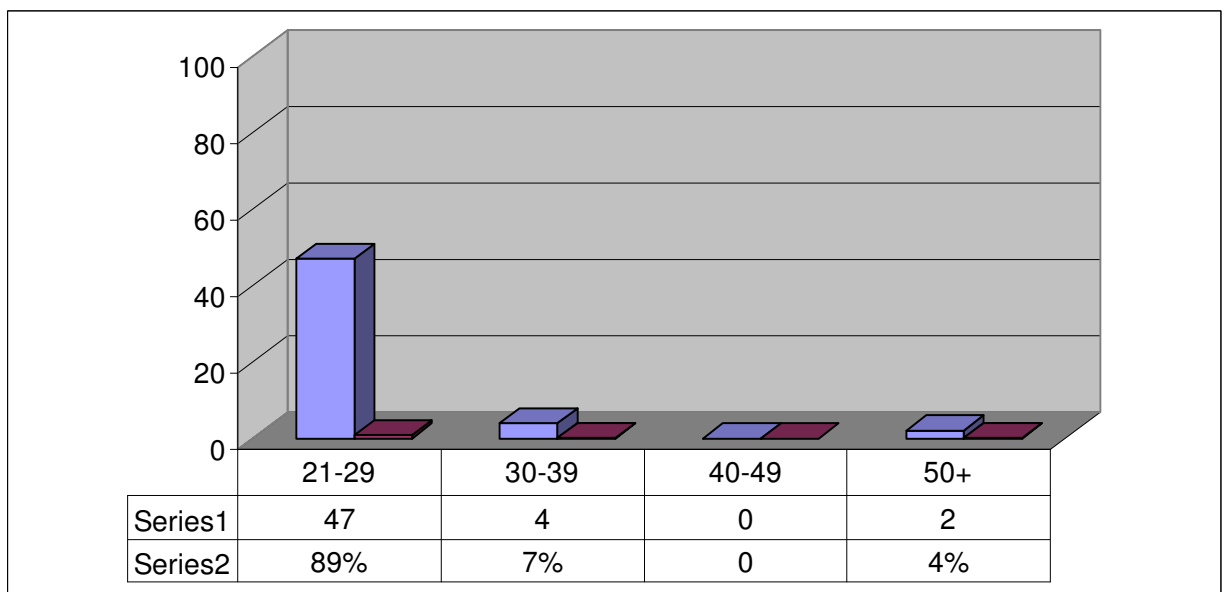


FIGURE 7.3: AGE DISTRIBUTION OF RESPONDENTS

Of the 53 respondents, 89% is between the age of 21 and 29. The next age group of 30 to 39 represents 7% of the total respondents followed by the age group 50+ representing 4% of the total. Unfortunately no respondents in the age group 40 to 49 were available or willing to participate in the study. The implication of this distribution is that the results of this study might not be applicable to endurance athletes in the age group 40 to 49. However, if one takes into account one of the basic assumptions of the Salutogenic theory that sense of coherence are basically established by the age of 30 with relatively few changes thereafter, the assumption can be made that coping and motivational strategies for the age group 40 to 49 would be similar to the groups 30 to 39 and 50+ and that with caution, the results can be generalised to this group. However, further research including this age group is essential.

7.2.4 DISTRIBUTION OF ENDURANCE SPORT DISCIPLINES

TABLE 7.1: DISTRIBUTION OF ENDURANCE SPORT DISCIPLINES

ENDURANCE SPORT DISCIPLINE	%	ENDURANCE SPORT DISCIPLINE	%
Marathon Running	15.3	Mountaineering	5.1
Backpacking/Trekking	14.4	Endurance Swimming	5.1
Cross Country Running	12	Canoeing/Kayaking	3
Orienteering	11	Ultra distance Marathon Running	2
Road Cycling	10.2	Endurance Horse Riding	2
Ultra distance Road Cycling	7	Military Pentathlon	2
Mountain Biking	6	Ultra distance Mountain Biking	1
Adventure Racing	6		

This table shows that the different disciplines that the respondents of this study participate in are relatively evenly distributed. However, marathon running (15.3%), backpacking/trekking (14.4%), cross country running (12%), orienteering (11%) and road cycling (10.2%) seem to be most prevalent. It would seem that the more technical and “equipment intensive” (and consequently more expensive) the discipline becomes, the less popular the discipline. A possible explanation for this phenomenon might be that 66% of the respondents fall into historically disadvantaged communities.

7.2.5 NUMBER OF DISCIPLINES PARTICIPATED IN

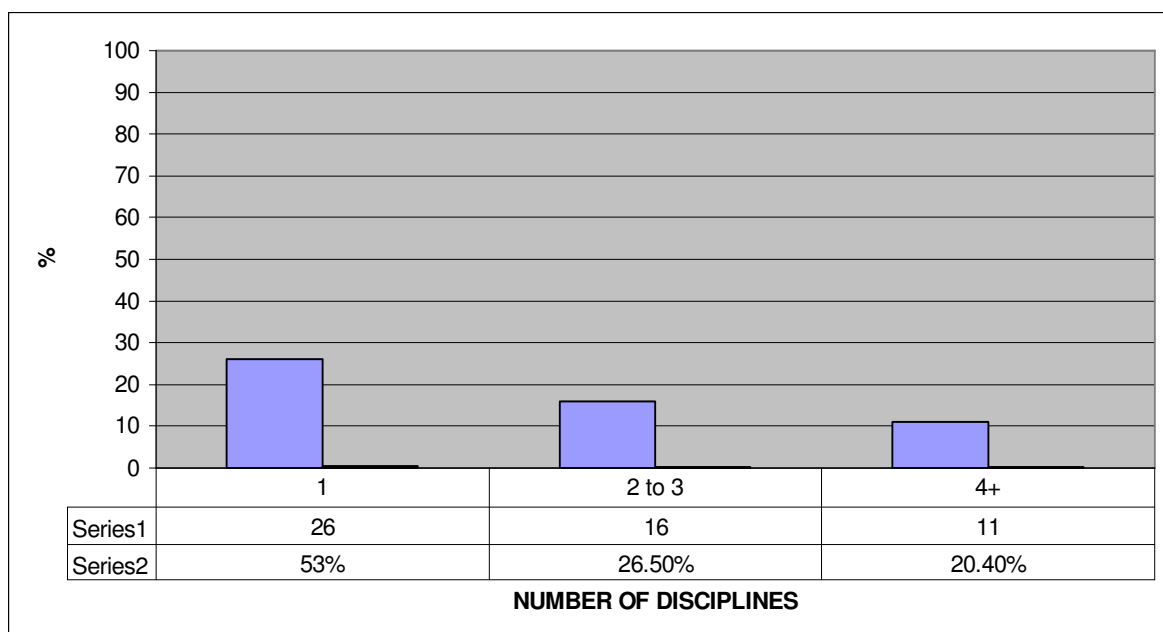


FIGURE 7.4: NUMBER OF DISCIPLINES PARTICIPATED IN BY RESPONDENTS

Figure 7.4 shows that 53% of the respondents participate in one endurance sport discipline. However, 26.5% of the respondents participate in between two and three endurance sport disciplines, whereas 20.4% participates in four or more endurance sport disciplines. Although this might seem strange, it must be remembered that several of the disciplines are related such as marathon running and ultra distance marathon running, road cycling and ultra distance road cycling as well as mountain biking and ultra distance mountain biking. Therefore, athletes might participate in one or more similar disciplines. Furthermore, a discipline such as adventure racing might include and necessitate some level of proficiency in three or more disciplines such as cross country running, orienteering, ultra distance mountain biking, trekking, mountaineering and kayaking.

7.2.6 ENDURANCE EVENTS PARTICIPATED IN DURING LAST YEAR

TABLE 7.2: ENDURANCE EVENTS PARTICIPATED IN DURING LAST YEAR

Comrades marathon	22
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Airborne Africa	3
Suikerbosrant Hiking trail	2
Ribbok Hiking trail	4
Liqui Fruit Adventure Race	8
OFM Moolmanshoek Adventure Race	6
Vulture Parys Adventure Race	7
The Lost Dash Adventure Race	2
Outeniqa Hiking trail	4
Swazi Extreme Adventure Race	2
Ficksburg Cherry Festival MTB Race	4
OFM Classic Cycle Race	11
Cape Argus Classic Cycle Race	15
Telecom Hartbeeshoek Tracking Station Cycle Challenge	5
Lonmin 65 Km Adventure Race	2
2 Oceans Marathon	14
Infantry School Cango Caves 42 road race	3
WPASS Oktoberfest Adventure Race	1
New Year 10 road race	3
ACE Half Marathon	4
Menlyn Park George Claasen 21 road race	3
McCarthy Toyota Half Marathon	6
Ndaba 2-in-1 road race	9
Bronkhorstspuit 32 km	3
Deloitte & Touché Pretoria 42 road race	13
Akasia 3-in-1 road race	7
BMW Summer Cycle Race	5
Harmony Heaven Adventure 42 road race	2
Fit 2000 Half Marathon	3
Wally Hayward 42 Marathon	1
Jackie Mekler 50 km Ultra marathon	6
Cansa Lost City Classic Cycle Tour	5
Telkom Midmar Mile	5
Roodeplaat 1000 m swimming event	3
Rooiwal Cycle Challenge	4
Bielie Mielie Festival Cycle race	2

As can be seen in table 7.2, the 53 respondents participated in over 200 endurance events during the previous year. This averages 3.8 events per respondent per year. A breakdown of the events shows that marathon running is the most prevalent both in number of events (15) as well as number of participants (99) followed by road cycling with 7 events and 47 participants. Close in terms of number of events is both adventure racing (with 7 events and 27 participants) and backpacking/trekking (with 3 trails and 10 participants). This is followed by endurance swimming (2 events and 8 participants), mountain biking (1 event and 4 participants) and military pentathlon (1 event and 3 participant). Some of the respondents participated in their relevant disciplines but not necessarily as part of official events or could not recall the specific events.

In the following section the results in terms of stressors involved in endurance events will be discussed.

7.3 PERCEIVED IMPACT OF ENVIRONMENTAL FACTORS ON PERFORMANCE DURING ENDURANCE EVENTS

In chapter 3 certain environmental stressors that influence athletes during endurance events have been identified from the literature. The identified factors were heat, cold, altitude, hydration, nutrition, wind, rain, distance, terrain and equipment. One additional factor, uncertainty, was included in the questionnaire. In this section, the influence of these factors will be discussed as well as additional factors that increase stress during endurance events. In chapter 3, an in-depth discussion revolved around the environmental factors that increase physical and/or mental stress in athletes participating in endurance events. This discussion was based on an extensive study of available literature. However, this discussion mostly focused on the physiological effects that it would have on athletes. Very little focus was placed on the individual athlete's *perception* of these conditions and *how it is perceived to influence performance*.

In this section, the perception of the identified (in the literature) environmental conditions as well as it's perceived influence on performance will be discussed. In the questionnaire the respondents had to answer the question: "What influence does.... (Extreme heat, cold, altitude, etc.) have on your performance during endurance

events?” The perception of or perceived influence of heat, for example, on the athlete could be categorized according to positive, negative and neutral influence. Furthermore, these aspects were further categorized according to their perceived physical and mental influence.

7.3.1 UNCERTAINTY

Uncertainty refers specifically to four types of uncertainty; general uncertainty, uncertainty over physical ability, uncertainty over mental strength and unexpected situations.

General uncertainty refers to general feelings of anxiety over uncertain situations or where the outcome of situations is unknown. The following quotations are some examples of the responses in this category:

“Lack of information (knowledge of the area). This makes me feel anxious”.

“Uncertainty of what is expected of me”.

“Being lost. For me this is the worst because it means that I don’t know what to do. If I go forward I might become even more lost. If I go back I might become even more lost”.

“Waiting is always the worst for me. I start to think of all the things that can go wrong. But all this uncertainty goes away once I start”.

“Unknown terrain makes it difficult for me to plan and to know what to expect. This uncertainty makes me nervous”.

“If I do not know what the distance is I become very anxious as it makes me uncertain and I cannot plan mentally and physically. It makes me feel out of control and vulnerable”.

Uncertainty regarding physical ability refers to feelings of anxiety by the athlete over his/her physical ability to successfully compete or perform. These feelings of anxiety can be due to several factors, such as real physical inability or perceived physical

inability. The following quotations are some examples of the responses in this category:

“Lack of confidence in own ability”.

“Fear that I will not be able to complete the event”.

“I’m uncertain whether I’ll finish or not”.

“Terrified when I think of myself falling”.

“Physical ability to perform well”.

“I’m afraid that the event will be physically too difficult/technical”.

“I’m worried that I will not keep up with the team”.

Uncertainty regarding mental strength refers to feelings of anxiety by the athlete over his/her mental strength or toughness to successfully compete or perform in endurance events. These feelings of anxiety can be due to several factors such as negative thought processes, lack of motivation or perceived mental inability. The following quotations are some examples of the responses in this category:

“I, myself are my own worst enemy. I sometimes start events or more often during preparation – I have to fight my own mind to continue”.

“Negative thoughts affects my performance making me uncertain if I will finish”.

“Mental ability to finish the race”.

“I don’t know if my mind will play tricks”.

“Being unmotivated”.

“Broken concentration and inability to focus makes me doubt the outcome of a race”.

“When I fall behind I get desperate. I wonder if I will make it and double my efforts to cycle faster”.

“Fear that I will not be mentally strong enough to complete the event”.

Uncertainty regarding unexpected situations refers to feelings of anxiety by the athlete over situations during the endurance event that change unexpectedly and his/her ability to adapt to this new situation. The anxiety or stress is the result of doubt by the athlete regarding his/her ability (mentally and physically) to cope and control the situation. An inability to cope would result in poorer performance or even an inability to complete the event. This uncertainty creates a certain level of stress within the athlete. The following quotations are some examples of the responses in this category:

“Deviations from the route by organizers”.

“Fear of not getting to the event on time”.

“Bottle necks in the route”.

“Surprises create uncertainty as I do not know what to expect or if I will be able to cope”.

“Uncertainty concerning factors that could be encountered over which I have little or no control”.

7.3.2 EXTREME HEAT

In general it would seem as if extreme heat has a negative influence on athletes both physically and mentally. The following quotations are some examples of the responses in this category:

“Dehydration, muscle cramps, headaches”.

“A runner can lose a lot of fluid during the race when it is extremely hot. I cannot run at fast pace when it is hot”.

"Makes you tired very fast. Sunburn makes it difficult to continue. Dehydration".

"Sweating a lot and can cause dehydration".

"Heat makes you slower causing more pain. Heat increases the heat in your shoes causing more friction and blisters".

"Makes you more tired".

"Extreme heat makes you more tired causing you to rest more and therefore slowing you down".

"During the event my body loose moisture quickly and I start struggling and have to stop often".

"Shortness of breath, excessive perspiration, discomfort, dizziness, dehydration".

" A very bad weather condition to participate in".

Mentally the influence is as negative as physically. The following quotations are some examples of the responses in this category:

"This is my personal worst".

"Mentally it makes the day seem longer".

"Mentally I consider changing the pace".

"Mentally more concentration is needed".

"Before: Will I be able to compete? During: Will I be able to complete at this pace?"

"Irritation and fatigue as well as anger".

“It bothers your mind and that makes you more tired”.

“It takes away control. Control of breathing, control of energy, control of focus, control of urination”.

Mentally the positive influence seems to be (as with physical) that it gives the athlete that is used to heat a competitive advantage.

“Positive as my body is used to heat and I can push myself. Then I get to the front and feel good about myself”.

“Love heat. Any heat makes me sweat a lot but if you feel that heat running down the side of your head you know that you are working”.

“Mentally makes me determined to endure”.

The candidates that were neutral with regarding to the influence of heat were so mainly because they did not think about it before the event or do not perceive it to be an influence mentally.

“Before - I usually don't think about it”.

“None before – I am just cautious”.

“Mentally not an influence”.

7.3.3 EXTREME COLD

In general, extreme cold is perceived as negative (both physically and mentally) although the difference between positive and negative is relatively small. Physically, cold is perceived as positive due to the fact that dehydration due to excessive sweating is not present.

“Very comfortable weather to compete in”.

“During: Physically - once in motion, I tend to have extra energy”.

“According to me, cold is better than heat especially when there is a task to be performed. I only feel the cold when I'm done”.

“Very enjoyable weather because no dehydration or over sweating”.

Mentally, cold is positively perceived due to the simple fact that some of the respondents seem to enjoy cold more than hot weather.

“Great – cold is good”.

“Before – excited. During – calm”.

“I get happy”.

“It is easy to adapt and concentration is very high”.

Physically extreme cold is perceived to have a negative influence due to the effect that the cold has on the body.

“Nasal congestion. Freezed fingers, toes and other sensitive areas. It is not comfortable to run in cold conditions”.

“My hands become stiff and my back become cold”.

“Has to run at an even pace, sometimes even faster, to keep my body at a certain temperature. Makes me uncertain of the outcome of an event”.

“Shivering and frozen toes, running nose”.

“Hypothermia”.

“It tires you as your immune system fights the cold”.

“It slows your movement”.

“Body starts stiffening when you rest causing more pain”.

“I use a lot of energy because I can't get warm and have to increase my activity level in order to get warm. I wonder why I started when it is so cold”.

“Physically fairly difficult to get started”.

Mentally, cold conditions are mostly perceived by endurance athletes to have a negative effect on mood and motivation.

“Before – de-motivates me. Wish I could rather stay in bed. Right before - wish we could start, muscles stiff. During - don't think it's ever been so cold that it bothers me”.

“My performance goes down. I lose concentration and I wish I were somewhere more comfortable”.

“Makes me very negative mentally”.

“Bothers my mind because I'd rather be hot than cold”.

“Before: Physically fairly difficult to get started and mentally not very motivated. During: Physically - once in motion, I tend to have extra energy. Mentally it requires a lot of self-motivation to continue”.

7.3.4 ALTITUDE

From the responses, it would seem as if the majority of athletes perceive altitude as a negative influence, both physically and mentally during endurance events.

“Athletes who live inland performs better when they are running marathons in the coastal areas and runners from the coast is hard for them to perform better because of the (higher) altitude”.

“Before event - might not notice it or sleep more. During - more/less capacity in body and lungs depending on altitude”.

“At sea level breathing is easier than inland”.

The perceived positive mental effects of altitude are related to individual preference for the type of terrain (mountains) that the individual athletes has.

“I like it – I love mountains and love cycling in them. I am good in this type of terrain and can usually out cycle a lot of other cyclists”.

The negative physical effects are mostly symptoms of this reduction in oxygen transportation.

“Atmosphere is not the same - breathing is sometimes a problem”.

“You get tired a lot easier”.

“Breathing is more difficult at high altitude - performance falls”.

“Makes you slow and use a lot of energy”.

“Constantly thirsty”.

“Lack of breathing control due to a change of atmosphere”.

“Nausea and headache”.

The perceived negative mental effects of altitude on endurance athletes are mostly related to disorientation and confusion.

“Sickening feeling in the gut and disorientation”.

“Mentally you can find yourself confused”.

“Nervous of altitude”.

“Makes one less sure of one’s ability to perform and takes mind of one’s aim”.

7.3.5 DEHYDRATION

The majority of respondents perceive this factor to have a very negative effect, physically and mentally, on performance during endurance events. There were no positive responses to this factor although there were some neutral responses.

“Terrible!! It is not only the loss of water, but also the loss of electrolytes that lead to cramps, loss of concentration”.

“Dizziness and blurred eyesight”.

“One’s performance goes down as the body loose power and one’s morale goes down and sometimes causes a no-care attitude whether you fail or not”.

“If you dehydrate during a race you will not be able to continue as you first have to recover”.

“You fall down and become unconscious”.

“I know I’m dehydrated when I get goose bumps despite the heat and when I dream of ice cold water (10)”.

“It is the loss of water from you body up to a level where even your brain shorts water and shuts down”.

“It makes you nauseous and weak and you will faint”.

“Sleepiness, raised heartbeat, doesn't speak sense”.

“Dizziness, dry mouth, lack of energy and terrible headaches”.

Mentally, dehydration is perceived as having a negative influence due to the fact that it negatively affects mood and motivation as well as the ability to concentrate and focus.

“Scared: feels like you're dizzy and can't think properly and feels like losing control of yourself”.

“I become very tired physically and mentally I would easily lack the will to carry on”.

“Makes me negative because I loose power and concentration and have to rest a lot”.

“One's performance goes down as the body lose power and one's morale goes down and sometimes causes a no-care attitude whether you fail or not”.

“I know I'm dehydrated when I get goose bumps despite the heat and when I dream of ice cold water”.

Some of the respondents felt that dehydration or the fact that some athletes become dehydrated is their own fault as event organisers usually provide more than enough water points along the way. Therefore, if an athlete does become dehydrated, it is due to ignorance, poor planning or poor preparation on his/her side.

“In extreme sports organisers place great emphasis on hydration and water points, the competition is to drink and fill up at each point. Dehydration is a sign of poor preparation and poor planning”.

“On event of a marathon there is enough water station on the road. Dehydration can occur to athletes who are ignorant”.

7.3.6 NUTRITION

Physically and mentally all the respondents perceive the lack of proper nutrition as having a negative effect on their performance during endurance events. As can be seen in the following quotations, these symptoms are experienced by several of the respondents.

"Feel weak when I haven't eaten".

"Makes your body and mind tired".

"Tiredness and nausea".

"Become more tired, restless and lose concentration".

"Energy levels go down".

"Makes you slow sometimes".

"A runner cannot perform without energy. Without nutrition long distance runner cannot run".

"Constant hunger during the race despite eating. "Hit the wall" (niks krag nie) worst factor of all for me".

"Have no power or energy - get tired very quickly. Feel physically ill (I didn't know the 1st time it happened that I didn't eat enough). Was depressed because I couldn't get going".

The negative effects to cognitive processes were also experienced by several of the respondents as well as negative effects to mood and motivation.

"Get tired easier and tend to think of my stomach".

"Think of food the whole time".

"Become more tired, restless and lose concentration".

Several of the respondents experienced general tiredness and difficulty with their cognitive processes.

“Makes your body and mind tired”.

“If you don't eat you will be unhealthy loss weight, your mind cannot function properly if you don't eat healthy”.

However, it does seem that some of the respondents are willing to undergo a certain level of nutrition deprivation as long as it is a “normal” or “acceptable” part of endurance events. However, if this is due to other reasons, for example poor planning, it becomes unacceptable.

“I would not participate if this factor (nutrition deprivation) were present”.

“Have no power or energy - get tired very quickly. Feel physically ill (I didn't know the first time it happened that I didn't eat enough). Was depressed because I couldn't get going”.

“Get upset if I can't get anything to eat without reason”.

“Feel weak when I haven't eaten and get negative”.

“I don't like it a lot”.

No positive (physical or mental) responses were made in terms of the effect of nutrition and specifically nutrition deprivation.

7.3.7 SLEEP DEPRIVATION

As seen in chapter 3, most healthy adults need between 6 and 8 hours sleep per 24 hours to function effectively the following day. However, the amount of sleep per day needed differs between individuals. Regardless of the inter-individual differences of sleep duration needs, the fact remains that when an individual sleeps less than what is needed, he or she is said to be sleep deprived (O'Neil, 2004). The respondents also identified the symptoms identified in the literature, both physical and mental. No

positive effects were identified. Physically the most important effect is not necessarily the symptoms itself but rather the negative effect that it has on performance during the endurance event.

“A runner who does not get enough sleep will get tired very early during the race”.

“I become bored and tired. Eyes become heavy”.

“One’s body feel exhausted and this informs the body and mind to be weak”.

“It is difficult to perform without sleeping because you always get tired or fall asleep when you are doing nothing”.

“Difficult to wake up and get going”.

“Headache”.

Sleep deprivation has a larger negative impact on the mental functioning of the individual than on physical functioning.

“It is difficult for concentration”.

“Lose focus”.

“Don’t think clearly”.

“This is especially bad on the second or third day of a race where you have to concentrate and navigate. Not only the map work but the concentration not to miss an important waypoint”.

“Everything takes longer - thinking, solving problems, waking up, concentrating. I sometimes have to read the same instructions 3 - 4 times before I understand”.

“Not thinking clearly and not concentrating”.

“Slows reaction time”.

“Hallucinations - I start to see and hear things”.

Disturbances to emotional functioning were also identified.

“You get irritated”.

“Not sleeping makes me impatient, grouchy and carefree”.

“Takes away motivation”.

“One's body feel exhausted and this informs the body and mind to be weak”.

“The one thing that really takes strain during (adventure) races is team work. Especially when the team have had little or no sleep for two or three days people get irritated with each other. When they fight with each other the team is not working for each other and gets slower”.

7.3.8 TERRAIN

As seen in the literature (chapter 3), terrain is a major determinant of performance during endurance events. Terrain could include other environmental factors such as altitude, heat, cold, rain, wind and dehydration as well as additional factors such as navigational difficulties due to dense growth or flat terrain. Furthermore, muddy conditions, gravel or sand as well as dense bush etc. can severely slow down an individual or team's performance. The type of terrain will also influence the energy- and-hydration needs of the endurance athletes. However, as is seen from the responses, terrain has both positive and negative influences. Terrain can enhance performance or can be detrimental to performance and is perceived as such.

An important trend that is identified from the responses is that terrain is often seen as the major challenge that has to be overcome. Terrain can be and is often perceived to be a stressor – however, it is an “acceptable” stressor, an integral part of endurance sport and is accepted as such.

“Flat terrain is not a problem but mountainous terrain is sometimes a problem”.

“Not a factor”.

“Mountains are more strenuous and can slow you down but flat terrain is difficult to navigate - I prefer mountains”.

“It will only effect the runner if it is rocky, muddy or icy terrain because runners wear shoes not boots and this terrain will slow you down. Tared roads are the best for marathon runners”.

“No effect”.

“Terrain can make you positive or negative depending on the terrain. Because you can get lost or be the king on that type of terrain or I can get injured in rough terrains and that makes you negative”.

Physically, terrain is perceived to have a negative influence.

“Difficult terrain can be hard on your feet as it causes blisters and makes your feet very more tired”.

“They cause injuries”.

“Rocky terrain is a nightmare - blisters”.

“When terrain is rocky or causes blisters the pain causes your mind to think wrong things like quitting”.

“Can put more strain on the body”.

“Grassy terrain hinders movement and slows you down while sandy terrain leads to heavy steps and staggering”.

“Uphill and stony paths are worst”.

“If the terrain is mountainous or rocky it will have a negative effect on performance”.

“Slows movement. It's a frustration”.

“Sandy terrain causes slow walking”.

Terrain also has positive mental effects on the athlete.

“An important part of preparation is to expose myself physically to any kind of terrain that could be encountered, prior to the event. Should the unexpected be encountered as far as terrain is concerned I would both physically and mentally be prepared to face the problem”.

“I struggle with up-hills and get highly aggressive”.

“A brief moment of despair and then seeing it as this huge challenge and working on overcoming it”.

“When the going gets tough – the tough gets going. Up-hills and difficult terrain motivates me to work harder”.

The negative mental impact that terrain has on endurance athletes is mostly related to mood and motivation.

“Terrain can make you positive or negative depending on the terrain. Because you can get lost or be the king on that type of terrain or I can get injured in rough terrains and that makes you negative”.

“With very difficult terrain, especially if I haven't prepared well, I struggle - I wonder why I started - but I WANT to finish”.

“Uphill and overgrown terrain is the worst. Water - fear of swimming - worry about it beforehand”.

“De-motivation”.

“When terrain is rocky or causes blisters the pain causes your mind to think wrong things like quitting”.

“A brief moment of despair and then seeing it as this huge challenge and working on overcoming it”.

“Slows movement. It's a frustration”.

7.3.9 EQUIPMENT

Strictly speaking, equipment is not an environmental factor such as heat, cold or terrain. However, for most types of endurance disciplines, equipment is an integral part of the sport that can either enhance or encumber performance.

“They break sometimes and can sometimes be heavy”.

“By using wrong running shoes, injury develops”.

“Is really a problem if it breaks/doesn't work properly during an event - frustrates me - anger and feel hopeless if it breaks”.

“Starting with bad equipment makes me negative”.

“If it is unprepared - nuisance and irritating and heavy equipment can be tiring”.

“Poor handled and damaged equipment cause for unpleasant training and races and even lead to injuries”.

“Heavy and unnecessary equipment can slow you down”.

“If equipment doesn't fit properly it will cause rash or blisters and it will irritate you”.

“Unprepared equipment causes delay on road and time lost because you have to stop frequently to adjust it”.

“Carrying something on your back such as a 15 kg daypack or a 25 kg backpack place a lot of pain and strain on your shoulders, lower back and legs. Mentally it is also strain because you keep on thinking of the pain”.

“It is only irritating if not packed correctly”.

However, equipment is also perceived to enhance performance during an endurance event.

“Correct equipment makes life easier and more bearable - shoes most important”.

“It is an investment in yourself to buy proper equipment”.

“The better the equipment - the better your performance will be”.

“I believe that proper equipment (not necessarily the most expensive) to suit my particular needs and performance constitutes at least 50% of the success of any endurance event”.

“Love working with any type of equipment”.

“If I have good and new equipment I'm happy but if it is old and broken I'm sad”.

7.3.10 DISTANCE

Terrain and the distance covered by endurance events are two of the main factors that distinguish it from “normal” track and field events. As seen in the definition of endurance sports, distance is one of the factors used to define endurance events.

An obvious deduction that can be made is that the further the distance, the longer the time required to finish the endurance event. As seen previously, the longer an individual is participating in an event, the more factors such as heat, cold, altitude, terrain, hydration and nutrition can negatively affect the individual physiologically and psychologically.

Not only does the person's physiological demands increase, but pain and discomfort also increases as the duration of an endurance event increases thereby contributing to the physical and mental/emotional difficulty of the endurance event.

This is reflected by the responses of the athletes that participated in this study. Some of the respondents indicated that distance has a positive mental effect on their performance.

"Distance can become a problem if factors arise during an event not contemplated beforehand e.g. extreme heat, cold, wind, rain".

"Endurance is all about the distance itself".

"Once again, distance is a factor that can be controlled in the preparation phase. A sound knowledge of this and other factors is absolutely essential prior to the participation of any event".

"Cover ASAP as pain is bad if you go fast or slow – therefore do it as soon as possible".

"I'm used to long distances because I train for it".

The negative physical impact of distance is perceived to be that the longer the distance the more energy is being used and the more tired the athlete becomes. This can be seen by the following responses:

"Tiredness. The longer the event or the distance the greater is its' effect on my strength. If the distance is very long I become more tired, need to rest more and my performance goes down".

"Limited time. If time is limited and the distance is very long I become more tired as I need to work harder to finish in time".

"It makes the time like it's going slow. When you are walking, a long distance takes a lot of time and it feels as if you are never going to get there. You become more aware of how far it is and this feels as if it takes a lot of energy".

"Takes a lot of time".

"Long distance takes a lot of energy out of you as you need more power and endurance to finish than a shorter distance".

"The long the distance one becomes tired and leaves one uncertain about finishing the race".

Mentally, long distances seem to have quite a negative impact on the mood and motivation and consequently performance of endurance athletes.

"I sometimes mentally think of sitting down. The long distance just lets you feel tired and wanting to stop and rest".

"It can break one's mind. When you are in an event and you see or know how far it is still to go you can get really de motivated".

"If you have to race for a long distance it will be difficult as it will increase that pain and tiredness".

"Can de-motivate you".

"When I'm tired and get behind - I start to worry that I'm not going to finish especially if I know that the distance to go is still great".

"Causes negative thoughts especially if you are tired and hungry. You start to wonder why you started and if there is any possible way that you can quit without feeling like a loser".

"Distance can also bother you in the mind thinking about how long it is".

"Psychological stress - the longer the distance the greater is the stress".

"It is just boring sometimes because you just walk the same thing but every step you take brings you closer to the end".

“Long distance breaks the morale”.

“Different mental preparation for different races (distances). Also influence the speed of the race”.

7.3.11 WIND

Wind has a dual effect on the individual's environment. Firstly, wind has a marked effect on the temperature level. Secondly, wind increases the level of discomfort that the individual experiences. These facts are also reflected by the responses of the participating athletes. Some perceive wind to have both positive and negative influences on their performance. This can be seen from the following responses:

“It can be a disadvantage or an advantage”.

“Not against you - it can make you go faster - but can also raise dust”.

“On a hot day the wind can cool you down”.

However, physically wind is perceived by most of the respondents as a very debilitating factor in terms of performance as well as overall discomfort.

“Can reduce runner's speed that results in reducing runner's best time”.

“Worst if it is cold. Makes all more difficult - especially cycling”.

“Wind is a problem especially when from the front”.

“Causes you to use more energy or power if it is facing you”.

“I can't perform properly because the blows me back”.

“A strong wind can blow sand in your face and that can frustrate you”.

“I can't see because of dust”.

“Lose pace and direction”.

"It can slow you down a lot".

"I get very cold".

Mentally, wind seems to be, together with heat and dehydration, the environmental factor that has the most de-motivating effect on endurance athletes.

"Bummer! I hate wind, especially from the front. Actually any wind except from behind is bad. I prefer a day where there is no wind, even from behind, for that wind or the road can turn and then it is from the front".

"I watch the weather report as part of my preparation and if strong wind is predicted I become de-motivated even before the race".

"If against you - it is a pain in the backside".

"You become dry and if it is from the front it can make you lose concentration".

"When I'm waiting for the race to start and I see that the wind is blowing strongly against me – I become dejected".

"To me personally, wind (especially from the front) is one of the most unpleasant - if not the most - factors to control - both physically and mentally. Obviously it doubles the effort and requires extreme motivation to complete an event".

"Makes me de-motivated and annoyed".

7.3.12 RAIN

Rain, as with wind can change the environment in which the endurance event will take place. However, rain is also perceived to have positive effects, both physically and mentally, during an endurance event.

"It cools me down".

"It is nice in the rain if it is hot".

"Depending on the temperature it is not so bad".

"Rain, although unpleasant, is not such a bad factor on its own. It stops you from sweating too much and dehydrating".

"Most of the time rain is good".

The majority of the respondents regard the physical effects of rain on their performance as negative.

"Can make terrain very slippery..."

"It slows the pace down".

"Cold and discomfort makes me depressed and makes me slower".

"Rain, although unpleasant, is not such a bad factor on its own. If accompanied by wind or even hail and lightning, it can be most unpleasant and even dangerous".

"Makes cycling and mountain biking more difficult due to slippery and muddy conditions".

"Awful to be wet. Makes me cold and stiff..."

"You become wet - mentally it is a drag - depending on what you are doing".

"Physically my kit becomes heavier and mentally I think how heavy it is going to get".

"I get wet and it makes all things seem impossible".

"If my clothes get wet I get rash and that is very painful".

“The ground is wet and you don't have a place where to rest”.

“It makes everything uncomfortable...”

“...and create very cold conditions”.

“Depending on the temperature it is not so bad”.

“It can frustrate you and you get very cold”.

“...and hinders ability to see”.

“Rain can restrict sight and make equipment heavier”.

“My visibility is reduced and I feel insecure”.

The respondents indicated that mentally, rain has a negative impact on performance during endurance events in two ways; mood and motivation and ability to focus.

“Makes me wish the end will come”.

“Feels like I don't want to do this anymore. Irritated”.

“Awful to be wet”.

“I get wet and it makes all things seem impossible”.

“It can frustrate you and you get very cold”.

“It makes everything uncomfortable, makes me negative and de-motivates me”.

“Cold and discomfort makes me depressed and makes me slower”.

“Disturbs me”.

“Physically my kit becomes heavier and mentally I think how heavy it is going to get”.

“Rain will disturb all the plans that I have planned”.

In the next section the motivational strategies used by athletes during endurance events will be discussed.

7.4 MOTIVATIONAL STRATEGIES USED DURING ENDURANCE EVENTS

Motivational strategies are those methods and techniques that athletes use before and during endurance races to motivate them to achieve their own objectives. Two broad themes and four sub-themes that emerged from the data showed that endurance athletes used two factors that the researcher labeled as focus and source as strategies to motivate themselves. Four additional sub-themes; positive focus, negative focus, external source and internal source were also identified.

7.4.1 POSITIVE AND NEGATIVE FOCUS

Positive and negative refer to the focus of the strategies. In other words the basic reference point that motivates the athlete as well as the end state or outcome that the athlete is motivated to achieve or avoid.

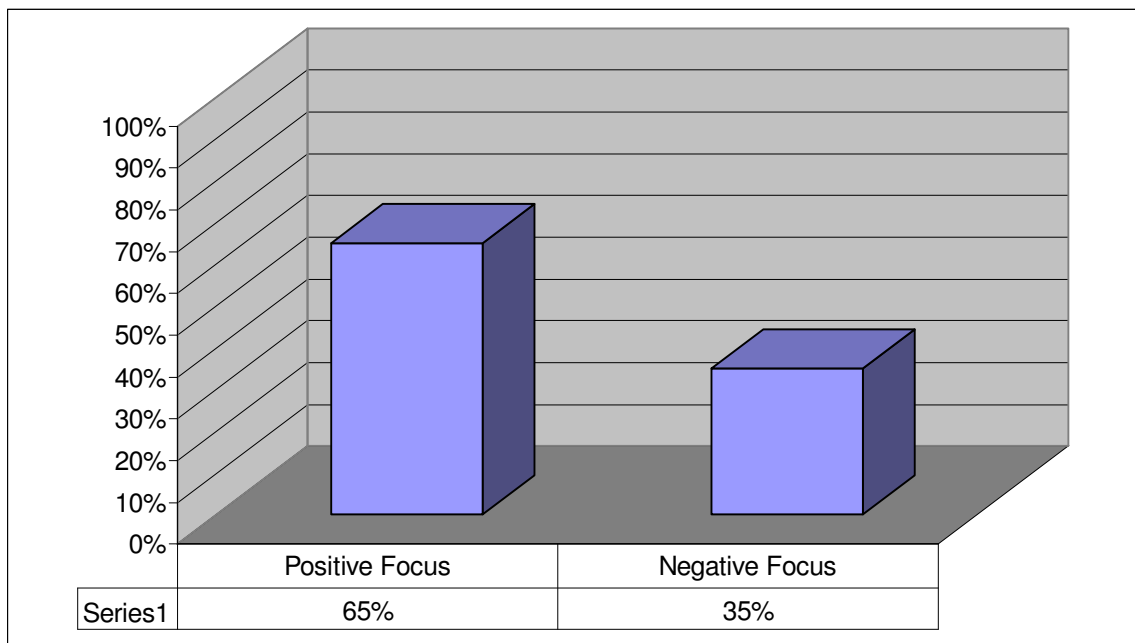


FIGURE 7.5: DISTRIBUTION OF FOCUS OF MOTIVATION

As can be seen in figure 7.5, 65% of the athletes in this study prefer to focus on the positive outcomes of the endurance event to motivate them whereas 35% of the athletes focus on the negative outcomes to motivate themselves. Therefore, the majority of the athletes seem to prefer to focus on the positive outcomes of performance to motivate them during an endurance event.

7.4.1.1 POSITIVE FOCUS

When individuals focus on the positive outcomes of the sport, either internal or external, or use positive thoughts and self-talk to motivate themselves they are using positive strategies.

In other words, the athlete employs motivational techniques and methods in a strategy that is designed to achieve a positive result. This can clearly be seen by the following statements by the respondents.

“Talk to myself. Strategise to complete the whole race. Tell myself that it is not that bad, I can go further”.

“I try to get halfway because then I tell myself there is less left than what I've done so far”.

“Pain will come and go. The event started and will have an end”.

“Tell myself that I'm not the first to do it and that I have to accomplish what I came to do”.

“Tell myself that I have to finish”.

“I see myself finishing at the end”.

“I think of what I'm going to do after the event and pray to God”.

“Satisfaction one feels once you have completed”.

“Think of the end and the rewards”.

“Think of the rewards, e.g. what it will feel like and what you will be able to do/see once you complete it”.

7.4.1.2 NEGATIVE FOCUS

When individuals focus on the negative outcomes or consequences, internal or external, or use visualisation and self-talk that reminds them of the negative consequences of quitting during or before endurance events to motivate themselves, they are using negative motivational strategies.

The strategy is therefore to use motivating factors such as fear or disappointment to motivate themselves to avoid the negative outcome. This negative focus as motivational strategy can be clearly seen in the following statements.

“By telling myself that although it is not nice it is part of me and by quitting I am letting myself down”.

“I started and WANT and HAVE to finish. For me quitting is a personal defeat - nobody is going to do it for me, I must do it myself”.

“Imagine failure - a half job is a job not done”.

“Pain is temporarily - finishing last forever”.

“I believe in the slogan: ‘Pain is temporarily while quitting is forever”.

7.4.2 INTERNAL AND EXTERNAL SOURCES

Incentives refer to the reward that the successful endurance athlete receives for participation in endurance events. These incentives are what motivate the athlete to participate in endurance events.

Internal and external refer to the source or origin of the incentives that motivate athletes to achieve their goals and objectives. These incentives might be external to the individual or internal (in other words, the reward comes from within the athlete when some need or desire is met). As can be seen in figure 7.6 the majority (69%) of

the athletes are motivated by internal incentives to perform in endurance events. A relatively small percentage (31%) are motivated by external rewards. Therefore, it would seem as if the majority of these athletes are motivated by the internal rewards of performance in endurance events.

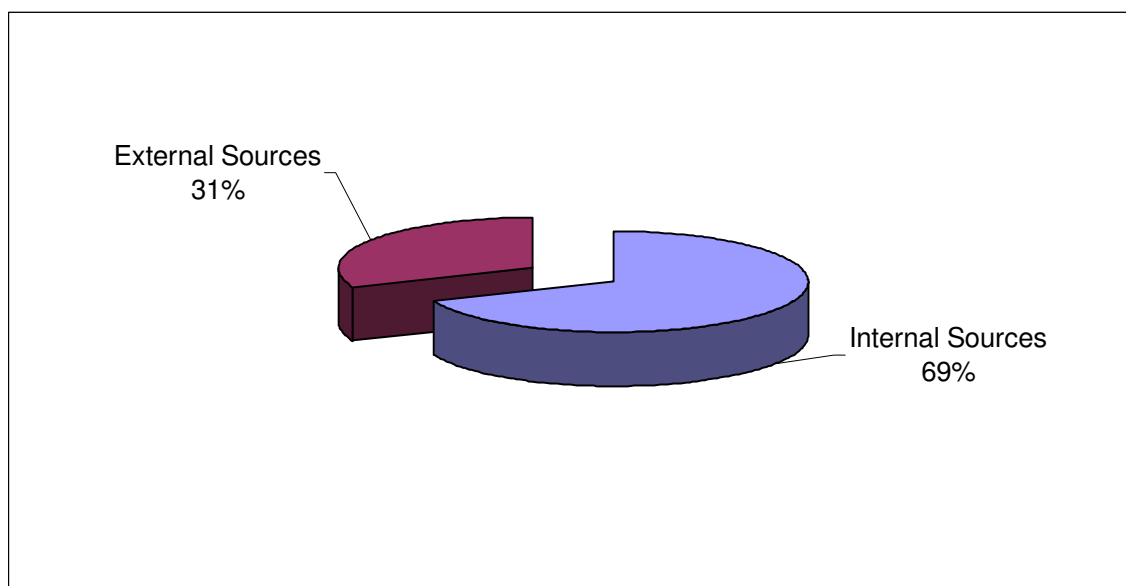


FIGURE 7.6: DISTRIBUTION OF SOURCE OF MOTIVATION

7.4.2.1 INTERNAL SOURCES

Internal rewards refer to those incentives related to self-image, internal standards of achievement, values, sense of achievement, attitudes, enjoyment etc. that motivates endurance athletes to overcome physical and mental challenges to achieve their goals.

These incentives are therefore desires or needs that are internal to the individual and the fulfillment of these internal desires or needs is what motivate the endurance athlete. The following statements by the respondents illustrate this point.

“Satisfaction one feels once you have completed”.

“Tell myself that I’m not the first to do it and that I have to accomplish what I came to do”.

“I believe in the slogan: ‘Pain is temporarily while quitting is forever”.

“My motivation lies in completing what I have started”.

“By telling myself that although it is not nice it is part of me and by quitting I am letting myself down”.

“I see myself finishing at the end”.

“Think of the rewards, e.g. what it will feel like and what you will be able to do/see once you complete it, or part of it”.

“Pain is temporarily - finishing last forever”.

“Up until a point it stays a challenge to overcome”.

7.4.2.2 EXTERNAL SOURCES

As seen previously in the literature, external rewards such as money, titles, approval, status, medals, other people’s perceived image of the athlete etc. are all incentives that can and do motivate endurance athletes.

In other words, it includes all those factors or incentives outside the individual that motivate the athlete to complete the event or perform during the event. The following statements by the respondents are examples of external incentives:

“I tell myself that I will reward myself afterwards”.

“I think of what I’m going to do after the event and pray to God”.

“Think of the end and the rewards”.

“The group with whom I’m running motivates me because I also know that they feel the same as I do”.

7.4.3 COMBINATIONS OF FOCUS AND SOURCE

Figure 7.7 illustrates the distribution of the motivational strategies that are used by athletes during endurance events. The strategy used most often is positive-internal (37%) followed by negative-internal (26%), positive-external (21%) and negative-external (16%).

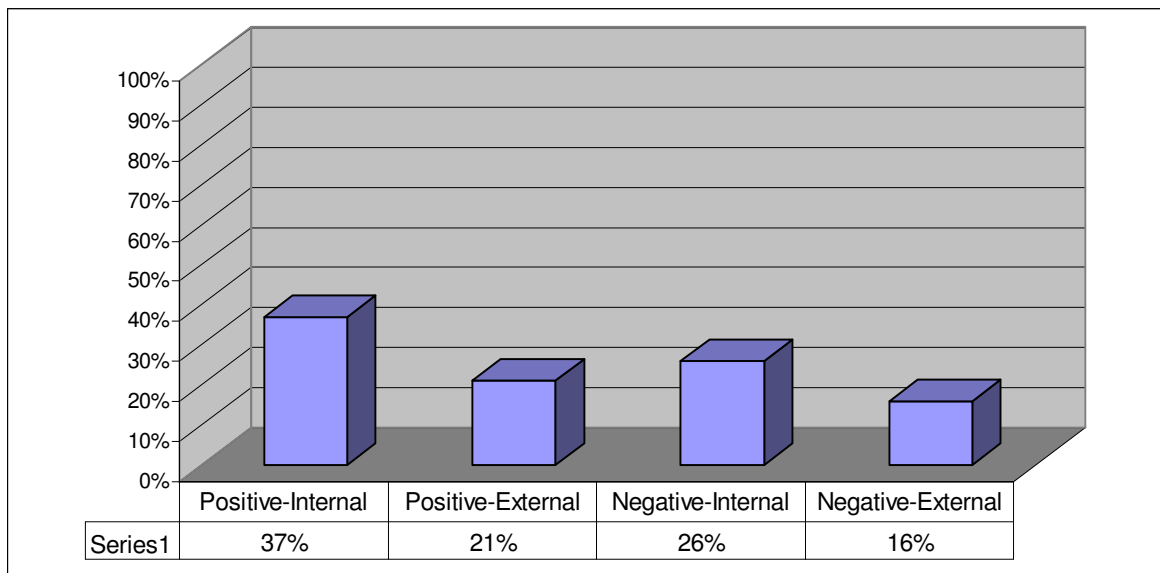


FIGURE 7.7: DISTRIBUTION OF MOTIVATIONAL STRATEGIES

7.4.3.1 POSITIVE-INTERNAL

Positive-internal strategies are used when the athlete motivates himself by focusing on the positive outcome or consequences of successfully completing an endurance event. The positive outcome of successfully achieving his goals would be internal rewards such as feelings of achievement, enjoyment or a reinforcement of a positive self-perception.

Therefore, by focusing on the positive internal rewards of achieving his own goals (using various techniques) the athlete motivates himself to overcome challenges and obstacles to reach his goals.

Some of the techniques that can be used are positive self-talk, positive visualisation, goal-setting. The following responses illustrates this strategy:

“Talk to myself. Strategise to complete the whole race. Tell myself that it is not that bad, I can go further”.

“Keeping initial aim in mind”.

“I try to get halfway because then I tell myself there is less left than what I've done so far”.

“Tell myself that I’m not the first to do it and that I have to accomplish what I came to do”.

“My motivation lies in completing what I have started”.

“I see myself finishing at the end”.

“Think of the rewards, e.g. what it will feel like and what you will be able to do/see once you complete it, or part of it”.

7.4.3.2 POSITIVE-EXTERNAL

Positive-external strategies are used when the athlete motivates himself by focusing on the positive outcome or consequences of successfully completing an endurance event. The positive outcome of successfully achieving his goals would be gaining external rewards such as prizes, medals, approval, titles etc.

Therefore, by focusing on the positive-external rewards of achieving his own goals (using various techniques) the athlete motivates himself to overcome challenges and obstacles to reach his goals.

Some of the techniques that can be used are positive self-talk, positive visualisation, goal-setting. This is illustrated by the following responses:

“Think of the end and the rewards”.

“I tell myself that I will reward myself afterwards”.

“The group with whom I’m running motivates me because I also know that they feel the same as I do”.

“I think of what I’m going to do after the event and pray to God”.

7.4.3.3 NEGATIVE-INTERNAL

Negative-internal strategies are used when the athlete motivates himself by focusing on the negative outcome or consequences of failing to achieve his/her goals and

objectives. The outcome of failing to achieve his goals would be internal “punishment” such as feelings of failure, disappointment, regret, and self-blame.

Therefore, by focusing on the negative-internal consequences of failing to achieve his own goals (using various techniques) the athlete motivates himself to avoid these negative outcomes by overcoming challenges and obstacles to reach his goals.

Some of the techniques that can be used are negative self-talk, visualising failure, goal-setting. The following responses are examples of this strategy:

“I believe in the slogan: ‘Pain is temporarily while quitting is forever”.

“By telling myself that I’m a man and thus I will never give up as long as I’m still moving forward”.

“I started and WANT and HAVE to finish. For me quitting is a personal defeat - nobody is going to do it for me, I must do it myself”.

“By telling myself that although it is not nice it is part of me and by quitting I am letting myself down”.

“Imagine failure - a half job is a job not done”.

7.4.3.4 NEGATIVE-EXTERNAL

Negative-external strategies are used when the athlete motivates himself by focusing on the negative outcome or consequences of failing to achieve his/her goals and objectives. The outcome of failing to achieve his goals would be external “punishment” such as where the athlete perceives that “important others” such as family, friends and coaches would have feelings of failure, disappointment, regret and disapproval about the athlete.

Therefore, by focusing on the negative-external consequences of failing to achieve his own goals (using various techniques) the athlete motivates himself to avoid these negative outcomes by overcoming challenges and obstacles to reach his goals.

Some of the techniques that can be used are negative self-talk, visualising failure, goal-setting.

“Tell myself that I’m not the first to do it and that I have to accomplish what I came to do”.

“I only started with the sport at a late age (56) and have to train very hard to be and stay fit. I always wonder what “good” cyclists/hikers will think of old people doing it - that thought motivates me”.

“I think of the people who believe in me and I talk to myself not to disappoint them”.

For the sake of clarity a clear distinction is made here between the strategies. However, it would appear that athletes probably use more than one strategy at different times during an endurance event and training. Unfortunately the distribution of these combinations was not determined. The techniques or combination of techniques will depend on the athlete’s previous experience and mastery of the technique.

7.4.4 MOTIVATIONAL TECHNIQUES

Motivational techniques refer to those sport-psychological techniques that are used for motivation. These are not motivational strategies but could fall under one or more strategy that is being used by the athlete to motivate him during endurance events. Examples of these techniques are positive self-talk, visualisation and goal setting. These techniques can and are used to reach different objectives such as arousal management, training and coping to name a few. However, the techniques that are discussed here are solely used for motivational purposes.

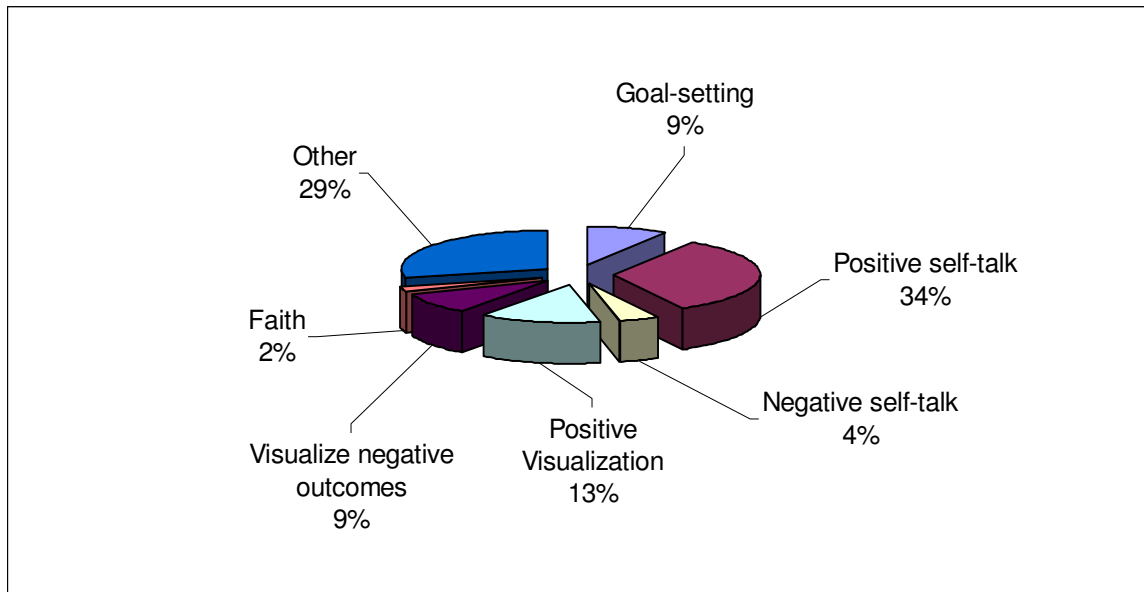


FIGURE 7.8: **MOTIVATIONAL TECHNIQUES**

Figure 7.8 illustrates the techniques employed by the respondents in this study to motivate themselves during endurance events. These techniques are positive self-talk (34%), other (29%), positive visualization (13%), goal-setting (9%), visualisation of negative outcomes (9%), negative self-talk (4%) and faith (2%). As can be seen, positive self-talk is employed by the majority of the respondents. This is followed by “other” techniques, positive visualisation, goal setting, visualisation of negative outcomes, negative self-talk and faith. Each of these techniques will be briefly discussed as it relates to this study.

7.4.4.1 POSITIVE SELF-TALK

Positive self-talk is a technique where the athlete encourages or motivates himself by repeating phrases or words that has a positive outcome. Examples of this are the following:

“I tell myself that pain will come and go. The event started and will have an end and I will finish”.

“Tell myself that it is not that bad, I can go further”.

“Tell myself that I have to finish”.

"I tell myself that it will end and that I will be there when it does".

"Tell myself that I'm not the first to do it and that I have to accomplish what I came to do".

"Pain is temporarily while quitting is forever".

"By telling myself that I'm a man and thus I will never give up as long as I'm still moving forward".

"I tell myself that I started and WANT and HAVE to finish".

7.4.4.2 OTHER

Under this category fall all the responses that cannot be categorised under the headings that were identified. Three groupings of responses or techniques are identified, anchoring, association and dissociation.

A. Anchoring: This refers to a technique where the athlete links his performance or motivation in some form of association with or conditioning with an object, idea, song, phrase etc. Once the associated or conditioned object is heard or visualised it motivates the athlete to perform better. The following responses are examples of this:

"I use my anchor - I sing motivational songs".

"I think of Infantry School – if I could make that I can make anything".

B. Association: This refers to a technique where the athlete is aware of the pain and discomfort and adjusts his performance accordingly. Instead of ignoring the feedback that is received via back pain, aching muscles, dry mouth and throat etc. the athlete uses these cues to identify areas of his/her performance that require rectification. Therefore, the athlete is aware of problem areas via physical feedback and adjustments of physical performance are usually accompanied by positive self-statements to ensure mental adjustment or motivation of performance.

"You have to finish - stopping is not an option".

"I think of the positive side of everything".

"I believe in the slogan: 'Pain is temporarily while quitting is forever".

"Up until a point it stays a challenge to overcome".

"I just push and push myself as it cannot last forever".

"I breathe in and out (deeply) and try to deal with the frustration".

"I just carry on slowly until I'm finished".

C. Dissociation: This refers to a technique where the athlete is aware of the pain and discomfort but attempts to ignore the pain or shift his/her focus to areas or ideas other than the physical or mental pain and discomfort. The thoughts or ideas that the athlete focuses on are usually motivating the athlete to continue. Examples of this technique are the following:

"I try not to think of the pain and discomfort. I know it has to end".

"Pain is temporarily - finishing last forever".

"I tell myself that pain is just one of the senses of the mind - you don't have to listen to the words".

"I just forget about it and carry on".

"Just go. There is nothing that you can do".

"Don't think about it - just go".

"I switch off my mind and just keep on going".

"I look around at the scenery to take my mind of the pain".

7.4.4.3 POSITIVE VISUALISATION

Visualisation or imagery is a technique where the individual uses some or as many of his/her senses as possible to create or recreate a specific experience in his/her mind. It is basically the recreation or practice of a real-life situation at a mental level.

Therefore, positive visualisation is where the athlete mentally visualises or “sees” the event or outcome of an event in his mind. By visualising a positive outcome the athlete motivates himself during an endurance event. Examples of this technique are the following:

“I think of what I'm going to do after the event and pray to God”.

“I see myself finishing at the end”.

“Think of the end and the rewards”.

“Think of the rewards, e.g. what it will feel like and what you will be able to do/see once you complete it, or part of it”.

“Strategise how to complete the whole race”.

7.4.4.4 GOAL-SETTING

Goal-setting has been described as one of the most effective performance enhancement techniques in the behavioural sciences (Potgieter, 2003). Goal setting is a technique where the individual sets short, medium and long-term objectives for himself. These objectives, if they are effective, are usually linked to time and are measurable.

The motivational value of goals lie in the fact that, if they are challenging, their achievement leads to emotional well-being (sense of achievement) as well as giving the athlete feedback with regards to his progress and performance.

Goals might be process goals or outcome goals. Process goals are goals where progress or success are measured in terms of individual subjective terms such as

completion of a challenging event or a 10% improvement in performance on a standard marathon.

Outcome goals are objectives that focus on the outcome of an event such as winning or being in the top ten finishers of an event. The majority of respondents seem to set process goals. This is not surprising as the respondents are all non-elite athletes. They therefore do not have the resources such as time and financial backing to participate in the same league as professional athletes and for the majority would outcome goals lead to unnecessary stress and frustration. Examples of this technique are the following:

“Keeping initial aim in mind”.

“I try to get halfway because then I tell myself there is less left than what I’ve done so far”.

“Break the race up in shorter distances and focus on completing one section at a time”.

“Break it up in short manageable sections”.

“I make shorter distances and smaller points, goals to reach”.

7.4.4.5 NEGATIVE SELF-TALK

As with positive self-talk, this is a technique where the athlete encourages or motivates himself by repeating phrases or words. However, instead of focusing on positive outcomes as with positive self-talk, the athlete focuses on the negative consequences of poor performance. This usually leads to a negative emotional reaction. In order to avoid the negative consequence and resultant negative emotional experience, the athlete is motivated to increase his/her effort or just to continue with the present level of performance. However, it should be noted that relatively few participants employ this technique. Examples of this technique are the following:

“By telling myself that although it is not nice it is part of me and by quitting I am letting myself down”.

"I started and WANT and HAVE to finish. For me quitting is a personal defeat - nobody is going to do it for me, I must do it myself".

7.4.4.6 NEGATIVE VISUALISATION

Visualisation or imagery is a technique where the individual uses some or as many of their senses as possible to create or recreate a specific experience in his mind. It is basically the recreation or practice of a real-life situation on a mental level. As with positive visualisation, this is a technique where the athlete encourages or motivates himself by visualising the outcome of an endurance event. However, instead of focusing on positive outcomes as with positive visualisation, the athlete focuses on the negative consequences of poor performance or visualises him/herself being unsuccessful. This usually leads to a negative emotional reaction. In order to avoid the negative consequence and resultant negative emotional experience, the athlete is motivated to increase his/her effort or just to continue with the present level of performance. However, it should be noted that relatively few participants employ this technique. Examples of this technique are the following:

"Imagine failure - a half job is a job not done".

"I believe in the slogan: 'Pain is temporarily while quitting is forever".

7.4.4.7 FAITH

Faith is not a technique as such but rather a belief that God or some supernatural force would provide the athlete with the necessary motivation, power and endurance to complete the event successfully. However, the action of praying can be seen as a technique that is used by the athlete to motivate himself by believing that God would provide the necessary motivation. Examples of this technique are the following:

"I think of what I'm going to do after the event and pray to God".

"God and my dreams".

"Pray to God to help me and He has".

In the next section the coping strategies that are employed by athletes to cope with extreme conditions during endurance events will be discussed.

7.5 COPING STRATEGIES USED DURING ENDURANCE EVENTS

Coping strategies (as defined in chapter 4) refer to *the psychological strategies (cognitive, emotional, behavioural and social) that individuals use to successfully adapt to stressors or adversity in their present or future situations and thereby continue to function at the same or better level of functioning/performance than before the adverse or stressful situation.*

This study focused specifically on the active coping strategies that athletes use during endurance sport. Although avoidant coping strategies are also coping strategies – they are strategies that enable the individual to cope and protect the ego from anxiety. Active coping strategies focus on problems related to the external environment – the focus of this study.

7.5.1 ACTIVE COPING STRATEGIES

As seen previously, active coping strategies are those strategies that actively “seek out” and confront the problem or obstacle or stressor and devise ways in which the individual can solve the problem. In the literature the following three strategies that are used to cope with stressors are identified:

- Responses that change the source of the stress or the situation out of which the stressful experience arises;
- Responses that change the individual’s perception of the stressor or that control the meaning of the stressful experience after it happened but before the emergence of stress;
- Responses that control the symptoms of stress itself after it has emerged.

This can be seen in figure 7.9 that displays the distribution of these coping strategies.

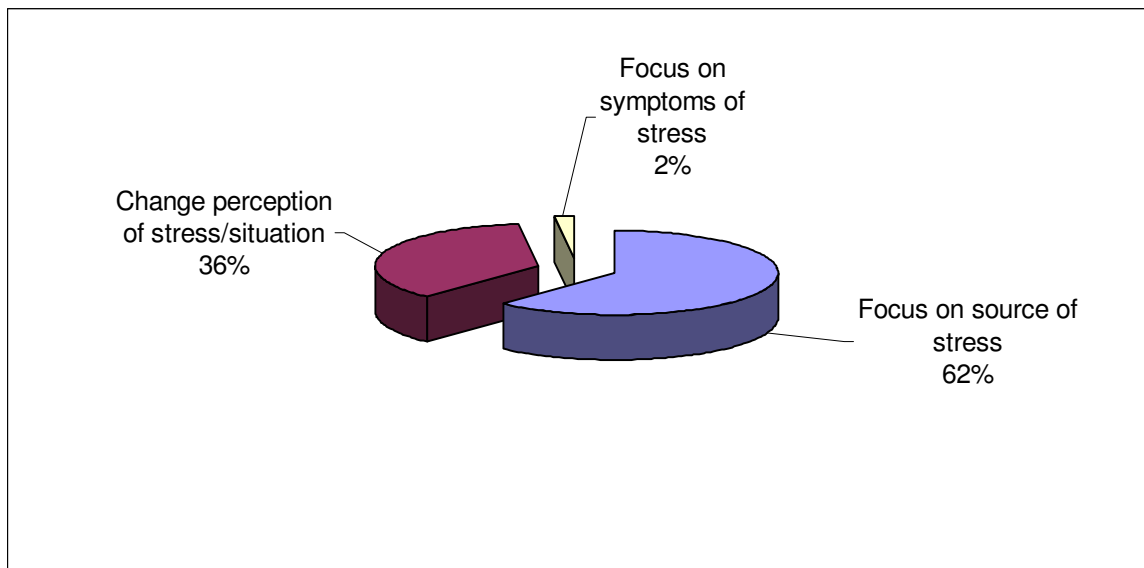


FIGURE 7.9: DISTRIBUTION OF COPING STRATEGIES

As can be seen from figure 7.9, that the majority (62%) of respondents use the coping strategy that changes the source or situation that creates stress. The strategy that changes the perception of the athlete in terms of the situation or stressor is employed by 36% of the respondents. Only 2% of the respondents use the strategy that focuses on the symptoms of stress itself to cope with the situation. However, several (8.2%) of the respondents employ a combination of all three coping strategies in the same situation. This can clearly be seen in figure 7.10 that depicts the distribution of coping strategies per environmental stressor.

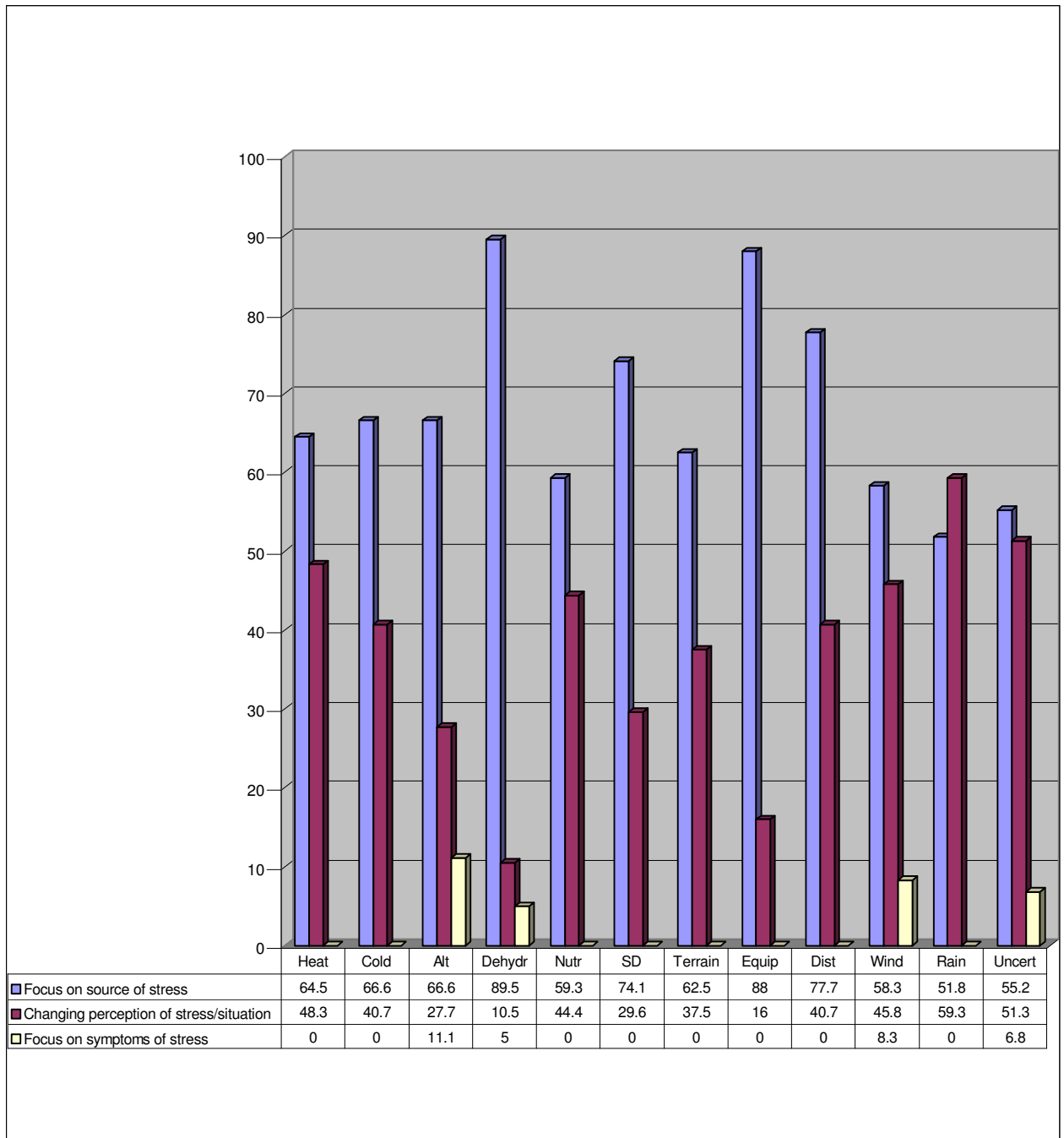


FIGURE 7.10: COPING STRATEGY DISTRIBUTION PER ENVIRONMENTAL STRESSOR

7.5.1.1 RESPONSES THAT CHANGE THE SOURCE OF THE STRESS OR THE SITUATION OUT OF WHICH THE STRESSFUL EXPERIENCE ARISES

Individuals that employ this strategy are able to correctly identify the source of their stress. They are then able to take action to remove the factor that causes the stress. The following responses illustrate the use of this strategy. The respondents had to answer the question: "Explain what you do to counter the physical and mental effects of *stressor* (heat, cold, dehydration) during an endurance event."

7.5.1.1 Heat:

"Fitness from training under the same conditions is a bonus. Use knowledge to avoid dehydration".

"Drink a lot of fluids".

"Reduce the running pace".

"Suntan lotion and sunglasses".

"Train in hot climate before the race, turn my weakness into a strength by focusing on it during training".

"During the race drink a lot of fluids, keep on going and ensure that no mistakes are made".

7.5.1.1 Cold:

"I try to get my body into motion. If not, I get more warm clothes".

"You know your body and when something is going to happen. When you know you can prevent it as soon as possible".

"Wipe my face and always put on my hat. I warm my hands with gloves".

"I do something like jogging, put on warm clothes, switch of my mind and carry on with what I'm doing".

"Do lots of stretch exercises".

"When I rest it is for short periods so that your muscles don't get painful".

7.5.1.1 Altitude:

"Wait for natural acclimatization, take in enough fluids and do light exercise".

"Try to slow down, acclimatize and motivate myself".

"Look down, choose a suitable pace and overcome it".

"I relax and try to control my breathing".

"Breathe deeper".

"I try to pace myself with short people because their legs are short and their pace is fast and short. Always I tell myself that I will rest after every hour and not every time I feel like resting".

"Acclimatize by moving to the area two to three weeks prior to the event".

"Training in different altitude is a solution - South Africa luckily has different altitudes with different temperatures".

7.5.1.1 Dehydration:

"Loads of water, try to take in salt beforehand. Rest in the shade".

"Get in shade, take of heavy equipment, try to relax and drink a lot of water".

"Whenever your body needs water your mouth feels dry so immediately I drink water and wipe my face and carry on".

"Sit down and get water and rest till strength is back".

7.5.1.1 Nutrition:

“Eat high calorie food up to two hours before the race”.

“Take enough food”.

“Food deprivation is not a factor - having no appetite is - force yourself to eat”.

“Try to go slower when I really feel bad. As soon as I have a bit of energy I try to use it effectively because it doesn't last long”.

“Balance food before or during. Preparation is very important”.

“Eat at regular intervals - preserve food”.

7.5.1.1 Sleep deprivation:

“Sleep as much as you can when you get a chance”.

“I keep myself busy with something because if you sit down and do nothing you will fall asleep”.

“As long as I am physically busy and not sitting down doing nothing - I can go for days without sleep”.

“When I'm busy I don't rest for too long and I don't take of my equipment”.

“When I rest I do so for short periods and make myself as uncomfortable as possible so that I will not fall asleep”.

“Try to plan for short sleep periods”.

“Know your own body, plan for sleeping periods and when sleeping try to sleep as comfortable as possible”.

“Sleep enough, especially two days before the event”.

“Practice before the event while you are sleep deprived to learn how to cope with lack of sleep”.

“Be aware of your levels of concentration - mistakes due to lapses in concentration can cost you a lot of time (and more sleep)”.

7.5.1.1 Terrain:

“Reduce the speed if rocky, muddy or icy terrain”.

“Seek the easiest route - try not to loose altitude”.

“Training in all types of terrain helps a lot”.

“Keep fit and try to look for easier surface to walk on”.

“You must read it and understand it”.

“Read the terrain and follow the easiest route”.

“When I walk in mountains I take good care because of the effect on the ankles”.

“Rocky terrain you must walk with care and look down most of the time. On sandy terrain try to walk on hard surface because sandy terrain uses too much energy”.

“Plan the route, understand the terrain and follow the easiest route”.

7.5.1.1 Equipment:

“I look after my equipment”.

“Just keep on going as far as possible if it is broken. Will try to fix it if it is too bad to bear”.

“Stop and fix it ASAP - though proper planning and preparation will minimise breakages to a great extent”.

“Carry the lightest equipment. Extra socks and spare shoes to keep feet dry”.

“Wear running shoes that are designed for running, socks for running as well as running vest”.

“Along the route during a break you must fix the faulty equipment”.

“Pack your equipment logically and as comfortable as possible”.

7.5.1.1 Distance:

“Break the race up in shorter distances and focus on completing one section at a time”.

“Break it up in short manageable sections”.

“Break the distance into smaller pieces. Just focus on smaller piece until it is completed. Otherwise there is not much that can be done but finish and get it over with”.

“Plan the distance for breaks”.

“I give myself points which are far from each other, those points it where I will rest”.

“I don't think of a distance. I just walk cause I know there is the end point somewhere”.

“Before - train as for race. Mentally - Go through the race in my mind (imagery)”.

7.5.1.1 Wind:

“You must try to avoid high places such as mountains and hills. You must think of cover”.

“When I'm very cold I mentally consider a faster pace”.

“Train to ride in a group (in the slipstream) and try to stay as low as possible on the bike during the race”.

“Open my eyes as small as possible to keep the dust out or wear sunglasses”.

“If possible try to move with the wind behind you”.

“Try to evade the wind by hiding behind an obstacle”.

“Correct clothing”.

7.5.1.1 Rain:

“Keep yourself and equipment dry”.

“Have the right equipment and concentrate on navigation”.

“I cover myself to keep dry”.

“Protective clothing and stay out of the rain as far as possible”.

“I make sure that I run in the middle of the road to avoid injuries from slipping”.

“Make sure that you have waterproof equipment”.

“Walk slower and when it stops raining I change into dry clothing”.

“Before I start with a race I make sure that I have extra dry clothing and waterproof kit”.

7.5.1.1 Uncertainty:

“I ask other people if unsure”.

“I just go and see what happens and make a plan”.

“Stop immediately and ask or confirm”.

“Make an effort to find out”.

“Expand my knowledge”.

“Just try to solve the problem and make a decision - it is better than doing nothing”.

“Trust your equipment and re-orientate yourself on the map”.

“The 7 x P's - Proper prior planning prevent uncertainty”.

“Make a decision and continue until I know it was right”.

“Sit down, relax, start at the beginning when it was still ok and fix problem”.

“I try to gather as much information as possible”.

7.5.1.2 RESPONSES THAT CHANGE THE INDIVIDUAL'S PERCEPTION OF THE STRESSOR OR THAT CONTROL THE MEANING OF THE STRESSFUL EXPERIENCE AFTER IT HAPPENED BUT BEFORE THE EMERGENCE OF STRESS

This coping style can entail paying selective attention to relevant stimuli and thereby concentrating on the less stressful aspects of the situation, positive comparisons that reduce the perceived severity of the stressful situation and to reduce the perceived importance of the stressful situation or the outcome of the situation in relation to one's overall life situation. Examples of this strategy are illustrated by the following quotations:

7.5.1.2 Heat:

“Keep on going - know it will soon end”.

“Tell myself I've been through worse or down the same road”.

“Focus on goals and positive things”.

“Stick by the pace even if it's hard. If your body is tired it is your mind causing it. It is your mind that says ‘You can carry on a little’ - it makes a difference”.

“Mentally the mind is in control”.

“No physical or mental effects because you endure. It's like sacrificing something for the benefit of something you'll do anything to get”.

“I just switch off my mind and drink a lot of water, and just keep on going”.

“I just free my mind and think of the things that lead me here”.

7.5.1.2 Cold:

“I try to encourage my team mates through words and by showing an example”.

“Try to focus on something else. When possible - I try to keep warm by means of body heat or clothes”.

“Focus on my task not my body”.

“I motivate myself saying it is my imagination - it's not real”.

“Do something so that you don't think of the cold”.

“I do something like jogging, put on warm clothes, switch of my mind and carry on with what I'm doing”.

7.5.1.2 Altitude:

"I just tell myself mentally that I can walk everywhere that other people can walk".

"I think of positive things".

"Physically you may be beaten but focus on your goal".

7.5.1.2 Dehydration:

"I think of positive things".

7.5.1.2 Nutrition:

"Try to go slower when I really feel bad. As soon as I have a bit of energy I try to use it effectively because it doesn't last long. Concentrate on other things than how I feel. It is extremely bad, just go - no thinking".

"I just forget about food and concentrate to what I am doing".

"Try to stay busy then it doesn't bother so much".

"I try not to think of food and drink a lot of water".

"Tell yourself that you don't need it and sleep when I can because then you're not feeling hunger".

"Mentally I tell myself that it will soon be over".

"Chewing a grass (stem) helps me! Think of other things not to get hungry".

7.5.1.2 Sleep deprivation:

"Nothing physical - but mentally you have to force yourself not to sleep. Nothing will happen to your body physically but it is a mental obstacle".

"Sleep as much as you can when you get a chance. Tell yourself that you will get time to sleep".

"I keep on thinking if there is thinking to be done, otherwise I just talk to my team mates (any crap that you can think of) or I will fantasize and think of good things or good times".

"Tell yourself that it is not time for sleeping".

"Be prepared for less sleep".

"Keep on thinking of finishing the event".

"Try not to think of sleep too much".

7.5.1.2 Terrain:

"See beauty in terrain and consider privilege of being there at that point".

"Worrying before - cope by conditioning myself to get used to the idea and visualise how I'm going to cope with it. Expect the worst - then the reality is not so tough. If there I do it and get it over with. If it's bad I convince myself that it is not so bad. If this doesn't work I just do it and get it over and done".

"I make sure that I am as comfortable as possible and tell myself that I will overcome this terrain".

"I mentally see myself on top of the hill".

"Take it as one more obstacle to overcome".

"See it as a huge challenge and work on overcoming it".

"Admire the view/ think of how it will look like when you get there".

"I understand that things such as cramps can keep me from finishing a race but I still feel like a failure and have difficulty to reconcile myself with that. I force myself to go as far as I can".

7.5.1.2 Equipment:

“If equipment breaks - improvise and fix it or just forget about it”.

“I’ll tell myself the worst case scenario and make myself believe there have been worse cases and make the best of the situation”.

“I just tell myself that the pain in my back and shoulders won’t kill me and continue”.

“Just tell myself that I will get to the finish point eventually”.

7.5.1.2 Distance:

“Concentrate on something else and just continue”.

“Running and silent singing or talking, running in a group at an affordable pace, re-hydrating when necessary”.

“Me, I do simple things, I like winning so I visualise or picture myself after finishing the event, that makes me carry on”.

“I motivate the participants and endure the pain”.

“I look around at the scenery to take my mind of the pain”.

“I count the distance and tell myself that others have done it so it is humanly possible”.

7.5.1.2 Wind:

“Accept the situation as natural”.

“I just forget about it and carry on”.

“I just take off my hat and enjoy the cool”.

“Tell myself that the wind is cooling me down”.

“Wonder why I started this but then I re-focus by telling me nobody is going to finish this for me”.

7.5.1.2 Rain:

“Convince myself that I'm getting warmer if I paddle faster”.

“Prepare for it and try to enjoy it”.

“Nothing - just endure and carry on”.

“You just adjust and adapt mentally”.

“I don't let myself give up easily - I just forget it and carry on”.

“I enjoy myself”.

“I learn to enjoy the wetness”.

“You have to keep on thinking that the rain keeps you from dehydration and is therefore helping you”.

“It's only my clothes and body not me that gets wet”.

7.5.1.2 Uncertainty:

“I just carry on with what I'm doing”.

“Practice, exercise, keep pace, stay calm and block uncertainty and think positive thoughts”.

“Stay calm and have confidence in your decisions and control your weak points”.

“Know your work and be self-assured”.

“I did tell myself that anything that a normal human being can do - I can do as well. I will do it and it will be an extra experience for me”.

“Tell myself that what is ahead can’t be that bad”.

7.5.1.3 STRATEGIES THAT CONTROL THE SYMPTOMS OF STRESS ITSELF AFTER IT HAS EMERGED

This coping style does not focus on the situation itself, either directly or by changing the meaning or perception. The focus is rather on the resultant stress itself and entails basic stress management techniques. As seen in figure 7.10 and figure 7.11, only a small number of respondents (2%) used this strategy at all. The following quotations are examples of this coping strategy:

7.5.1.3 Altitude:

“I relax and try to control my breathing”.

“You must just stay calm so that you do not make mistakes before any action”.

7.5.1.3 Dehydration:

“Relax myself and think of the facts”.

7.5.1.3 Wind:

“I just relax and let the wind cool me down”.

“I breathe in and out (deeply) and try to deal with the frustration”.

7.5.1.3 Uncertainty:

“Self motivation, rest and calm down”.

“Sit down, relax, start at the beginning when it was still ok and fix problem”.

An important element of motivation and coping, specifically from the Salutogenic perspective, is the attitude that individual athletes have towards problems and difficulties. This philosophy will be discussed in the next section.

7.6 ATTITUDE TOWARDS PROBLEMS

An important element that is common to all five theories of coping is the presence of a generalised approach/orientation, attitude or belief towards life and difficult situations experienced in life that enables the individual to cope with challenges. This section will focus on the way that respondents approach problems and difficulties. The participants in this study had to answer the question: “How do you see problems and difficulties?” The responses to this question can be seen in figure 7.12.

7.6.1 GENERAL PERCEPTION OF DIFFICULTIES

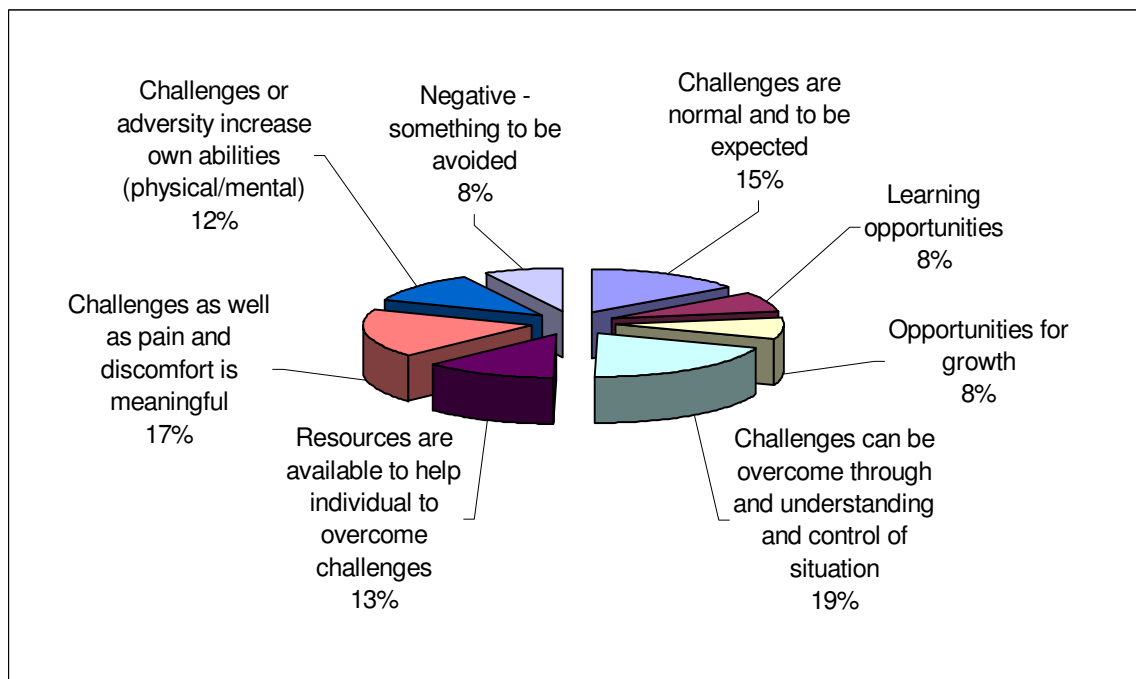


FIGURE 7.12: VIEW OF PROBLEMS/DIFFICULTIES

From figure 7.12 it is clear that the majority of respondents view problems and difficulties as something positive. Only 8% of the respondents view problems as something that is negative and that should be avoided. Those who view problems as positive believe that challenges are normal and to be expected (15%), believe that challenges can be overcome through an understanding and control of the situation (19%), believe that the resources needed to overcome these challenges are available to the individual (13%), believe that challenges as well as the pain and discomfort associated with endurance sport are meaningful (17%), believe that challenges are learning opportunities (8%) and believe challenges to be opportunities for personal growth (8%).

7.7 SELF-PERCEPTION OF ENDURANCE ATHLETES

Another theme that is found in all the theories of coping is that of a positive self-perception by the individual that he has the ability to cope with challenges. In actual fact, in the same manner that a positive attitude or approach to challenges is essential to cope with these challenges so is a positive self-perception of own abilities essential to cope with challenges. In this study, the respondents seem to have a perception that they are able to understand and control the outcome of most situations – specifically in endurance sport. Their own self-perception is that they can cope with the majority of stressors. This positive self-perception can be seen in figure 7.13.

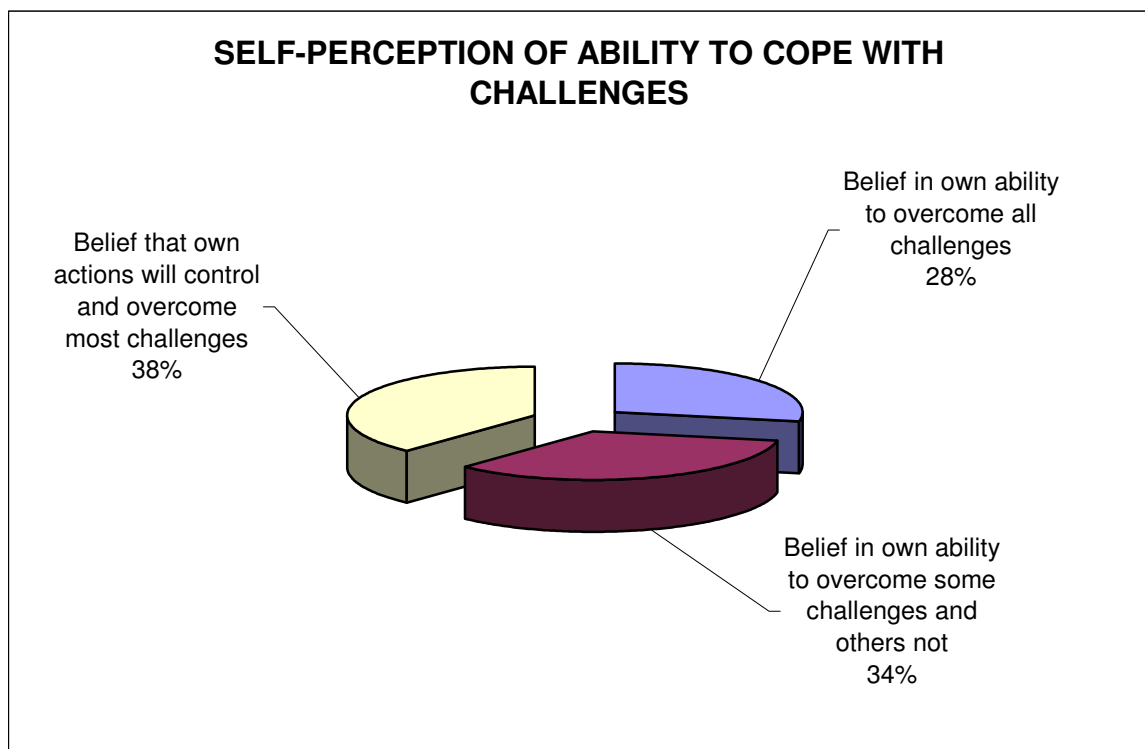


FIGURE 7.13: **SELF-PERCEPTION OF ABILITY TO COPE WITH CHALLENGES**

As seen in figure 7.13, all the athletes that participated in this study believe that they have the ability to overcome most or all challenges in endurance sport. Of these athletes, 28% believe that they have the ability to overcome all challenges in endurance sport. This is illustrated by the following responses of the athletes:

"I tell myself that this is not yet difficult".

“All challenges and obstacles that must be met and overcome”.

“No matter what the problem is or how difficult, it can be overcome and will pass”.

“Everything is difficult but the mind is the deciding factor. If the body is in serious pain, the mind can decide whether to listen to the body or mind”.

“Problems are things that are not easy to overcome but is very much possible to overcome”.

“I will work it out - take it as it comes”.

“Just expect the worst that can happen, be prepared for it, and then it is not difficult”.

Of the athletes that participated in the study, 38% believe that they will be able to overcome most challenges. This is illustrated by the following responses of the athletes:

“It is part of it and unavoidable. Have to handle and overcome as it happens and make peace with it”.

“That if I exercise more I will be able to overcome the challenges. That I want and are going to finish what I have started - nobody else is going to finish it for me”.

“Mentally the mind is in control and can overcome most challenges”.

“Challenges can mostly be overcome”.

“Some problems such as wind or cold are very difficult to overcome but one can try”.

Quite a significant part of the group (34%) believes that they have the ability to overcome some of the challenges of endurance sport. This is illustrated by the following responses of the athletes:

“My motivation lies in completing what I have started. I'm honest enough with myself to never start with something that I know beforehand I cannot complete”.

“I sometimes wonder if I'm good enough to finish”.

“I'm sometimes uncertain whether I should go on or stop”.

“You will get unsure if your subject knowledge is poor or if there is a lack of control”.

“If I have not prepared enough I sometimes wonder if I will finish”.

“If I'm uncertain of the distance I get afraid and even panicky - I think it is because of my age and due to the fact that I'm not always fit enough”.

It is probable that the 28% that believes that they will be able to overcome all challenges in endurance sport are not realistic about their ability. The remaining 72% seem to be more realistic in the self-perception.

7.8 SUMMARY

In this chapter the results of the study were presented based on the qualitative analysis process as discussed in chapter 6. Focusing on the manifest themes as they emerged from the data as well as the latent themes that emerged from both the data and latent themes achieved this objective.

The results were presented under the following headings or themes that emerged from the data and were accepted after careful consideration:

- Description of the respondents;
- Perceived impact of environmental factors on performance;
- Motivational strategies used during endurance events;

- Coping strategies used during endurance events;
- Attitude towards problems/challenges;
- Self-perception of own ability to cope with the challenges of endurance sport.

In the next chapter the results as presented as well as their implications will be discussed.

CHAPTER 8

DISCUSSION OF RESULTS

“An expedition adventure racer does not look in awe at endurance record holders or listen in disbelief at tales of human struggle and survival. They reflect in quiet agreement and respectful appreciation for the sacrifices of their peers. They share in common a life driven by passion not possessions. For those in the arena, it is the experiences that provide value in living.” – Dan O’Shea

8.1 INTRODUCTION

The aim of this chapter is to clearly present and systematically discuss the results of this study. The results will be discussed under the following headings or themes: description of the respondents, the perceived impact of environmental factors on performance, motivational strategies used during endurance events, coping strategies used during endurance events, attitude towards problems/challenges, and self-perception of endurance athletes. In the discussion, references will be made to other studies and theories to indicate how the findings of this study fits in with the larger body of sport psychology literature.

8.2 DESCRIPTION OF THE RESPONDENTS

Based on the population distribution factors of race, age, and gender the participants of this study generally reflect the general population of South Africa. Unfortunately no biographical statistics are available of the distribution of endurance athletes to determine whether this study reflects the endurance sport community of South Africa. When compared to the general population of South Africa certain limitations in the application of the results exist. The greater majority of respondents are male. The implication of this is that the results of this study are limited in its application to female endurance athletes. Unfortunately no Asian respondents were available.

No respondents in the age group 40 to 49 were available or willing to participate in the study. Therefore, results of this study might not be applicable to endurance athletes in this age category. However, if one takes into account one of the basic assumptions of the Salutogenic theory that sense of coherence is basically established by the age of 30 (see page 100) with relatively few changes thereafter,

the assumption can be made that coping and motivational strategies for the age group 40 to 49 would be similar to the groups 30 to 39 and 50+ and that with caution, the results can be generalised to this group. However, further research including this age group is essential.

The different disciplines that the respondents of this study participate in are relatively evenly distributed. It would seem that the more technical and “equipment intensive” (and consequently more expensive) the discipline becomes, the less popular the discipline. A possible explanation for this phenomenon might be that the majority of the respondents are from historically disadvantaged communities. The majority of the respondents participate in one endurance sport discipline. However, a significant number of the athletes participate in between two and four or more endurance sport disciplines. The athletes that participated in this study are relatively active in endurance sport and participated in over 200 endurance events during the previous year an average of 3.8 events per participant per year.

8.3 PERCEIVED IMPACT OF ENVIRONMENTAL FACTORS ON PERFORMANCE DURING ENDURANCE EVENTS

Environmental factors can either enhance or encumber performance, depending on the type of environmental factor or the perception of the environmental factor by the athlete. The impact can be on a physical level. It is possible that the environmental factors can have both positive and negative physical influences on performance. This finding is supported by countless other studies of which the following are examples; Warburton, Gledhill, and Quinney (2000) on blood volume, aerobic power and endurance performance, Bachle, Eckerson, Albertson, Ebersole, Goodwin and Petzel (2001) on the effect of fluid replacement on endurance performance, Hahn, Gore, Martin, Ashenden, Roberts and Logan (2001) on moderate training and living at sea level, Andrews, Sedlock, Flynn, Navalta and Ji (2003) on carbohydrate and supplementation in endurance-trained women athletes, González-Alonso, Teller, Andersen, Jensen, Hylidig, and Nielsen (1999) and Sawka and Pandolf (2003) on performance in hot climates. All of these studies (on different environmental factors) show how specific environmental factors influence on the physical performance during endurance events. In all of the studies environmental factors did have an impact on physical performance during endurance events.

Furthermore the results indicate that environmental factors impact on performance during endurance events on a mental level or a combination of both physical and mental. It is perceived that the environmental factors can have both positive and negative mental influences on performance. These results are fully supported by other research. Studies by Creagh *et al.*, (1998) on female “off road” runners, Laursen and Rhodes (2001) on factors affecting performance in an ultra endurance triathlon, Ainslie *et al.*, (2002) on energy balance, metabolism, hydration and performance during strenuous hill walking, Atkinson, Davidson, Jeukendrup and Passfield (2003) on cycling, Abbiss and Laursen (2005) on fatigue during prolonged endurance cycling, Kayser (2005) on endurance performance at high altitudes show that the environment has a significant impact on mental processes and consequently on performance.

Generally these studies indicate that the impact is situation and individual bound. In other words, each individual’s perception as well as the situation determines whether the environmental factor is perceived positively or negatively. However, as seen in the studies by O’Neil (2004) and Abbiss and Laursen (2005) motivation, motivational and coping strategies have an influence on the individual’s perception of environmental factors. Therefore, environmental factors should always be seen as an integrated part of endurance sport as a whole that has the potential to influence performance.

8.4 MOTIVATIONAL STRATEGIES USED DURING ENDURANCE EVENTS

In this section the focus was on the motivational strategies that are used by athletes during endurance events. Two factors, focus and source of incentive, were identified in chapter 5. These two factors determine the motivational strategies that will be used. From these two factors, four motivational strategies can be identified. These strategies are positive-internal, positive-external, negative-internal and negative-external. Athletes used all four of these strategies during endurance events to motivate themselves. The most commonly used strategy was positive-internal followed by negative-internal, positive-external and negative-external. It would seem as if endurance athletes are more motivated by internal incentives or rewards than by external incentives or rewards. This finding is supported by several research studies

conducted on the motivational attributions that justify an ultra-triathlete's need to perform (Anthony, 1996), competitive orientations and motives of adult sport and exercise participants (Beaudoin *et al.*, 1996), achievement motivation, sports-related future orientation, and sporting career (Halvari & Thomassen, 1997), on adventure racing (Mann & Schaad, 2001), distance running (Williamson, 2003), the relationship between collegiate track runners' achievement orientations and perceptions of motivational climate (McManus, 2004), the influence of intrinsic motivation on an endurance (Tsigilis, 2005). According to these studies a mastery or task orientation as well as an emphasis on intrinsic motivation, as opposed to a win orientation and emphasis on extrinsic rewards, encourages participation and achievement.

The results indicate that the majority of athletes in this study focus on the positive outcomes of performing rather than on the negative outcomes to motivate themselves during endurance events. This finding is partially supported by the work of Atkinson (Gill, 2000; Potgieter, 2003) who stated that the motives to approach success and to avoid failure exist independently of each other and are present in all individuals' personality to some degree. One cannot be predicted on the basis of the other and are two separate achievement-related dimensions susceptible to external influences. However, a study by Halvari and Thomassen (1997) on achievement motivation, sports-related future orientation, and sporting career found that individual endurance athletes were more frequently motivated by the avoidance of failure than by the motive to approach success. There is therefore a difference between the results of this study and available literature. It must be remembered that studies on motivational orientations in sport are still limited (Conroy, Poczwadowski & Henschen, 2001) and it is to be expected that discrepancies will occur.

Under each of these strategies the athletes utilised one or several techniques to motivate themselves. The techniques identified in this study are positive self-talk, anchoring, association, dissociation, positive visualization, goal-setting, visualize negative outcomes, negative self-talk and faith. This is supported by research conducted on the facilitation of physical performance by means of a cognitive strategy (Morgan, Horstman, Cymerman & Stokes, 1983), goal-setting and exercise performance (Smith, Hauenstein & Buchanan, 1996), the effect of goal specificity, goal difficulty and duration of practice time intervals on muscular endurance performance (Bar-Eli, Tenenbaum, Pie, Btsh & Almog, 1997), the use of imagery in fencing, (Boron, 2002), the use of imagery in climbing (Boyd & Munroe, 2003), exercise imagery (Giacobbi, Hausenblas & Fallon, 2003), on the effects of brief yoga

exercises and motivational preparatory interventions in distance runners (Donohue, Miller, Beisecker, Houser, Valdez, Tiller & Taymar, 2006), self-talk and gross motor skill performance (Hardy, Hall, Gibbs & Greenslade, 2005). These studies support the findings of this study insofar as the use of motivational techniques. According to these studies the use of motivational techniques increased performance when compared to athletes who did not use motivational techniques. However, some studies like Schofield, Dickson, Mummery and Street (2002) illustrate the danger to the well being of endurance athletes when using inappropriate motivational techniques. According to this study inappropriate motivational techniques or the inappropriate use of motivational techniques can lead to psychological states such as depression and higher levels of pre-competitive anxiety. Therefore, although these studies confirm the use of motivational techniques in sport and specifically endurance sport and that they generally have a positive effect on performance, the results in terms of its' effect on performance is still ambivalent. However, many of these studies refer to sport in general or non-endurance sport. The influence of and effectiveness of motivational techniques on the performance of endurance athletes have not been extensively studied. There is therefore an opportunity to study the effect and effectiveness of motivational techniques on athletes during endurance events. Studies of this kind will fill the current lack in sport psychology literature. However, the aim of this study to identify motivational strategies and techniques was reached. In the next section the coping strategies utilised by athletes during endurance events will be discussed.

8.5 COPING STRATEGIES USED DURING ENDURANCE EVENTS

The majority of respondents (62%) prefer to utilise the strategy that changes the source of the stress whereas only 36% of the respondents utilises the strategy that changes the individual's perception of the stressor. This differs from previous studies (Van Breda, 2001). Only a small portion of the respondents (2%) utilised a strategy that focuses on the symptoms of the stress. This finding is supported by research conducted by Gould, Eklund and Jackson (1993), Stevinson and Biddle (1998), Dale (2000), Lazarus (2000) and Banghurst, Thierry, and Holder (2004). Additional research by Gould, Finch and Jackson (1993), Anshel and Kaissidis (1997) and Hardy and Gould *et al.* (in Weinberg & Gould, 2003) show that combinations of strategies seems to be most effective and that those athletes that were prepared for

unexpected situations (strategy that change the source of the stress) were more successful than athletes that did not prepare.

The endurance athletes in this study seem to prefer to place themselves in stressful situations. These athletes seem to have a perception that they are able to understand and control the outcome of most situations – specifically in endurance sport. Their own self-perception is that they can cope with the majority of stressors. This is supported by the theories of sense of coherence, self-efficacy and locus of control where the perception and ability to take meaning out of any given situation as well as the ability to understand and manage the situation is central to the individual's self-perception that is needed to cope with adversity. These findings are supported by research regarding anxiety and sport performance (Raglin, 1992), the relationship of coping and its perceived effectiveness to positive and negative affect in sport (Ntoumanis & Biddle, 1998) and gender differences in coping with endurance sport stress (Burton & Hammermeister, 2004).

However, this self-perception is only valid as long as it is tested on a regular basis. In other words, to reinforce their positive self-perception, endurance athletes continuously need to prove to themselves (and sometimes other people) that they can cope in difficult and possibly even life-threatening situations by participating in endurance events. This finding is supported by findings by Wurtele (1986), Lane, Jones and Stevens (2002) whose studies indicated that self-efficacy is the strongest predictor of performance for novice athletes, while previous performance is the best predictor for experienced athletes. Therefore, continued successful experiences in endurance events will increase self-efficacy to cope with difficulties and challenges. An important element of motivation and coping, specifically from the Salutogenic perspective, is the attitude that individual athletes have towards problems and difficulties. The results of this study in terms of this attitude will be discussed in the next section.

8.6 ATTITUDE TOWARDS PROBLEMS AND CHALLENGES

The greater majority of endurance athletes who participated in this study perceive problems and difficulties in a positive manner. They see them as challenges that can be overcome, as learning opportunities, and as opportunities for personal growth. Studies by Skirka (2000), Lane *et al.* (2002), Bandura and Locke (2003), Williams

(2003), Mummery, Schofield and Perry (2004), and Sheldon (2005) found that many successful athletes perceive problems as positive challenges and as opportunities for personal growth as well as opportunities to improve their mastery of their sport discipline. Although the majority of these studies were done on non-endurance athletes, their findings support the results of this study.

8.7 SELF-PERCEPTION OF ENDURANCE ATHLETES

All the athletes in this study believe that they have the ability to overcome at least some of the challenges of endurance sport. The responses could be divided into three groupings; those who believe that they have the ability to overcome all challenges, those who believe that they will be able to overcome most challenges, and those who believe that they will be able to overcome some of the challenges. These findings are fully supported by theory and research conducted on recycling misconceptions of perceived self-efficacy (Bandura, 1984), the effects of personal and competitive self-efficacy and differential outcome feedback on subsequent self-efficacy and performance (Taylor, 1989), self-efficacy and health behaviours (Schwarzer and Fuchs in Conner and Norman, 1995), negative self-efficacy and goal effects (Bandura & Locke, 2003), the role of coping style, social support and self-concept in resilience of sport performance (Mummery *et al.*, 2004), and physical and psychological predictors of perceived ability in adult male and female tennis players (Sheldon, 2005).

These studies indicate that a positive perception of own abilities (self-efficacy) is characteristic of successful athletes. It predicted successful performance during sporting events and was also shown to be an indicator of general well being. Furthermore, they believe that they have sufficient resources available to overcome these challenges and that the pursuit of these challenging situations is meaningful. These studies are grounded in theory and specifically that of the social learning theory. An interesting trend is that even those athletes who are unsure of their ability to overcome all challenges attribute this to a lack of effort, training or control over the situation – not necessarily lack of ability. By training harder, preparing and planning better and by learning from previous mistakes, they perceive that they will be able to overcome the challenges of endurance sport.

8.8 SUMMARY

In this study answers have been given to questions that previously have been unanswered or where assumptions had to be made based on previous research. In many cases this research has not been entirely applicable to endurance sport or even the South African environment. This can be seen in results of this study that do not reflect the normal trend of previous research results. Several new and interesting research findings in terms of motivation, rewards, coping strategies and stressors in sport and specifically endurance sport have been identified that should be further explored.

Findings of this study are that environmental factors are perceived to have a physical and mental impact on performance. The perception of this impact differs and can be positive, negative or neutral depending on situational factors.

Motivational strategies that are employed during endurance events by athletes to motivate themselves to overcome the challenges are the result of two factors: focus of motivation and source of motivation. By combining these two factors four motivational strategies or styles were identified: positive-internal, positive-external, negative-internal and negative-external of which positive-internal were most frequently used followed by negative-internal, positive-external and negative-external. It seems as if endurance athletes most frequently focus on the positive outcomes of performance in endurance events coupled with the internal rewards thereof to motivate themselves to overcome challenges in endurance events.

Endurance athletes used all three coping strategies that were identified in the literature. The most frequently used strategy was to remove the source of the stress, followed by strategies that changes the athlete's perception of the stressor and that focuses on the symptoms of the stress.

Endurance athletes perceive themselves able to overcome the challenges of endurance events. However, this ability must constantly be tested by participation in endurance sport or other stressful situations. Previous successful participation in endurance events or other stressful situations leads to an increase in positive self-perception of own abilities as well as an increase in performance in endurance events.

By answering the research questions this study can be considered a success in the sense that all the questions have been (at least partially) successfully answered. However, to claim that this study is without shortcomings would be unwise and detrimental to science. In the next chapter the shortcomings and practical applications of this study will be discussed.

CHAPTER 9

LIMITATIONS, RECOMMENDATIONS AND PRACTICAL APPLICATION OF RESULTS

“It is not the critic that counts...it’s not the man who points out how the strong man stumbled...Credit belongs to the man who really was in the arena, his face marred by dust, sweat and blood, who strives valiantly, who errs to come short and short again, because there is no effort without error or shortcoming. It is the man who actually strives to do the deeds, who knows the great enthusiasm and knows the great devotion, who spends himself in a worthy cause, who at best knows in the end the triumph of great achievement. And who, at worst, if he fails, at least fails while daring greatly, so that his place shall never be with those cold and cruel souls who know neither victory nor defeat”.

- Teddy Roosevelt

9.1 INTRODUCTION

The aim of this chapter is to analyse and discuss the limitations of this study. Secondly, to recommend further research areas and lastly, the practical applications of the results of this study. Thus, the chapter will be divided into two sections under the following headings:

- Limitations of the study and recommended research areas;
- Practical application of results.

9.2 LIMITATIONS OF THE STUDY AND RECOMMENDED FUTURE RESEARCH

One of the most obvious limitations is one that is probably common to all descriptive explorative studies – too broad a scope.

As can be seen from the results of this study there are several topics that on their own would have been sufficient for a doctoral study. Motivational strategies alone

would have been sufficient. The same is true for coping strategies or stressors. The result of this is that the study might be too broad in its' findings instead of being deeper in one or two areas. The positive side to this limitation is that a large amount of groundwork for further studies in specific areas (such as motivation) has been done through this study.

The basic theoretical approach of this study was the Salutogenic Model of Health and although this model has been used successfully to theoretically explain coping strategies as well as motivational strategies, there was one limitation to this study. The use of the psychometric test, the sense of coherence (SOC), would have confirmed the assumptions of the strength of the respondents' SOC made based on their responses. It is therefore, recommended that future studies, specifically those that focus on coping strategies include the use of the SOC.

Although the respondents approximately represent the general population of South Africa, the lack of Asian endurance athletes as well as athletes in the age group 40 to 49 years is a limitation. The implication of this distribution is that the results of this study might not be applicable to endurance athletes in the age group 40 to 49, nor Asian endurance athletes. This limitation is due to the fact that an availability sampling method has been used. This was necessary due to the difficulty of finding enough respondents to use a stratified random sampling method. However, it is recommended that future studies make use of random sampling or stratified random sampling methods to select respondents.

This study provided answers as to how endurance athletes experienced these environmental stressors as well as the subjective perception of the influence of environmental factors on their performance. An in-depth study of each of the environmental stressors and the influence of each on the performance of endurance athletes is recommended.

The lack of a clear objective measurable definition of endurance sport is a limitation not only in this study but also in sport psychology literature in general. Fortunately, this limitation did not have a serious impact on this study, as the explorative nature of the study did not necessitate an objective measurable definition. However, this limitation might have serious implications for future studies, specifically quantitative studies.

This study focused on the individual endurance athlete. It is recommended that future studies also focus on the effect of environmental factors on other aspects of endurance sport such as teamwork.

As seen in this study, several other stressors such as teamwork, injuries, other competitors for example have been identified. The effect of these stressors on endurance athletes as well as their performance needs to be studied.

It would seem as if there is a general lack of research on the psychological aspects of endurance sport in South Africa. Applicable to this study is the lack of knowledge on the motivations of endurance athletes to start and to continue with endurance sport. The varied cultural and ethnic background of the South African population makes such a study necessary.

This study described the stressors involved in endurance sport, motivational and coping strategies employed during endurance events, endurance athletes' self-perception of their ability to cope with challenges during endurance events, as well as their philosophical view of problems or challenges. However, this study did not focus on the development process of coping strategies, motivational strategies or the philosophical view of problems (or SOC).

A study of the development process of coping strategies, motivational strategies and the SOC will not only enable a better understanding of these concepts, but will also enable the development of training programmes to develop and enhance these skills in endurance athletes. Furthermore, this study did not focus on the development of the resources that enable endurance athletes to cope and thrive with the difficult and challenging situations found in endurance sport. It is therefore, recommended that this development process should be studied.

Although the study did briefly focus on emotion-focused coping strategies as well as avoidant coping strategies, the lack of an in-depth study of these two coping strategies is a limitation that needs to be rectified with future research.

It is recommended that a study be undertaken to determine the effect of endurance sport participation on the development of SOC, coping strategies, motivational strategies and self-esteem.

An important study would be to compare the coping ability of endurance athletes with non-endurance athletes as well as to see if the coping strategies and motivational strategies used during endurance events are transferable to other life situations. An important study would be on specialist groupings in the SANDF and SAPS. Groupings such as the SA Special Forces, Parachute Regiment, Infantry Corps, SA Navy Divers and SAPS Special Task Force work under similar conditions as endurance athletes and face similar if not worse environmental stressors. If research on these groupings indicates similar findings to this study, the results can be used for training and development, recruitment and selection. In the next section, the practical applications of the study's findings will be discussed.

9.3 PRACTICAL APPLICATIONS OF THE RESEARCH RESULTS

Theoretical research is of extreme importance for any science as this forms the basis of future research and increasing subject knowledge. However, as important as theoretical research is the need for research to be useful in the practical setting. This is important for all applied sciences and even more important for emerging sciences. Although sport psychology cannot be classified as an emerging science per se, it certainly is in the South African setting. South Africa and South African athletes are only recently starting to discover the application value of sport psychology. Therefore, to enhance the need for and importance of sport psychology research need to be useful for sport practitioners (athletes, coaches and sport psychologists). This chapter aim to provide some of the practical applications of the results of this study as well as a brief discussion of how the results will be useful to sport practitioners. The main focus of this study was on the stressors encountered in endurance sport, strategies and techniques used to motivate athletes to overcome the stressors of endurance events and the strategies employed by athletes to cope with the stressors of endurance events.

The most obvious practical application of the research results would be the transfer of this knowledge through training or development courses. These courses could enable endurance athletes, coaches of endurance athletes and sport psychologists to develop a better understanding of the general motivational and coping factors involved in endurance sport. This knowledge can be used to select and develop individuals with potential to become endurance athletes by developing the attitudes, strategies and skills needed to overcome the physical and mental challenges of

endurance sport. Knowledge and understanding of concepts such as stressors, motivational strategies and techniques and coping strategies are important as it will enable endurance sport practitioners to know how these factors influence performance on a physical and mental level. By understanding concepts such as stressors, motivational strategies and techniques and coping strategies, endurance athletes develop an understanding of themselves. Understanding of themselves would enable endurance athletes to increase their self-knowledge, thereby increasing their performance. Individual reactions at different times would enable endurance athletes to understand their rhythm of their own performance. This would not only enable athletes to increase their own performance but could have beneficial effects for team dynamics.

As seen in chapter 7, team dynamics is one of the factors that is perceived as a stressor in endurance sport. Not only is it perceived to be a stressor, but also an “unnecessary” stressor. One of the reasons for this perception is the fact that inexperienced team members in endurance sport do not know each other or the individual reactions to the different stressors. By understanding individual differences in reactions to stressors as well as differences in coping and motivational strategies will enable team members to understand each other better. This understanding will enable team members to support each other better and that could lead to increased team performance. The results of this study could therefore be used as part of team-building programmes as well as individual development.

An understanding of the concepts of this study such as stressors as well as the influence thereof, motivational and coping strategies will enable sport psychologists to develop interventive therapies to enable endurance athletes to overcome the stressors. By focusing on the motivating factors, inexperienced endurance athletes can be taught strategies to motivate themselves before events to train and prepare themselves for these events. Furthermore, athletes can be taught motivational strategies to ensure continued performance in endurance events over extended periods of time.

As seen in chapter 7, motivating factors are the basis for participation in endurance sport. An additional use of an interventive programme dealing with motivating factors might be for endurance athletes that have sustained injuries to develop motivational strategies to enhance their recovery process. Marketing of endurance sport and events is a field of application that can benefit from the results of this study.

Marketing aims to attract people to participate in endurance events or endurance sport by using messages that consciously or unconsciously change their perception of endurance events or endurance sport. Therefore, by focusing these messages on the motivating factors as identified in this study will enable more effective marketing of endurance events or endurance sport. This is particularly important in South Africa where endurance sport can be considered an emerging sport when compared with sport disciplines such as soccer or rugby. In addition to improving the marketing of endurance sport, the results of this study, specifically the type of rewards, would enable the organisers of endurance events to improve the type of rewards given to participants of endurance events. This will not only motivate experienced athletes to participate and perform well, but will also draw more non-elite athletes to endurance events. The importance of “recruiting” new participants to endurance sport, especially from previously disadvantaged communities, cannot be stressed enough. Endurance sport has the potential to become one of the sport disciplines that have numerically the most participants of all sport disciplines in South Africa. This can be seen from the number of participants in events such as the *Comrades Marathon*, *The Pick and Pay 94.7 Cycle Challenge* or the *Pick and Pay Cape Argus Cycle Challenge*. Each of these events draws between twelve and thirty thousand participants. However, these events (as well as a few others) are exceptions that prove what good marketing can do as well as the potential for expansion in the sport. The majority of events are not well attended either by athletes, sponsors or spectators. Using the results of this study, specifically the type of rewards and motivating factors, will enable sport administrators to develop marketing strategies to promote endurance events and endurance sport.

If future research does indicate similar findings, the results of this study would be of particular use to specialist groups in the SANDF and SAPS such as the SA Special Forces, Parachute Regiment, Infantry Corps or SAPS Special Task Force. These groupings work under similar conditions as endurance athletes and are exposed to similar if not worse environmental stressors. If research on these groupings indicates similar findings to this study, the results can be used for training, development, recruitment and selection.

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APPENDIX A



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RESEARCH STUDY TO DETERMINE THE COPING-AND-MOTIVATIONAL STRATEGIES USED BY ENDURANCE ATHLETES

Dear participant.

This study is being done as part of a D. Phil in Sport Psychology. The aim of this study is to determine the motivation for athletes to participate in endurance sport, the stressors involved in endurance sport, the coping-and-motivational strategies used by athletes during endurance events. The last objective of this study is to determine how and where in the athlete's life these coping-and-motivational strategies have been developed and learned.

To accomplish these objectives, the study is divided in two phases that will not be on the same day but at least a few days apart. The first phase consists of you completing a questionnaire that will take between 45 – 85 minutes to complete.

The second phase will consist of an in-depth interview where the information from the questionnaire will be confirmed and clarified. This interview will take 2 – 3 hours to complete. During this interview you will also be asked questions about your past life and will be asked to draw timelines. These questions and timelines are used to determine where and how you have developed the coping-and-motivational strategies that you use during endurance races.

The information gathered here will be used for research purposes and will be published in a research report. The information might also be used for further research and possibly as part of future publications. However, personally you will remain anonymous and any information that might identify you will remain strictly confidential.

Please indicate on the indemnity form if you prefer that this information only be used for this study and not for further research purposes. I cannot give any rewards, monetary or otherwise, for your participation in this study and your participation are therefore completely voluntary. However, if you prefer, I can provide you with an abstract of the results once the study is complete. Your participation in this study will help a great deal to the understanding of endurance athletes as well as the dynamics involved in endurance sport.

If you are interested to participate in this study, please complete and sign the accompanying indemnity form.

Thank you.
Johnny O' Neil

RESEARCH STUDY: ENDURANCE ATHLETE'S COPING AND MOTIVATIONAL STRATEGIES

INDEMNITY FORM

I,(name and surname in block letters) wish to participate in the study that determines the coping-and-motivational strategies used by athletes during endurance events.

I understand that my identity will remain strictly confidential and anonymous and will in no way, directly or indirectly be made available to anyone except the individuals directly involved with the data-gathering phase of this study.

I understand that the results of this study will be made available in a research report and possibly further future articles or other publications. I hereby **give permission/do not give permission** (circle your choice), that the information provided by me be used in future research studies.

I understand that should I give my permission for this information to be used for future research, it is with the understanding that my identity will remain strictly confidential and anonymous and will in no way, directly or indirectly be made available to anyone except the individuals directly involved with the data-gathering phase of this study.

I understand that I will receive no rewards, monetary or otherwise, for my participation in this study and that my participation is completely voluntary. I **wish/do not wish** (circle choice) to receive an abstract of the results after completion of the study.

.....
Signature

.....
Date

Principle Researcher

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APPENDIX B

ENDURANCE SPORT PARTICIPATION QUESTIONNAIRE

1. GENDER:

Male	<input type="checkbox"/>
Female	<input type="checkbox"/>

2. RACE: (Used for biographical research only)

African	<input type="checkbox"/>
Asian	<input type="checkbox"/>
White	<input type="checkbox"/>
Coloured	<input type="checkbox"/>

3. AGE:

21 - 29	<input type="checkbox"/>
30 - 39	<input type="checkbox"/>
40 - 49	<input type="checkbox"/>
50+	<input type="checkbox"/>

4. TYPE OF ENDURANCE SPORT:

Marathon running	<input type="checkbox"/>
Ultra-marathon running	<input type="checkbox"/>
Cross-country running	<input type="checkbox"/>
Extreme cross-country running	<input type="checkbox"/>
Orienteering	<input type="checkbox"/>
Road cycling	<input type="checkbox"/>
Ultra-distance road cycling	<input type="checkbox"/>
Mountain Biking	<input type="checkbox"/>
Ultra-distance Mountain Biking	<input type="checkbox"/>
Canoeing /Kayaking	<input type="checkbox"/>
Mountaineering	<input type="checkbox"/>
Backpacking/Hiking	<input type="checkbox"/>
Endurance swimming (1000 m +)	<input type="checkbox"/>
Adventure Racing	<input type="checkbox"/>
Other	<input type="checkbox"/>

5. If “other”, please specify:

--

6. Please specify the endurance events that you have participated in during the last year:

--

7. Endurance sport usually involves a certain amount of pain and discomfort. Do you agree with this statement and explain your answer.

8. In endurance sport the environment has some impact on all participants. Below is a list of some of the environmental factors. With each factor, explain the physical and mental influence (if any) that each has on you before and during the endurance event.

8.1 EXTREME HEAT

Explain what you do to counter the physical and mental effects of extreme heat during an endurance event:

8.2 EXTREME COLD

Explain what you do to counter the physical and mental effects of extreme cold during an endurance event:

8.3 DEHYDRATION

Explain what you do to counter the physical and mental effects of dehydration during an endurance event:

8.4 ALTITUDE

Explain what you do to counter the physical and mental effects of altitude during an endurance event:

8.5 NUTRITION (FOOD) DEPRIVATION

Explain what you do to counter the physical and mental effects of nutritional deprivation during an endurance event:

8.6 SLEEP DEPRIVATION

Explain what you do to counter the physical and mental effects of sleep deprivation during an endurance event:

8.7 TERRAIN

Explain what you do to counter the physical and mental effects of terrain during an endurance event:

8.8 EQUIPMENT

Explain what you do to counter the physical and mental effects of poor or faulty equipment during an endurance event:

8.9 DISTANCE

Explain what you do to counter the physical and mental effects of long distances during an endurance event:

8.10 WIND

Explain what you do to counter the physical and mental effects of wind during an endurance event:

8.11 RAIN

Explain what you do to counter the physical and mental effects of rain during an endurance event:

8.12 UNCERTAINTY

Explain what you do to counter the physical and mental effects of uncertainty during an endurance event:

9. Why did you start participating in endurance sport?

10. Why do you prefer endurance sport to other sport?

11. Endurance sport requires a preparation over an extended period of time. How do you motivate yourself to continue exercising?

12. How do you motivate yourself during an endurance event to continue despite pain and discomfort?

13. How do you view difficulties or problems during an endurance event?

14. Describe how you see/and feel about yourself after completing an endurance event.

15. Explain why you see yourself in this way (question 14).

16. Briefly describe three things and/or situations that frustrates you during an event, and what you do when you feel this way

Frustration	What you do

17. Name 5 factors that increase your stress before and during an endurance event.

18. When you make a mistake during an endurance event, how does this make you feel?

19. What are the things/factors that makes endurance sport attractive to you?

20. How important are external rewards such as medals, prizes and prize money to you?

Very important		Important		Ambivalent		Not important	
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21. Motivate your answer in 14.

22. Name 5 emotions that you experience frequently during endurance events and briefly describe or give an example of a situation where you feel this way.

Emotion	Situation/Example

23. With each situation mentioned in 16, describe how you resolve this situation.

Situation	Solution

24. What are the characteristics of an endurance athlete?

25. What are the things that you do and think of when you experience pain and discomfort such being tired, sleepy, hungry etc?

26. Identify the symptoms that you experience before and/or during an endurance event?

SYMPTOM	
Increased heart rate	
Rapid breathing	
Tenseness or trembling muscles, tightness in neck, chest, shoulders or hands	
Increased sweating	
Inability to sleep	
Dryness of the mouth	
Numbness in hands and feet	
Tingling in limbs	
Dizziness or light-headedness	
Urge to urinate, nausea, vomiting, diarrhoea	

Pacing	
Trembling	
General restlessness	
Hyperventilation	
Pressured speech	
Hand-wringing or finger tapping	
Recurrent or obsessive thoughts	
Fear-inducing thoughts or ideas	
Confusion or inability to concentrate	
Feelings of doom	
Feelings of tension or nervousness	
Feelings of unreality, panic, or terror	
Feeling “psyched up”	

27. What do and think when you experience these symptoms?