

CHAPTER ONE: INTRODUCTION TO THE STUDY

1.1 Introduction

Emil Zatopek, the only man to win the 5 000 metres, 10 000 metres and marathon in a single Olympic Games, namely in Helsinki in 1952 (Coe, 1984; Giradi, 1972; Sandrock, 1996) said, "If you want to run, then run a mile. If you want to experience another life, run a marathon" (cited in Treadwell, 1987, p. 9). On reading contemporary literature on long-distance running, one may come across comparable quotations from both renowned and admired runners as well as from those who are unknown in the sport which captures their passion for long-distance running. Cameron-Dow (2011, p. 395) recalled that Lindsay Weight, previous two-time winner of the Comrades Marathon, said, "Running connects me to the soul of the universe." Similarly, the popular literature on the sport also contains excerpts from long-distance runners which convey their feelings when they are unable to run. Yates (1987, p. 202) reported a runner as saying, "If I can't run, I feel as if I'm full of dirty dishwater". Noakes (1994, p. 300) noted that Waldemar Cierpinski, two times winner of the Olympic marathon in 1976 and 1980, said, "It's the passion of my life ... Without it, I wouldn't be able to live".

The purpose of the study was to explore the psychosocial factors involved in the susceptibility, experience and rehabilitation of injuries sustained in long-distance running in order to develop a biopsychosocial theoretical model that will help explain injury and the successful rehabilitation thereof in long-distance running. The purpose of the study was borne out of quotations, claims and statements similar to those in the preceding paragraph that are found in well-known magazines and books devoted to the sport, and voiced by long-distance runners informally at road races. In order to orientate the reader, it is necessary to place the study in context and thus, briefly outline the origins of the marathon and the current worldwide popularity of the sport. Furthermore, it is imperative to consider the road running scene in South Africa as well as the following the sport enjoys in the country.

A marathon is a long-distance footrace of 42,195 kilometres. The origins of the marathon can be traced back to ancient Greece. Although the evidence is vague and negligible, Herodotus, a Greek historian, wrote that in 490 BC an enormous Persian army landed at Marathon on the east coast of modern Greece, approximately 38 kilometres from Athens. The Athenians decided to march to Marathon to meet the enemy, but at the same time sent a messenger to Sparta to ask for help. In order to facilitate communication, the ancient Greek army made use of professional runners who reportedly could run enormous distances. One such professional and trained runner, Pheidippides, was chosen to run to Sparta. Legend has it that he ran approximately 238 kilometres over mountainous country in 24 hours to deliver the message. Thereafter,

Pheidippides ran back to Athens, followed the Athenian army to Marathon and once they had miraculously defeated the Persians, he ran back to Athens with the news of their victory. Apparently, he then collapsed and died (Hauman, 1996; Martin, Benario & Gynn, 1977).

Michel Bréal, a friend of Baron Pierre de Coubertin, recommended that in order to commemorate the legend of Pheidippides a distance race of approximately 40 kilometres, from the modern town of Marathon to the stadium in Athens, be included in the first modern Olympic Games in 1896. Accordingly, the race which became known as the Marathon was held on 10 April 1896, the final day of Olympics in Athens. Sixteen started the race which was won by a Greek, Spiridon Louis. At the 1908 Olympic Games in London the marathon distance was extended to 42.195 kilometres so that the race could start at the royal residence at Windsor Castle and finish directly in front of the royal box in the stadium (Hauman, 1996). However, it was only in 1921, at a conference of the International Amateur Athletics Federation that 42.195 kilometres became the standard distance for the marathon (Treadwell, 1987). Since the distance for the marathon was standardized many kinds of endurance races have been organized, but according to Schomer (1984), it is the marathon which has achieved the greatest popularity.

Until the early seventies long-distance running in the United States of America (USA) was considered to be the domain of the elite athlete. Many Americans perceived that those who were involved in the sport had been unable to excel in more masculine sports such as baseball and football (Sandrock, 1996). Furthermore, long-distance running was viewed in general throughout the world as a masochistic pastime pursued by a few demented individuals (Cameron-Dow, 1989). Women were discouraged from taking part in the sport because it was perceived that it would be detrimental to their health (Mayer, 2009). According to Treadwell (1987), long-distance running became popular when Frank Shorter of USA won the Olympic marathon in Munich in 1972. Sandrock stated that it took Shorter 2 hours 12 minutes to change running history. His win started a fitness boom, popularized long-distance running and turned it into a mass-participation sport throughout the world. Burfoot (2011) has attributed the boom experienced in women's marathon running to the Norwegian, Grete Waitz who won the New York Marathon nine times.

A brief review of statistics reveals the popularity long-distance running enjoys. In 1970 a mere 126 runners participated in the New York Marathon and in 1976 there were 2000 entrants in the race (Treadwell, 1987). Since the mid-eighties, the race organizers of the New York Marathon accept 30 000 entries every year (Lobb, 1994). Statistics from marathons throughout the world further illustrate that long-distance running experiences worldwide mass popularity; for example, the London Marathon has in excess of 80 000

applicants, of whom 25 000 are chosen to participate (Treadwell) and since the fall of the Berlin Wall, the Berlin Marathon has attracted more than 25 000 runners each year (Williams, 1992).

Long-distance running in South Africa has followed a similar pattern to that found internationally. According to Mayer (2009), the first sign that running was becoming popular in the country was in 1977 when the 25 km SABC TV road race attracted approximately 20 000 runners. From that year there was a sudden increase in the number of participants in long-distance running races throughout the country, but particularly in the Comrades Marathon and Two Oceans Ultra Marathon (Noakes, 1989). While the standard marathon has been the focus of long-distance running in general throughout the world, South Africans have tended to concentrate on ultra-marathons (Cameron- Dow, 1989), namely races from 50 to 160 kilometres, and from 24-hour to six-day races (Fordyce & Renssen, 2002). According to Cameron-Dow (1989), the Comrades Marathon and the Two Oceans Ultra Marathon are the two premier road running events in South Africa; thus, a review of these two races is imperative.

The Comrades Marathon, an ultra-marathon of approximately 90 kilometres, is run from Durban to Pietermaritzburg or vice versa in KwaZulu Natal in June of each year. The race was founded by Vic Clapham in honour and remembrance of his comrades who had died during the First World War (Alexander, 1985). The Comrades Marathon has been called the world's greatest footrace (Burfoot, 2009a) and is often called 'The Ultimate Human Race' (Cameron-Dow, 2011).

The race is best known for its tortuous route and infamous climbs (Burfoot, 2009b). Five hills, ranging from 1.8 to 3.2 kilometres in length and 101.7 to 186 metres in height characterize the route. When the Comrades is run from the coastal city of Durban to Pietermaritzburg which is approximately 650 metres above sea level, it is referred to as the up run and is remembered for its strenuous climb to Pietermaritzburg. Conversely, when run in the opposite direction, the race is known as the down run, and runners endure a jarring descent into Durban (Cottrell, Laxton & Williams, 2000). According to Cameron-Dow (2011), the Comrades Marathon provides an important encounter for the world's elite ultra-distance runners and at the same time tests the average runner's capability to complete the race in the allotted time.

In 1921, the year of its inception, 34 runners participated in the Comrades Marathon. This figure only rose to 98 and 925 in 1961 and 1971 respectively. However, it was during the second half of the seventies that the numbers participating in long-distance running in South Africa and consequently, in the Comrades Marathon showed a marked increase. In 1979 there were 3 410 finishers (Cottrell, Laxton & Lombaard, 1998) and 8 194 finishers in

1985 (Alexander, 1985). With the exception of the year 2000, approximately 10 000 runners have completed the race each year since then. To celebrate the new millennium the Comrades Marathon Association extended the cut-off time by one hour to 12 hours in 2000 and subsequently, 23 901 ran the race (Cameron-Dow, 2011). According to Burfoot (2009a), a race the distance of the Comrades Marathon would only attract about 71 runners in USA.

The Two Oceans Ultra Marathon is a 56 kilometre ultra-marathon run alongside the coast near Cape Town in the Western Cape on Easter Sunday each year. Although the race is believed to be one of the most scenic long-distance events in the world, it is also one of the most difficult, encompassing two stupendous climbs (Cameron-Dow, 1997) of 180 and 215 metres (Cottrell, 2010). When the Two Oceans Ultra Marathon was first run in 1970, only 15 of the 26 starters managed to complete the course within the six hours allowed. This figure increased to 8 154 and 7 150 runners in 1994 and 1995 respectively (Cameron-Dow, 1997). During the last seven years, 6 000 runners on average have completed the race each year (Cottrell 2004, 2007, 2008, 2010).

The statistics outlined in the preceding two paragraphs are indicative of the enthusiasm South Africans have for long-distance running. A consideration of other data also demonstrates this passion. Cottrell (2010) listed over 700 road races on the country's road running calendar for 2011. According to P. de Jager, technical manager of Athletics South Africa, over 70 000 road runners are expected to register with Athletics South Africa in 2012 (van der Westhuizen, personal communication, 19 November 2011).

Runner's World columnist, Simon Gear, observed that South Africans are obsessed with ultra distance running (2008). An examination of the country's road running calendar (Cottrell 2004, 2007, 2008, 2010) reveals that there are races held all over the country virtually every weekend of the year. Furthermore, particular races are held at specific times of the year in order to assist those runners training for the Two Oceans Ultra Marathon and in particular, the Comrades Marathon. Thus, from the end of January until the beginning of May there are a number of marathons and ultra-marathons held. After the Comrades Marathon, runners tend to focus on shorter distances such as 10, 15 and 21.1 kilometre races. Towards the end of the year, a number of runners start to run 32 kilometre races as well as standard marathons.

The following section of this chapter discusses the motivation for the study. In order to examine how the study may advance psychological knowledge of sport injuries, it is necessary to consider the recent literature on the topic. Only a brief outline of the literature is necessary as this is dealt with extensively in Chapter Two.

1.2 Motivation for the study

There is a proliferation of literature that has dealt with the physical benefits of long-distance running (Fixx, 1977; Fordyce & Renssen, 2002; Noakes, 2001). Furthermore, amongst others, psychological studies conducted by Chan and Lai (1990), Hassmen and Blomstrand (1991), Symonds (1995) and Ziegler (1991) have focused primarily on motivation for participation, and the perceived emotional and psychological benefits of participating in the sport. These perceived psychological benefits include a positive mood, a decrease in depression, stress reduction and a positive mental outlook (Noakes, 2001).

Although long-distance running has been associated with both physical and psychological benefits, runners may also experience risks and in particular, physical injuries because of their involvement in the sport (Brewer, 2001b). According to Noakes and Granger (1990), runners are always at a risk of suffering an injury. When runners are unable to run they experience negative psychological effects. These include fear, depression, frustration, guilt, a lack of concentration, anxiety, irritability, a loss of self-identity and loneliness (Chan & Grossman, 1988; Potgieter, 1997).

During the last three decades, sport medicine and sport psychology researchers have tried to determine which psychosocial variables influence vulnerability and resistance to sport injuries (Williams & Roepke, 1993). Andersen and Williams (1988) developed a multi-component theoretical model of stress and athletic injury. This model has provided a theoretical foundation for most of the research on psychosocial factors inherent in the risk of sustaining an athletic injury (Williams, 2001). In their critique of their model of stress and athletic injury, Williams and Andersen (1998) acknowledged that the model was most applicable for acute injuries. However, the majority of injuries sustained in long-distance running are overuse in nature (Bennell & Crossley, 1996). Runners are likely to sustain chronic injuries because the manner in which they train exceeds their genetic limitations (Noakes, 1985).

Several conceptual frameworks for understanding an athlete's psychological response to injury have also been developed. According to Cupal (1998), successful rehabilitation is dependent on an understanding of this psychological response to injury so as to help the athlete adhere to rehabilitation and make a successful return to competition. Stage models were adapted from research on psychological reactions to terminal illness and loss (Brewer, 2001a). The key assumption of stage models is that injury constitutes a loss of an aspect of the self (Brewer, 2001b) and is a threat to one's basic identity (Van Raalte & Brewer, 2002). Furthermore, these models assume that an athlete's psychological response to injury follows a predictable sequence (Quinn & Fallon, 1999). Cognitive appraisal models were, to a large extent, developed to account for individual

differences that stage models find difficult to explain (Brewer, 1994). The primary tenet of cognitive appraisal models is that cognition plays a central role in determining psychological reactions to sport injury; furthermore, injured athletes' psychological responses to injury may have an effect on their injuries, and thus, may have a significant impact on how they respond to rehabilitation (Brewer, 2001a; Brewer, 2001b). The most evolved and well-developed cognitive appraisal model is an integrated model of psychological response to the sport injury and rehabilitation process (Wiese-Bjornstal, Smith, Shaffer & Morrey, 1998). In an attempt to explain the multitude of factors that are involved in sport rehabilitation, Brewer, Andersen and Van Raalte (2002) developed a biopsychosocial model of sport injury rehabilitation.

After a consideration of the psychological responses to injury as well as the theoretical models, it appears that most of the research conducted has not tested the models; rather, the models and in particular, the integrated model (Wiese-Bjornstal et al., 1998) seem to have been developed to explain these psychological responses. On the other hand, most of the research conducted on factors that make an athlete more susceptible to injury has tested an aspect or aspects of Williams and Andersen's (1998) model of stress and athletic injury. According to Brewer (2001b), these models cannot be viewed in isolation from the rehabilitation process. Research has shown that physiotherapists would welcome more knowledge on psychological interventions that may assist the athletes in the recovery process (Evans, Hardy & Fleming, 2000). Brewer et al. (2002) developed a biopsychosocial model of sport injury rehabilitation in order to help medical practitioners treat injured athletes holistically.

The motivation for the study is justified when one considers the literature outlined above as well as the mass popularity the sport of long-distance running enjoys. Firstly, as stated previously, Williams and Andersen (1998) recognized that their model of stress and athletic injury was most suited for acute injuries. Generally, runners suffer from chronic injuries (Noakes, 2001). The psychosocial factors involved in acute injuries are likely to be different from those involved in chronic injuries. Furthermore, the stress and athletic model focused on psychosocial factors that make athletes more susceptible to injury (Andersen & Williams, 1988). In other words, the model has injury as its endpoint. Stage models as well as cognitive appraisal models, on the other hand, have focused specifically on injured athletes' psychological responses to injury as well as rehabilitation. The focus of the biopsychosocial model of sport injury rehabilitation is on the interrelatedness of biological, psychological and social factors in rehabilitation (Brewer et al., 2002). However, the model does not concentrate on susceptibility to and the experience of injury, but only on rehabilitation. Brewer (2001b) suggested that from a theoretical standpoint, a comprehensive model of sport injury which would attempt to explain the factors that make an athlete susceptible to sport injuries as well as the factors

involved in rehabilitation would be beneficial. The model that emanated from the present study is an attempt to help explain the experience of injuries sustained in long-distance running. Moreover, the model focuses on factors that make runners susceptible to injury, their psychological responses to injury and the factors involved in the successful rehabilitation thereof; thus, it may be viewed as a comprehensive model. Secondly, no identified research in South Africa on the psychosocial factors involved in injuries suffered in long-distance running has been conducted. Finally, the study may lead to the development of psychological intervention programs to help long-distance runners reduce their risk of injury and further psychological programs to help them cope when they are injured. If one considers the large number of long-distance runners in South Africa, the psychological benefits they derive from running and the negative effects they experience when unable to run one may conclude that these programs will contribute to the psychological well-being of many people.

In the following section. The purpose of the present study is outlined. The research question that advised the study is put forward.

1.3 Research question

In order to develop a biopsychosocial theoretical model that will attempt to explain the experience of injury, and the successful rehabilitation thereof in long-distance running, the following research question was advanced:

What psychosocial factors are involved in the susceptibility, experience and rehabilitation of injuries sustained in long-distance running?

In the following section, there is a concise summary of the research methodology employed in the study. The motives for employing the particular research design and research instruments are also briefly outlined. Once again, a detailed discussion of the subject is not necessary as it is explained thoroughly in Chapter Three.

1.4 Research methodology

The study was approached from a biopsychosocial theoretical perspective. The biopsychosocial model is a multi-model, multidisciplinary, integrated and comprehensive approach to understanding people (Craigie, 1999). The model proposes that people can only be understood fully if all their levels of functioning, namely biological or physical, psychological and social are considered (Gove, 1994). The holistic approach of the model may also be understood to include religious and spiritual variables (Sperry, 1999). Furthermore, there is a circular rather than a linear relationship between the components of the systems (Borrell-Carrió, Suchman & Epstein, 2004)

The study was approached from the biopsychosocial theoretical perspective for a number of reasons. Long-distance running is largely a physical activity. Furthermore, sport injury is primarily physical. However, people live in increasing complex psychosocial contexts. Long-distance runners perceive physical, psychological and social benefits because of their involvement in the sport. Furthermore, when unable to run because of injury, runners experience negative effects that are of a physical, psychological and social nature. It is not only necessary to treat the physical causes and symptoms of injury, but also to attend to the psychological and social needs of injured runners. In other words, it is of paramount importance to view injured runners holistically.

A mixed methods design with the purpose of expansion and using case studies of 15 injured long-distance runners was employed in the study. According to Cresswell and Plano Clark (2007), employing a mixture of qualitative and quantitative approaches enhances a better understanding of research problems than if either approach was used. Johnson and Wuegbuzie (2004) added that researchers are able to answer a wider and more complete range of questions because they are not limited to a single approach. Although most of the study was conducted within the qualitative paradigm, both qualitative and quantitative forms of data collection were used in order to expand the breadth and range of the study.

In the study, in order to explore long-distance runners' experiences of injuries sustained in the sport, semi-structured interviews were conducted. Berg (1998) stated that the interview is notably useful in understanding participants' perceptions as well as exploring how they make sense of phenomena or events. Semi-structured interviews were conducted with each participant in order to explore and shed light on his/her experiences of injury sustained in the sport. Each participant also completed the Myers-Briggs Type Indicator (MBTI). This quantitative technique of data collection was employed in order to examine the preferences long-distance runners exercise. By employing both qualitative and quantitative forms of data collection the breadth and range of the study was expanded (Johnson & Wuegbuzie, 2004).

The researcher relied upon thematic analysis to make sense of and analyze the data obtained during the interviews. Thematic analysis is known to be a flexible and beneficial research tool which in essence is independent of theory. It has the potential to generate a detailed, abundant and complex description of data (Braun & Clarke, 2006). In the study, the steps outlined by Braun and Clarke were used as a guideline to explore and come to an inclusive understanding of long-distance runners' experiences of injury. After the thematic analysis of the data captured during the interviews, each participant's MBTI results were analyzed.

1.5 Conclusion

In this chapter, the study was succinctly introduced. Firstly, the context of the study was explained. Secondly, the motivation for the study was examined; in order to do so, a concise outline of the literature on psychological factors inherent in sport injuries formed part of this section. Thirdly, the research methodology employed in the study and reasons for doing so were briefly sketched. In Chapter Two, there is an extensive discussion on the literature on psychosocial factors involved in sport injury. The third chapter focuses on the research methodology of the study. A detailed examination of the results of the study follows in Chapter Four. In Chapter Five, the results are discussed in depth. Finally, Chapter Six considers the strengths and weaknesses of the study as well as recommendations for further studies on the topic.

CHAPTER TWO: LITERATURE STUDY

2.1 Introduction

A plethora of literature has been devoted to the physical benefits of participating in sport and, in particular, long-distance running (Fixx, 1977; Fordyce & Renssen, 2002; Higdon, 1993; Noakes, 2001; Sparks & Kuehls, 1996). The psychological benefits of long-distance running have also been well documented (Chan & Lai, 1990; Hassmen & Blomstrand, 1991; Symonds, 1995; Ziegler, 1991). According to Taunton et al., (2002), running is the sport of choice for many because of the health benefits associated with it.

Although athletes may benefit as a result of their involvement in sport, they may also encounter risks, especially physical injuries, because of their involvement (Brewer, 2001b). According to Taylor and Taylor (1997), irrespective of the level of participation, almost all athletes will suffer an injury that will restrict them from sport for an extended period. Udry and Andersen (2002) stated that "injuries are endemic to sport" (p. 529). A survey conducted in the United Kingdom revealed that sport accounted for 33% of all injuries (Uitenbroek, 1996). It is estimated that every year 1 in 17 Australians suffers a sport injury (Centre for Health Promotion and Research, cited in Gordon, Milios & Grove, 1991).

There is also always a risk of injury in long-distance running (Fordyce & Renssen, 2002; Noakes & Granger, 1990). This potential risk of sustaining a running injury has been detailed (Taunton et al., 2002). According to Noakes (2001), the only danger involved in long-distance running is the large number of injuries sustained. Young and Press (1994) noted that it has been estimated that from 30% to 70% of all runners suffer an injury. Every survey conducted by the United States' edition of *Runner's World* since 1970 has shown that every year half of the magazine's readers have had their training programs interrupted by injury (Ellis & Hendersen, 1994). Sheehan who was the medical editor of the aforementioned magazine in the 1970s, estimated that only one percent of runners do not get injured; he referred to the latter group as "motor" geniuses (Burfoot, 2010). Brunet, Cook, Brinker and Dickinson (1990) reported estimates of between 25 and 40% of all runners at some point suffering one of the common knee injuries. Taunton et al. (2003) conducted a survey in 17 running clinics to determine the number of running injuries that were sustained by those who were involved in a running programme that was designed to minimize the rate of injury for runners training for a 10 kilometre race. They found that 29.5% of the runners across the 17 clinics sustained an injury during the 13 week training program. Fordyce (1996) reckoned that each year in South Africa there is probably as many running injuries as there are runners who run the Comrades Marathon. The only identified statistics for the number of runners in South Africa who get injured was from an online poll conducted by the South African edition of *Runner's World* which revealed that 66% of the respondents suffered an injury in 2009 (Burfoot, 2010).

Despite advances in sports medicine, it is unlikely that injuries sustained in sport will ever be completely eradicated (Udry & Andersen, 2002). Rather, the incidence of injury may increase as society continues to place emphasis on optimal health and physical fitness (Green & Weinberg, 2001), and as the number of athletes participating in recreational, amateur and professional sports continually increases (Smith, Scott & Wiese, 1990). Injuries sustained in sport can affect an athlete's physical functioning and concomitantly, sport's performance negatively (Brewer, 2001b). Sport injuries may also adversely affect the psychological well-being of an athlete (Lynch, 1988).

The purpose of this chapter is to review and discuss the literature that focuses on psychosocial factors involved in sport injuries. The chapter is organized into four main sections. Firstly, dilemmas encountered in conducting research on sport injuries are examined. This is a necessary starting point because the considerable variety of definitions of terms related to injury, determining the severity of injury and the evaluation of pain have resulted in confusion. Secondly, the literature pertaining to psychosocial factors that may make athletes more susceptible to sport injury is examined in detail. An in-depth critical examination of Andersen and Williams' (1988) model of stress and athletic injury as well as the revised version of their model (Williams & Andersen, 1998) is the focal point of the section. Thirdly, athletes' psychological responses to injury are discussed. In this section, both stage models and cognitive appraisal models which have been developed to explain injured athletes' responses are reviewed. Finally, psychosocial factors involved in the successful rehabilitation of sport injuries are explored. In each section, directions for future research are suggested. Although the literature reviewed considers all sports, the findings are applied to long-distance running at the end of each section.

2.2 Dilemmas in research on sport injury

Researchers in the field of sport psychology have become increasingly aware of the dilemmas of conducting research on sport injuries. These dilemmas include the different operational definitions of sport injury; ascertaining the severity of injuries; and determining the role and evaluation of pain in injury. Furthermore, the nature of different sports varies; thus, further highlighting the difficulties of conducting research on sport injuries.

Sport injury has been defined in various ways. Criteria for defining a sport injury generally include a medical diagnosis, an alteration in performance and time lost from participation. Sachs, Sitler and Schwille (1993) also stated that the injury should be specifically sport-related; for example, a broken arm cannot be classified as a running injury. However, even though an injury may not be specifically related to a particular sport, it may still have a negative effect on performance. Flint (1998), in defining sport injury, included reporting practices; in other words, to be classified as a sport injury the

athlete must seek medical advice. This criterion is flawed as some athletes choose to treat the injury themselves and may even attempt to continue training and/or competing with the injury. According to Powell (1991), as a medical diagnosis requires the intervention of a medical practitioner it may lead to subjectivity whereas the criterion of time lost is more objective as it can be easily recorded. However, to determine how much time should be lost cannot be scientifically evaluated. Furthermore, Flint stated that not all athletes who suffer similar injuries react emotionally and/or respond to rehabilitation in the same way. Most studies that included this criterion added that at least one day of participation post occurrence had to be lost. What constitutes a sport injury may be perceived differently by participants in different sports and different competitive levels. According to Young and Press (1994), a running injury is usually defined as a condition that makes a runner reduce his/her desired mileage or training per week.

Defining the type and severity of injury is also problematic. Whereas some researchers have made a distinction between the two terms, others have used them interchangeably. Petrie (1993) differentiated three types of injury: self-limiting injuries which prevent participation; injuries which are painful, but allow participation; and injuries which fall into a grey area as the athlete does not know whether to participate or not. This criterion does not employ any objective criteria, but appears to rely on the athlete's and/or coach's subjective opinion. On the basis of the onset of injury, Flint (1998) classified injuries as either macrotrauma or microtrauma. The former is associated with acute injuries which are the result of a sudden discrete impact; acute injuries usually occur in high impact sports such as rugby and ice-hockey. Microtrauma or chronic injuries are caused by an accumulation of seemingly negligible, gradual, repetitive damage; these injuries are normally sustained in sports such as long-distance running and swimming. Flint stated that it is difficult to classify injuries on the basis of severity as the underlying pathology of tissue is not visible to the human eye. The most common classification of severity is based on time lost: 1 to 7 days, 8 to 21 days and more than 21 days are categorized as minor, moderate and major injuries respectively. Andersen and Williams (1999) cautioned against classifying the severity of injuries on the basis of days lost to participation as limiting. If negative life events are related to injury risk, this classification might lead to the assumption that a high level of negative life stress may result in a more severe injury. Noakes (2001) described four stages or grades of running injuries; these stages are an indication of the severity of the injury. A Grade I injury does not cause pain during running, but may only be felt hours later. A Grade II injury causes discomfort, but not pain during exercise; it does not affect the runner's training or racing performance. On the other hand, a Grade III injury is painful and limits training and racing performance. Finally, a Grade IV injury is so debilitating that it prevents any running.

The role and evaluation of pain also makes it difficult to define and classify injury; this complexity is exacerbated by the fact that researchers also experience difficulty defining pain. The label, pain is used to describe an array of unpleasant sensations; furthermore, an assortment of words is employed to explain these disagreeable sensations (Addison, Kremer & Bell, 1998). In sporting activities, the term, pain is also used to express a diversity of sensations ranging from muscle soreness after a hard training session to that associated with injury. According to Heil (1993), in order to excel at the highest level it is essential for elite athletes to endure pain; these athletes accept and tolerate pain as part of their daily lives. Studies have shown that athletes tolerate pain in order to succeed; Pike and Maguire (2003), for instance, found that female rowers in their study perceived injuries to be a sign of a defective body and consequently, disguised their pain and injuries so as to escape shame. Addison et al. developed an integrative model to explain pain in sport. The model proposes that the physiological sensation of pain is linked to a process of cognitive appraisal as well as behavioural responses which, in turn, are mediated by extrinsic factors such as previous experience and culture, and intrinsic factors such as personality and pain tolerance. This model highlights the view that it is difficult to define and use objective criteria to measure pain.

As discussed in this section, it is difficult to conduct research on injuries sustained in sport. The variety of criteria used to define what injury is as well as determining the type and severity of injury makes it very difficult to compare studies that have been conducted in this field. Furthermore, the complexity of the term, pain and the role it plays in sport performance makes it problematic to use as a criterion to determine what injury is. This is further compounded by athletes' differing cognitive appraisals of unpleasant sensations that are labeled as pain. These dilemmas are further exacerbated when conducting research on injuries sustained in long-distance running because most injuries suffered in the sport are chronic. The next section considers psychosocial factors that are involved in the susceptibility and prevention of sport injury.

2.3 Psychosocial factors involved in the risk and prevention of sport injuries

2.3.1 Early studies

Three decades ago researchers in the fields of sport psychology and sport medicine postulated that a relationship exists between various psychosocial factors and injuries sustained in sport (Williams & Roepke, 1993). It appears that initial thinking on the relationship between psychological factors and the risk of sport injury resulted from observations during coaching (Andersen & Williams, 1993). Ogilvie and Tutko (1971), for instance, referred to those athletes who during training are perpetually injured as 'training-room athletes.' They suggested that those athletes have strong feelings of inferiority and thus, fear that competitions will reveal their physical limitations; however,

they wish to remain members of a team because they fear rejection and isolation. Injury allows them to think that if they were not injured they would be exceptional athletes. On the other hand, many athletes fear doing well because excellent performances make demands on them and thus, they under-perform or continually get injured (Fixx, 1985).

The first studies that were conducted to determine what psychosocial factors influence injury risk were narrow in scope and atheoretical (Williams, 2001). Researchers explored either stressful life events, personality characteristics or both, and did not employ a theoretical perspective to explain their findings. According to Williams and Roepke (1993), in this early research the complexities of stress as well as the wide range of psychosocial and behavioural variables that could influence the stress-injury relationship were not considered. In order to support and illustrate the views outlined above, a few of these studies are briefly described.

Research examining the psychosocial variables that influence the risk of injuries sustained in sport has its origins in the work of Holmes and Rahe (1967). It is assumed that the body adapts when experiencing life events; this adaptation places stress on the body, and this may cause illness and disease. The term, life stress is best defined as those events that cause major changes in one's life such as marriage, a change in employment and the death of a significant other (Junge, 2000). Consequently, Holmes and Rahe developed the Social Readjustment Scale (SRRS). In order to explore the life stress-athletic injury relationship, Holmes (cited in Williams, 2001) administered the Social Readjustment Rating Scale (SRRS) to football players at the University of Washington at the beginning of the football season. At the end of the season, each player's life stress scores were compared to the time he had lost during the season because of injury. Holmes found that the players who had experienced much stress during the year preceding the football season missed at least three days practice due to injury. Thus, he concluded that life stress is related to sports injuries.

In the next study that examined the life stress-sports injury relationship, Bramwell, Masuda, Wagner and Holmes (1975) modified the SRRS by replacing items that are irrelevant for athletes with more sport-specific items; 20 more applicable items were added to the new scale, the Social and Athletic Readjustment Rating Scale (SARRS). Results showed that the injured athletes experienced significantly more life stress than their uninjured counterparts. According to Junge (2000), the SRRS and modified versions of it are one of the methods most frequently used in the assessment of life events.

Sarason, Johnson and Siegel (1978) postulated that adapting to negative life-change events affects individuals differently than to adapting to positive life-change events. Accordingly, they developed the Life Experience Survey (LES) which assesses negative life events, positive life events and total life events. Respondents are required to indicate

if they experience a life-change event as positive or negative; furthermore, they are required to assess whether the event in question had no effect, a little effect, a moderating effect or a great effect on them. In their study, the researchers found that a positive life-change event had no effect or a less damaging effect on the respondents' health than a negative life-change event.

The first study to examine the different effects that positive life stress and negative life stress might have on the prevalence of injuries sustained in sport was conducted by Passer and Seese (1983). They modified the LES to make it more relevant for athletes. By employing the resulting scale, the Athletic Life Experience Survey (ALES), they found that football players in the second division team who reported that they had experienced more negative life stress were more likely to suffer injuries; however, results for the team in the first division showed no significant relationship between injury and life stress.

Quantifiable studies on personality and vulnerability to injury were also conducted, but unlike the initial studies on life stress and injury results were not always consistent (Williams & Roepke, 1993). To determine the traits of those sport participants who are more prone to injury many researchers used personality questionnaires. Brown (1971) employed the California Psychological Inventory (CPI) and found no differences in personality between injured and uninjured football players. Furthermore, no significant differences were found in the relationship between personality traits and time missed at games and practices. This led Brown to conclude that football related injuries and the psychological make-up of footballers are not related.

Jackson et al. (1978) used Cattell's Sixteen Personality Factor Questionnaire (16PF) in their study on high school football players. They found that Factor I (tough-minded versus tender-minded) was the only factor that differentiated between injured and uninjured players. The tender-minded, dependent, overprotected and sensitive players were on average more likely to suffer injuries than those who were tough-minded and self-reliant. Jackson et al. also found that Factor A was predictive of injury severity. Those players who scored low on this dimension and were thus, categorized as reserved, detached, critical and cool experienced more severe injuries than those who scored high on this factor and known to be outgoing, warmhearted, easygoing and participating. The authors cautioned that injury occurs as a result of many interacting variables such as the type of sport engaged in, experience, sensitivity and tolerance to pain, physical attributes, and personality traits. Having to consider a number of interacting variables poses a challenge to all sport injury research.

Valliant (1980), in a study of 21 non-competitive runners, used the 16PF and found that the injured runners differed significantly from their uninjured counterparts on only a few personality factors. These significant differences were the result of sex differences in the

injured group only. Injured female runners were more assertive and practical, but less disciplined in their approach to running than the injured male runners. Valliant (1980) reasoned that this may have accounted for the fact the female runners sustained more injuries than the males. However, in a subsequent study of 41 competitive runners, Valliant (1981) found that injured runners were more tender-minded and less forthright than uninjured runners. Results also revealed that the injured runners were also heavier, taller and ran more miles a week than the uninjured runners. Williams and Roepke (1993) expressed the opinion that the general nature of these questionnaires may have contributed to these inconsistent results.

In an attempt to overcome the limitations of these early studies, Andersen and Williams (1988) developed a multi-component interactional theoretical model of stress and athletic injury. This model has provided a theoretical foundation for most of the research on psychosocial factors involved in athletic injury risk (Williams, 2001) and hence, an in-depth discussion of it follows. Pike and Maguire (2003) also developed a conceptual model to explain injury risk; this model is considered in a subsequent section.

2.3.2 A model of stress and athletic injury

Andersen and Williams' (1988) model of stress and athletic injury evolved from a synthesis of the stress-illness, stress-accident and stress-injury literature, and in particular, from Smith and Ascough's mediational model of stress (Williams, 2001). The stress-athletic injury model considers a broad array of moderating factors, namely cognitive, physiological, behavioural, intrapersonal, social and stress history variables that may affect the occurrence and prevention of injuries sustained in sport (Andersen & Williams, 1988; Potgieter, 1997). A decade after its development, Williams and Andersen (1998) reviewed their model. This critique of the model revealed support for the tenets and hypotheses of the model, but also led the authors to make some minor changes to it. According to Udry and Andersen (2002), the model is the most comprehensive and influential model that deals with risk of injury in sport. The revised model is depicted in Figure 2.1. A brief description of the model follows.

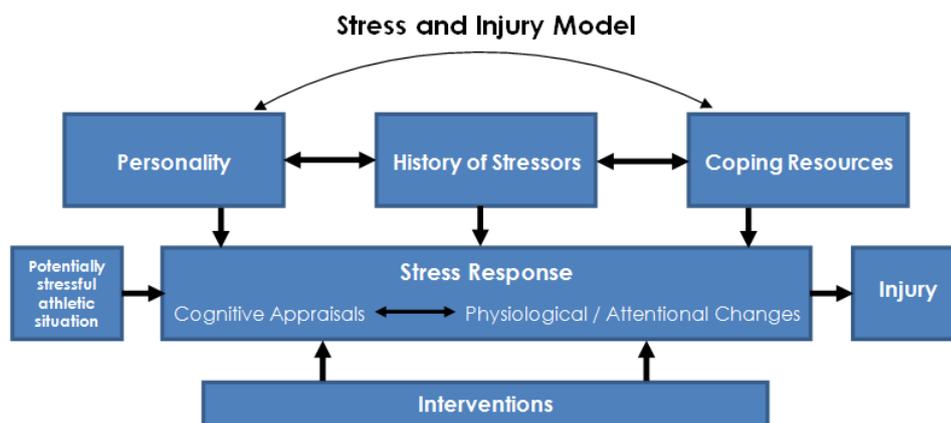


Figure 2.1: A Model of Stress and Athletic Injury

The central core of the model of stress and athletic injury model, the stress response, has four major components: the potentially stressful athletic situation, the cognitive appraisal of that situation, the physiological and attentional responses to stress, and the potential injury outcome. Three major groups of variables are found above the stress response core of the model, namely personality factors, history of stressors and coping resources (Andersen & Williams, 1988).

According to the model of stress and athletic injury, when athletes experience stressful situations such as a demanding training session or a taxing competition their history of stressors, personality characteristics and coping resources contribute in isolation or interactively to the stress response. Physiological reactions and deficits in attention during stress are the two basic mechanisms behind the stress-injury relationship. The central hypothesis of the model is that sport participants who have much stress in their lives, personality characteristics that exacerbate the stress response and few coping resources are more likely to get injured when they experience stressful situations than those individuals who have the opposite profile. The model proposes that these athletes are at a greater risk of injury because when they are placed in a stressful situation they are more likely to perceive the situation as stressful and thus, experience physiological reactions such as greater muscle tension and attentional disruptions such as narrowing of the visual field and increased distractibility. Thus, the severity of the resulting stress response is the mechanism that causes the risk of injury (Andersen & Williams, 1988; Williams, 1996; Williams, 2001; Williams & Roepke, 1993).

There are also two groups of interventions or prevention measures depicted below the stress response. These interventions are hypothesized to lessen the stress response by either attending to the cognitive appraisal or the physiological and attentional facets. Furthermore, these groups of interventions may be employed to directly influence personality factors and coping resources (Andersen & Williams, 1988; Williams, 2001; Williams & Roepke, 1993).

The original model hypothesized that an athlete's history of stressors influences the stress response directly while personality factors and coping resources either act on the stress response directly or have a moderating effect on the history of stressors. Furthermore, these variables can act singly or in combination with one another. This relationship was depicted in the original model by directional arrows from personality factors to history of stressors, and from coping resources to history of stressors. However, in their critique of the model, Williams and Andersen (1998) acknowledged that a person's history of stressors can influence that individual's development, behaviour and coping mechanisms. Consequently, they added bi-directional arrows between personality and

history of stressors, and between coping resources and history of stressors. They also added a bi-directional arrow between personality and coping resources as these two groups of variables can influence one another. Personality characteristics such as a negative self-concept, for example, can be addressed in self-management programs proposed in the category, coping resources. An in-depth examination of the components of the model follows.

2.3.2.1 The stress response

The central core of the model, the stress response, is a bidirectional relationship between an athlete's cognitive appraisal of a potentially stressful athletic situation, and the physiological and attentional aspects of stress. Athletes evaluate the demands of the situation, their resources or abilities to meet the demands and the consequences of success or failure in meeting these demands. According to Williams (1996), when an athlete experiences so-called 'good' stress or eustress the risk of injury is lower than when the athlete experiences 'bad' stress or distress. An athlete, for example, who perceives competition as being too demanding or fears failure, is more likely to get injured than the athlete who views competition as challenging and fun. Furthermore, athletes who perceive the demands of a stressful situation as exceeding their resources are more susceptible to injury than athletes who believe their resources exceed the demands. In addition, negative perceptions are more likely to be experienced when athletes do not have adequate coping resources. Whether the cognitive perception of the athletic situation is accurate or has been distorted by maladaptive patterns of thought and irrational thinking patterns makes no difference in the generation of the stress response (Andersen & Williams, 1988).

The athlete's cognitive evaluation of the demands, resources and consequences of any situation is, as stated previously, connected bidirectionally to the physiological and attentional aspects of the stress response. The cognitive appraisal of a situation can influence an individual's attention and physiological arousal; likewise, an individual's patterns of attention and physiological arousal can influence that person's cognitive reappraisal of the situation (Andersen & Williams, 1988). Muscular tension is not only a response to physical motor demands, but is inextricably linked to cognitive patterns and emotional states. Hugdahl (1995) stated that the muscles are the mechanisms that allow communication between the inner and outer worlds of an individual. This has been acknowledged by both athletes and sport specialists such as Elliot (1991), Bannister (1981) and Noakes (2001). Elliot, both a runner and running coach, stated that both the mind and body are the cause and effect of arousal. Roger Bannister, in his endeavours to be the first person to run the mile in under four minutes, recognized the intimate link between one's physiological attributes and thought patterns; sports scientist, Noakes

(2001) is of the opinion that this was the key to Bannister's success. In essence, cognitive evaluations, and physiological and attention reactions to stress modify and re-modify one another in a cyclical pattern (Williams & Andersen, 1998).

The effects stress has on an individual's health have been well-documented. High levels of perceived stress are more likely to cause infections than low levels (Cohen, Tyrrel & Smith, 1993). Physiological and attention reactions to stress have their origins in changes in the endocrine and autonomic nervous systems. An example of an endocrinological change is the release of glucocorticoids. Autonomic nervous system changes include the arousal of the sympathetic nervous system. Changes that can be observed due to the activation of the sympathetic nervous system may include increased sweating, papillary dilation, altered breathing patterns, tremors, deficits in attention, emotional lability and generalized muscle tension. Changes that are not easily noticed include nausea, vasoconstriction of the viscera and tunnel vision (Andersen & Williams, 1993). Of the many physiological and attention changes that may occur during the stress response, Andersen and Williams (1988) hypothesized that increases in general muscle tension, attention distractions and narrowing of the visual field are the probable mechanisms behind the stress-injury relationship.

Generalized muscle tension is the result of the unwanted simultaneous contraction of agonistic and antagonistic muscle groups. This is often referred to as bracing or guarding and leads to fatigue, reduced flexibility, difficulties with motor co-ordination and muscle inefficiency (Williams, 2001). Thus, an athlete may be at risk of suffering a number of injuries such as sprains and fractures because he/she may not be able to avoid a dangerous situation such as being tackled by an opponent in rugby (Andersen & Williams, 1993). Tense and fatigued muscles have poor shock-absorbing qualities; this increases injury risk and is of particular importance to long-distance runners.

During stress an individual's attention may be distracted and even scattered. These attention disruptions could be the result of adaptive responses being blocked or of being preoccupied with the possible consequences of stressful situations. These distractions may lead to the narrowing of peripheral vision. This might make athletes more vulnerable to injury as they will fail to detect or quickly respond to important cues in the periphery. The causes of peripheral narrowing are unclear, but it has been postulated that when the demands of a situation exceed athletes' resources, the resources they have at their disposal are employed for more central tasks; consequently, the periphery will have fewer resources in order to process information. Peripheral narrowing has often been reported retrospectively. A lapse and/or distraction of attention may also put the athlete at risk of injury because that person may fail to attend to important cues. A gymnast, for example, might suffer a fall or have a poor landing because of not paying attention to

the task at hand. When Williams and Andersen revised the model in 1998, deficits in audition were included in this section of the stress response (Andersen & Williams, 1988; Andersen & Williams, 1993; Williams, 2001; Williams & Andersen, 1998).

According to Williams (2001), only a few studies have examined the mechanisms proposed to explain how psychosocial factors influence the likelihood of injury. Rather, most studies have examined the prediction of what should occur under low and high stress conditions to state anxiety, peripheral narrowing, central vision distractibility and muscular tension for individuals when placed in stressful conditions. The only identified studies that have examined the relationship of stress reactivity to injury outcome are that of Andersen and Williams (1999) and Rogers and Landers (2005).

Andersen and Williams (1999) measured the changes in state anxiety, visual perception and reaction time during stress of 169 college athletes. The testing took place in a laboratory; according to the researchers, technology was not advanced enough to measure perceptual changes during competition. Furthermore, it is difficult to replicate the stress of competition (Udry & Andersen, 2002). The participants' life event stress and social support were also assessed. Results showed that for the whole sample negative life stress was the only significant predictor of injury. However, those low in social support with more negative life events and greater peripheral narrowing during stress suffered more injuries than the other participants. Ten sports, including cross-country and athletics, were represented; thus, according to the researchers, enhancing the generalizability of the results.

Rogers and Landers (2005) investigated life event stress, social support and psychological coping skills as well as the mediating effects of attention disruptions as measured by peripheral vision of 144 high school players between the ages of 14 and 18 years. Contrary to the opinion expressed by Udry and Andersen (2002), they examined the mediating effects of peripheral vision in a non-stressful situation before practice during the first three weeks of the season as well as in a stressful situation an hour before an important game. None of the participants were injured at the beginning of the season at the start of the study; however, by the end of the season 38% of them had missed between 1 and 25 days of participation due to injury. The following psychosocial variables were measured: life-event stress, state anxiety, social support and general coping skills. Results showed that total life stress, negative life stress and psychological coping skills contributed significantly to the prediction of the occurrence of sport injury. Furthermore, psychological coping buffered the negative life-event stress-athletic injury relationship. Rogers and Landers compared the participants' state anxiety with their peripheral vision in the two situations. Results revealed that there were significant increases in state anxiety and significant decreases in peripheral vision from the non-stressful situation to the stressful situation; furthermore, peripheral narrowing during stress

mediated 8.1% of the negative life-event stress-athletic injury relationship. Thus, they concluded that peripheral vision narrowing is a mechanism of the stress response in the stress-athletic injury relationship.

In their review and critique of their model of stress and athletic injury, Williams and Andersen (1998) acknowledged that the model “with its central core of situational acute stress responsivity, is probably most appropriate for acute injuries” (p. 20). Research has shown that the majority of injuries sustained in long-distance running are overuse in nature (Bennell & Crossley, 1996). With the exception of muscular tension, it is unlikely that overuse injuries such as those sustained in long-distance running are mediated by the attention and physiological changes that occur during situations of acute stress. Chronic injuries are more likely to occur because the athletes have reached their breakdown point. This will happen if athletes train harder or further than their genetic limitations allow (Noakes, 1985; Noakes, 2001; Noakes & Granger, 1990).

Why athletes try to train beyond their limitations and thus, put themselves at risk for injury is speculative. Meyer (cited in Williams & Andersen, 1998) suggested that these athletes may have certain personality traits such as perfectionism. Research has shown that the majority of long-distance runners believe they experience many psychological benefits such as reduced stress, an enhanced mood and a positive self-image as a result of their participation in the sport (Chan & Lai, 1990; Percy, Dziuban & Martin, 1981; Ungerleider, Golding & Porter, 1989; Ziegler, 1991). On the other hand, they experience negative psychological effects when they are unable to run. These include irritability, guilt, isolation, anxiety and depression (Acevedo, Dzewaltowski, Gill & Noble, 1992; Chan & Grossman, 1988; Symonds, 1995). According to Blumenthal, Rose and Chang (1985), running may be a method used by individuals to regulate their emotions; they suggest that some runners may run to improve their feelings of self-worth while other runners may run to control their distress. In effect, these runners may use running as an antidote to reduce their stress and may have no other stress management methods (Noakes, 1992; Noakes, 2001). This has yet to be explored.

2.3.2.2 History of stressors

Andersen and Williams (1988) asserted that the stressors in an athlete’s life should be thoroughly assessed because of the substantial impact they have on the stress response. This assessment may give the athlete’s coach and/or sports psychologist a good idea of the risk of injury. The category, history of stressors includes three factors: major life events, chronic daily hassles and previous injuries. Of these three factors, the most research has been conducted on life events stress.

Andersen and Williams (1988) criticized previous research conducted on the stress-injury relationship because they had only examined the effect major stressful events have on

injury. According to Williams (2001), from 1975 when Holmes explored the effect of life stress on football injuries until 2001 approximately 35 studies had examined the life stress-athletic injury relationship. Of these, 30 found a positive relationship between life stress and athletic injury; in fact, there was a direct relationship between the level of life stress and risk of injury. Moreover, athletes who experienced a high level of life stress were two to five times more vulnerable to injury than athletes with low life stress. Most of these studies were conducted on American football players, but similar results were found in other sports including race walking and athletics. Andersen and Williams (1999) viewed this as a compelling finding as it occurred across sports and competitive levels, life stress was assessed using diverse methods and what constitutes an injury was defined in various ways. However, the different operational definitions of and criteria for determining injury make it very difficult to ascertain the effect of life stress on the severity of injury as well as the relative risk of injury in different sports and competitive levels (Williams, 1996; Williams, 2001).

Stress, however, may also occur because of minor daily hassles and irritations which are of an ongoing nature. Furthermore, minor stressors that often accompany major life events might exacerbate the stress encountered and associated with the major events. Fawcner, McMurray and Summers (1999) examined the effect minor life events have on the risk of injury. Previously, research that had focused on this relationship had only assessed daily hassles once during the season; for example, Hanson, McCullagh and Tonymon (1992) only assessed this variable at a preseason meeting. This limitation could explain why the results of their study showed no significant relationship between minor life events and injury. According to Williams (2001), daily hassles need to be assessed frequently because they constantly change. Fawcner et al. assessed and examined the hassles of the 98 participants in their study weekly throughout the competitive season. The participants were either involved in hockey, volleyball or triathlon. Results showed little fluctuation in the average intensity of the minor life events of the 63 participants who remained uninjured; however, the intensity of the minor life events of the 35 injured athletes increased immediately before they sustained an injury. These results provide substantial evidence of a relationship between minor life events or daily hassles and injury. This study was limited in that major life stress was not assessed and thus, a potential relationship between life stress and daily hassles could not be determined. Furthermore, the effect of moderator variables was not determined.

Andersen and Williams (1988) included previous injuries in the category, history of stressors because these may help predict future injury. Some athletes may not be fully recovered physically when they return to competition; others may be physically fit, but be unprepared for the psychological challenges of competition. Anxiety is known to cause an increase in muscular tension (Cratty, 1983). Fear may also elicit muscle guarding (Heil,

2000). It follows that athletes who are afraid and very anxious of returning to competition may be at a greater risk of re-injury and/or further injury (Rotella and Heyman, 1986).

Van Mechelen et al. (1996) investigated the importance of various subject-related risk factors for injury. These included previous injury, body mass index, neuromotor fitness, muscle strength, exposure time and psychosocial factors. The latter included life events, daily hassles, personality characteristics, vital exhaustion and coping mechanisms. Vital exhaustion was defined as experiencing apathy, depression, anxiety and malfunctioning. The study was conducted over a period of 12 months. Although the findings indicated that dominance, vital exhaustion and stressful life events increased the risk of injury, the strongest independent predictors for sport injuries were previous injury and exposure time.

The purpose of a study conducted by Buist, Bredeweg, Lemmink, van Mechelen and Diercks (2010) was to identify gender-specific risk factors for running-related injuries in a group of novice runners. Results showed that 21% of the runners sustained at least one injury during the training period of 13 weeks. The male participants who had suffered a previous lower limb injury prior to the study were 2.6 times more likely to suffer an injury than those who had not sustained such an injury. However, in female participants no relation between previous injury and injury sustained during the study was found. Buist, Bredeweg, Lemmink et al. stated that this difference may be explained by the fact that a significantly higher percentage of male participants than female participants had run on a regular basis previously. On the contrary, in a previous study a positive relationship between previous injury and the risk of sustaining an injury in female recreational runners was found (Buist, Bredeweg, Bessem et al., 2010). According to Buist, Bredeweg, Lemmink et al., this dissimilarity may have been due to the fact that in the current study the participants who had sustained an injury in the three month period before the study were excluded.

Silva and Hardy (1991) asserted that the role training and competitive stress plays in performance is a highly publicized research topic, but has not been given much attention in the research on the stress-athletic injury relationship. Stress incurred as a result of training may include staleness, overtraining and burnout. These syndromes have physiological, biochemical and psychological consequences. Overtraining, for example, is not only characterized by physical symptoms such as chronic muscle soreness and fatigue, impaired performance, heavy legs, persistent muscle soreness, susceptibility to infections and poor co-ordination, but is also characterized by emotional symptoms such as loss of enthusiasm, inability to concentrate, irritability, listlessness, anxiety, inability to relax, apathy and depression. According to Froehlich (1993), chronic muscle soreness in conjunction with emotional and mental instability may affect the nervous co-ordination of working muscles, and the perception of movement and

fatigue. Overtraining is often referred to as the 'plods' and 'super plods' in long-distance running terminology (Noakes, 2001; Noakes & Granger, 1995). When runners have the 'plods' they are known to feel sluggish and may have sore muscles at the start of a run; however, they usually feel better as they continue to run. On the other hand, the 'super plods' is characterized by exhaustion, sluggishness and sore muscles throughout the run; the affected runner is often only able to jog (Noakes, 1985). Stress may also result from other factors in the athletic domain such as pressure to perform, relationships with teammates and/or coaches, fear of opposition, and concern about competitions in the foreseeable future (Sachs et al., 1993). These psychological as well as physical stressors are interrelated and may increase the risk of injury. Therefore, the inclusion of both training and competitive stress in any model that attempts to explore injury risk is recommended.

The purpose of a study conducted by Johnson (2011) was to describe and structure athletes' experiences of psychosocial risk factors of acute injury as well as the connections between psychosocial risk factors and the occurrence of acute injury. Of 81 competitive athletes who were previously injured, 20 reported a possible connection between psychosocial risk factors and their injuries. Interviews were conducted with the 20 athletes who perceived a link between the psychosocial risk factors that they had experienced one day to two weeks before sustaining their injuries, and injury. Four risk factors emerged from the thematic content analysis that was carried out: history of stressors, person factors, fatigue and ineffective coping. History of stressors included both stress inside sport such as previous injury and changing sports contexts, and stress outside sport such as work-related stress. Performance anxiety, concentration disruptions and a lack of motivation were included under person factors. Fatigue was comprised of psycho-physiological fatigue and being careless with one's body; the former includes variables such as diminished energy and the latter not paying heed to body signals; this factor may be linked to signs of overtraining as depicted by Noakes (2001). The fourth factor, ineffective coping, included negative influences of others such as criticism from a coach and the lack of social support. It must be noted that only one of the four factors that emerged from the study, namely, fatigue did not coincide with the stress and athletic injury model (Williams & Andersen, 1998). The importance of this study highlights the necessity of including biological factors in models that attempt to explain factors involved in sport injury.

Heil (1993) developed a model of psychology and injury risk; the model is in agreement with Andersen and Williams' model of stress and athletic injury in that both psychological and physiological facets of the stress response are emphasized. A strength of Heil's model is the specific emphasis on sport stress. Poor sport performance is linked to injury; athletes are unlikely to enjoy success if they are constantly injured. Moreover, a negative

performance caused by injury may further aggravate psychosocial stressors and the dynamics underlying the stress response. Overtraining and signals of overuse injury are also included in Heil's model; consequently, the model may be employed to predict acute as well as chronic injury.

Dunn, Smith and Smoll (2001) expressed a similar view to that of Silva and Hardy (1991). They criticized previous research conducted on the life-event stress-athletic injury relationship for not assessing stress that is specifically sport related separately from other life stress. Hence, the purpose of their study, involving 425 high school athletes, was to examine whether sport-specific stress was a more effective predictor of athletic injury than general life stress. The athletes participated in four diverse sports, namely boys' and girls' basketball, boys' wrestling and girls' gymnastics. Their stressful sport experiences as well as other stressful life experiences were assessed prior to the start of the season. This may be regarded as a potential limitation as stressful sport life experiences may change constantly during a season; such stressful experiences may include a poor performance or a misunderstanding with the coach. In the study, time lost due to injury was recorded during the subsequent season. Results showed that statistically significant injury time loss was accounted for by sport-specific stressful events beyond that accounted for by other general negative life stress only for female athletes. Results also indicated a stronger total stress-athletic injury relationship for females than for males.

Steffen, Pensgaard and Bahr (2009) also conducted a study to test the relationship between stress and athletic injury. The purpose of the eight month cohort study was to inspect whether various psychological characteristics, more specifically history of stressors, constitute risk factors for injury. The sample of 1430 female football players between the ages of 14 and 16 years completed a self-administered questionnaire that considered player history, previous injuries, perception of success and motivational climate, life stress, anxiety and coping resources. During the duration of the study, 20.7% of the participants sustained an injury. The principal finding of the study was that a perceived mastery climate and high levels of life events stress were significant risk factors for new injuries. Steffen et al. suggested that the emphasis on improvement and development in a mastery climate could lead to a desire for perfectionism which, in turn, might force players into injury risk situations. The risk of injury was 70% greater for the players who had high levels of perceived life stress compared to those who believed they experienced low levels of stress. Results also showed that the risk of sustaining an injury was twice as high for players who had sustained previous injuries than for those who had no history of injuries. Furthermore, 25% of all the acute injuries sustained were re-injuries. The participants who had suffered previous injuries perceived their anxiety to be more debilitating to their performance in comparison to the uninjured players; those players also experienced more stressful life events.

2.3.2.3 Personality

Andersen and Williams (1988) argued that any comprehensive model that attempts to explain the relationship of stress to athletic injury is not complete if personality factors are not considered. As stated previously, the presence of certain personality factors and/or coping resources may buffer individuals from stress and injury by helping them to perceive fewer situations as stressful or by helping them to be less susceptible to stressors such as daily hassles and major life events (Pargman, 1993; Williams, 2001). However, a shortcoming of a number of studies conducted to test the stress-athletic injury model is that they only considered history of stressors and failed to consider the other psychosocial factors that influence the stress response, namely personality and coping resources. According to Udry and Andersen (2002), considerably less attention has been given to these sections than the history of stressors.

The following personality factors are included in the original model of stress and athletic injury: hardiness, locus of control, sense of coherence, competitive trait anxiety and achievement motivation. Most of the studies that have explored these personality variables have yielded mixed results (Udry & Andersen, 2002). Andersen and Williams (1988) acknowledged that these identified personality variables were suggestions for initial research and not an exhaustive list of personality factors that may make an athlete susceptible to injury. Furthermore, Williams and Roepke (1993) stated that to a certain extent the five identified variables overlap one another. According to Williams (2001), no research conducted on personality and injury has considered hardiness and sense of coherence. Other personality variables that are not included in the original model but have been examined include sensation seeking, aggression, dominance, positive and negative states of mind, tough-mindedness, pessimism, Type A patterns of behaviour, perfectionism, denial, and task-orientation and self-orientation (Udry & Andersen, 2002; Williams, 2001). In their critique of their original stress-athletic injury model, Williams and Andersen (1998) suggested that research on personality-related factors that are not included in the original model should be conducted. They also came to the conclusion that positive and negative states of mind are linked to coping resources and thus, as noted previously, included a bidirectional arrow between personality and coping resources. Two studies that did not focus on the stress-athletic injury model, but examined the personality-injury relationship and thus, may be of relevance in explaining this relationship are discussed subsequently.

Gill, Henderson and Pargman (1995) examined whether runners who exhibit Type A behaviour are more susceptible to injury than those who may be classified as Type B persons. While Type A behaviour is often associated with excellence in sport, Gill et al. questioned if this pattern of behaviour which is characterized by excessive

competitiveness and ambition, easily aroused hostility and aggression, and an unrealistic sense of time urgency could also put an athlete at a greater risk for injury (Reber, 1985). Results in their study on 17 Type A and 20 Type B competitive runners showed that both groups engaged in intense and competitive training sessions. Furthermore, both groups reported experiencing a moderate level of daily stress. On average, both Type A and Type B runners sustained one injury a year; however, Type B runners took more time off training to recover from injury than Type A runners. To explain these findings, Gill et al. suggested that Type A runners may ignore fatigue, stress and pain in an attempt to achieve their running ambitions; hence, they may be more susceptible to chronic injury. On the contrary, Buist, Bredeweg, Lemmink et al. (2010) found that Type A behaviour was not related to the risk of sustaining injury in novice runners.

Kontos (2004) explored, amongst other variables, the predictive validity of estimation and overestimation of ability on injury in a group of 260 adolescent soccer players. During the preseason, the participants completed self-report measures on their perceived risk, previous injuries, risk taking and estimation of ability. A record of injuries incurred during practices or matches was kept for an eight week period. Results indicated that a low estimation of ability increased the risk of injury. Participants with a low estimation of ability were 4.4 times more likely to get injured than those with high estimations of ability. Kontos suggested that a low estimation of ability may not be the result of a lack of skill, but a lack of confidence. Findings also revealed that estimation of ability was positively related to taking risks; in particular, those that involved potentially injurious skills. This finding could also indicate that taking risks and thus, estimation of ability may be linked to confidence and a positive state of mind. The latter is intimately linked to coping resources as suggested by Williams and Andersen (1998) and previously noted.

A further shortcoming of many of the studies that have focused on the psychosocial factors of the stress and athletic injury model is that they did not study multiple predictor and moderator variables as well as how these patterns interact with one another. Exploring a single variable that may be involved in injury risk excludes the complexity of possible causes. The only study discussed thus far that has considered a number of risk factors is that of van Mechelen et al. (1996).

Kerr and Minden's (1988) study on a sample of gymnasts also examined multiple factors in injury risk. The purpose of their study was two-fold. Firstly, they examined the relationship in time between injury and competitions as well as the perceived causes of injury. Secondly, they explored whether trait anxiety, locus of control, self-concept and stressful life events were related to the number and severity of injuries. The most important finding was that stressful life events were the best predictor of the number and

severity of injuries sustained. No significant relationship was found between trait anxiety and injury, and locus of control and injury. Those gymnasts with positive self-concepts were more likely to get injured, suggesting that they may take more risks. This finding is in agreement with the findings of Kontos' study (2004). Findings also indicated that injury was more likely to occur before competitions. Kerr and Minden suggested that this may be due to heightened anxiety before competitive situations; this is in accordance with Silva and Hardy's view (1991). The gymnasts attributed their injuries mainly to a lack of concentration; thus, supporting the changes in attention that Andersen and Williams (1988) hypothesized would occur during the stress response. Although this study considered a number of variables that could influence injury, it did not attempt to determine how these variables interact with one another.

2.3.2.4 Coping resources

Coping resources are the third set of variables in Andersen and Williams' (1988) model that is proposed to influence injuries sustained in sport. Coping resources comprise a wide variety of behaviours and social networks that may help an individual to deal with stressful situations. The availability of coping resources may make an athlete see a stressful situation as less threatening; thus, decreasing the stress response and reducing the likelihood of injury (Wills & Filer, 2001). Athletes may feel more capable of coping with the demands of stressful athletic experiences when they possess one or more coping resources. On the other hand, an athlete who has a lack of coping resources may be more susceptible to stress and consequently, at a greater risk of injury (Williams, 2001). In their initial model, Andersen and Williams (1988) included general coping behaviours, social support systems, stress management and mental skills, and medication, both self-selected and prescribed, under coping resources. Once again, Andersen and Williams (1988) acknowledged that the coping resources presented in the model did not comprise a complete list, but were to be considered as suggestions for further research. Ursin and Eriksen (2004) stated that coping could also be viewed as a positive response outcome expectancy; for example, performing well in a very stressful environment could be viewed as a means of coping.

Habits and behaviours that are classified as general coping resources include eating, sleeping, exercising and relaxation. According to Williams (2001), what is regarded as social support and how best to measure it remains unclear and debatable as it is a multidimensional construct. However, it is generally associated with the presence of those persons whom an individual knows, values and knows cares for him/her, and on whom the individual can rely. Sports psychologists have suggested that the quality of this social support given to athletes is important. The capacity to concentrate and think clearly as well as keep one's emotions in check are examples of management and

mental skills. These psychological skills include the ability to control arousal, and to think and concentrate effectively under stress. These skills are also included in the section of the model dealing with interventions. Andersen and Williams (1988) proposed that these three areas of coping resources may act singly or in combination.

The inclusion of the fourth group of coping resources, namely self-selected and prescribed medication is controversial. Many drugs influence cognitive perception as well as physiology; consequently, they could affect the stress response and likelihood of injury. However, drug use is very prevalent in sport today and yet is also clandestine in nature. This makes the assessment thereof very difficult. This resulted in Williams and Andersen omitting both self-selected and prescribed medication from the model when they reviewed it in 1998 (LeUnes & Nation, 2002; Williams, 2001). However, it can be argued that because of its prevalence in sport the omission of both self-selected and prescribed medication from any model that attempts to explain the risk of sport injuries could result in incomplete research findings.

As alluded to previously, only a few identified studies have investigated the link between injury and coping resources. These have shown that low levels of coping resources make one more susceptible to injuries sustained in sport (Williams, 2001). However, the research conducted on the effect of social support on athletic injuries has not produced consistent results. Byrd (cited in Udry & Andersen, 2002) found that athletes who did not have much social support suffered more injuries. On the other hand, Andersen and Williams (1999) found that there was only a relationship between social support and injury in athletes who suffered negative life stress. More research is needed to reach definite conclusions and in particular, to determine if the coping resources included in the stress and athletic injury model act singly or in combination with one another. Furthermore, as stated previously, only a few studies have examined if coping resources moderate levels of stress.

In a study that considered a number of variables, Hanson et al., (1992) found that coping resources were the best discriminator for both injury severity and injury frequency. They assessed locus of control, sport competition trait anxiety, life- event stress, daily hassles, previous injuries, coping resources and social support to determine which variables were the best predictors of injury in their sample of 181 track and field athletes. Discriminant analyses showed that coping resources, negative life stress, social support and competitive anxiety were the best predictors of injury severity. On the other hand, coping resources and positive life stress differentiated the injury frequency group. Once again, while this study explored a number of factors that may influence injury risk, the investigators recommended that a multivariable approach should be taken in order to determine the influence of the combination of variables in injury risk.

The main purpose of a study conducted by Devanter (2011) was to outline psychological factors and predict susceptibility for injury among professional soccer players in Denmark. More specifically, he hypothesized that low coping resources, high competitive trait anxiety and a history of previous injury is positively related to increased injury as well as severity of injury. The participants, 66 elite male soccer players, completed two questionnaires, namely the Competitive Trait Anxiety Test and the Athletic Coping Skills Inventory. Furthermore, for three months their injuries were recorded by the team's medical personnel. Findings revealed that a history of previous injury and coping with adversity are the best predictors of injury. There was no relationship between general coping resources and injury. Rather, injury was positively related to players with low coping with difficulties and obstacles. Devanter postulated that players with good coping resources are better equipped to remain calm in the face of adversity and overcome obstacles. Findings also revealed that previous injury might be related to increased competitive trait anxiety which leads to injury vulnerability. Devanter suggested that previous injury may have altered players' perceptions of competition and thus, they may experience higher levels of somatic anxiety. He further noted that injury is a physical phenomenon that is dependent on variables such as the type of sport, gender, level of participation, weather, training and competition.

According to Williams (2001), methodology was significantly advanced when Smith, Smoll and Ptacek (1990) examined how two moderating variables, namely social support and psychological skills interacted with one another and life stress to influence the risk of injury. In their study of 451 high school athletes, Smith et al. found that coping resources were not directly linked to injury risk, but rather moderated the life stress-injury relationship. The strongest correlation between negative life stress and injury was found for the participants who experienced low levels of social support, and few stress management and mental skills. There was no significant relationship between negative life stress and injury for the groups who exhibited moderate or high levels of both social support and psychological skills. Furthermore, injury susceptibility was reduced in the groups who had experienced negative life stress, but moderate to high levels of either of the two moderating variables. The researchers made a distinction between conjunctive and disjunctive moderation. In this study, psychological skills and social support were classified as conjunctive moderators because they had to co-occur in a specific pattern in order to maximize the life stress-injury relationship or predictor-outcome variable relationship. On the other hand, disjunctive moderation occurs when a number of moderator variables contribute to the predictor-outcome relationship. Williams (2001) stressed that research needs to concentrate on multiple predictor and moderator variables as well as how these variables interact with one another. However, she acknowledged that this may be difficult because studies of this nature require a large sample.

2.3.2.5 Interventions

The final component of Andersen and Williams' (1988) stress and athletic injury model focuses on interventions or prevention measures that may prevent injury by potentially lessening the stress response. These interventions may also be employed to influence the athlete's personality factors and coping resources directly. In the schematic representation of the model, these are found below the stress response. Two sets of interventions are suggested: one set addresses the cognitive appraisal of a stressful event and the other deals with modifying the physiological and attention aspects of the stress response (Williams, 2001; Williams & Roepke, 1993).

Interventions that may alter one's cognitive appraisal of a stressful event include techniques to eradicate negative and irrational patterns of thought, fostering realistic expectations, confidence building, and fostering team cohesiveness and a sense of belonging. Helping athletes change their use of drugs is also likely to change the severity of the stress response. Improving the communication between athlete and coach is also a technique that could be included in this set of interventions because good rapport between athlete and coach may help the former to master the other techniques (Andersen & Williams, 1988).

The aim of the interventions that attempt to modify the physiological and attention aspects of the stress response is to lower arousal levels and enhance concentration. These may include relaxation skills, mental rehearsal and visualization, autogenics and meditation, and concentration skills (Andersen & Williams, 1988; LeUnes & Nation, 2002; Potgieter, 1992; Williams, 2001). An example of a concentration skill that may help is private self-consciousness or self-attention. Private self-consciousness can be equated with associative thought, namely concentrating on the activity. After examining the effects of associative and dissociative thought patterns in 10 marathon runners, Schomer (1990) stated that consistent body monitoring which is characteristic of associative thinking was responsible for the minimization of overuse injuries. Martin, Craib and Mitchell (1995) found that runners who directed attention inwards were also the most economical. On the basis of their findings, they suggested that runners who had mastered this skill may have had superior running economy because they were sensitive to muscle tension. Muscular tension may influence runners' performances negatively and/or make them more susceptible to injury. However, runners who direct attention inwards may be less susceptible to injury as they are more aware of muscular tension and can subsequently, employ relaxation techniques.

Williams (2001) stated that this component of the stress and athletic injury model is the area of the model that has been researched the least. Prior to that statement the most recent identified study that had focused on interventions was that of Kerr and Goss

(1996). Two studies that have since examined the effectiveness of prevention intervention programs in reducing athletic injury will also be discussed; namely, those of Johnson, Ekengren and Andersen (2005) and Maddison and Prapavessis (2005).

Kerr and Goss (1996) examined what effects a longitudinal stress management program would have on stress levels and injury. Twenty-four gymnasts were matched according to age, sex and performance, and randomly assigned to either an experimental or control group. Each member of the former group attended a stress management program individually every fortnight during the eight month period of the study. Both life stress and athletic stress were assessed; this concurs with Silva and Hardy's view (1991). Results showed that each gymnast suffered at least one injury during this period. The gymnasts in the stress management program reported less stress than those in the control group. Those in the experimental group spent less time injured than those in the control group; however, this difference was not significant. To explain the latter finding, Kerr and Goss suggested firstly that possible overuse, fatigue and poor technique might make a gymnast more susceptible to injury than stress, and secondly, those skills that deal with the causal mechanisms of attention deficits and increased arousal should be dealt with at the beginning of a stress management program.

In an exploratory study, Johnson et al. (2005) investigated the efficacy of a cognitive-behavioural prevention intervention program to reduce the occurrence of injury for soccer players with at-risk psychosocial variables. Sport-specific questionnaires were used to assess life-event stress, state anxiety and coping resources of soccer players from 12 clubs in Sweden. Thirty-two participants were identified as high injury-risk players and were subsequently, randomly assigned to treatment and control groups. The intervention program which comprised eight sessions during 19 weeks of the competitive season consisted of training in five mental skills: somatic and cognitive relaxation; stress management; goal setting; attribution and self-confidence; and identification and discussion about critical events that were related to their participation in soccer as well as everyday situations. Results showed that the treatment group sustained significantly fewer injuries than the control group. Johnson et al. stressed, as had Kerr and Goss (1996), the importance of training in specific skills such as somatic relaxation and stress management at the start of a sporting season in order to prevent injury. Furthermore, they suggested that by taking note of critical events, the participants may have been more aware of the effects of negative events associated with both soccer and everyday life, and this awareness may have helped them handle the situation better.

Maddison and Prapavessis (2005) conducted two interrelated studies to examine the role psychological factors play in the prediction and prevention of sport injury. Results from the first study which involved 470 rugby players revealed that social support, type of

coping and previous injury interacted in a conjunctive manner to maximize the relationship between life stress and injury. The purpose of the second study, conducted a year later, was to investigate the effectiveness of a cognitive behavioural stress management intervention program in reducing injury. Forty-eight players from the first study who were identified as having an at-risk psychological profile for injury were randomly assigned to the intervention program or to a no-contact control group. The participants completed psychological measures of coping and competitive anxiety at the beginning and conclusion of the season. Results showed that those in the intervention program missed less time due to injury than those in the control group. Furthermore, the participants in the intervention program also had an increase in coping resources and a decrease in worry following the program. Maddison and Prapavessis concluded that vulnerability to injury may be reduced by participating in a cognitive behavioural stress management program. However, they cautioned that the participants' lessened susceptibility to injury may not have been due to changes in coping resources and competitive anxiety, but to changes in other variables that were not assessed in the study.

Interventions that may lessen the stress response and thereby reduce vulnerability to injury risk are inextricably linked to coping resources. According to Williams (2001), the results of early studies that explored social support variables in the stress-injury relationship indicated that interventions designed to increase athletes' social support might reduce their susceptibility to injury. A dependent relationship between interventions and coping resources is also suggested by research conducted by Smith et al. (1990); this study was discussed in the previous section.

Potgieter (1992) suggested that athletes need assistance with coping resources so that they will be able to deal with stress, especially the extra stress before competitions. Why injuries occur before major competitions remains uncertain; it could be a result of fatigue, but the added pre-competition stress might be the cause. Junge (2000) proposed a modification of Andersen and Williams' model; namely, the model of the influence of psychological factors on sport injury. Junge's model proposes that by assisting athletes with their emotional states and coping resources, injury may be prevented. He stated that preventive measures are extremely important because of the primary and secondary costs as well as the personal suffering caused by injury. Sachs et al. (1993) stated that a proactive approach in dealing with stress is necessary. This would involve periodic monitoring by means of psychological inventories and interviews which, in turn, would indicate if the athlete needed help with potential stress. This periodic monitoring could also be employed to predict when athletes would be most susceptible to injury during the course of the season. A modification that Williams and Andersen (1998) might have considered in the revision of their model would have been to add bi-directional

arrows between coping resources and interventions, and between personality and interventions. This would have depicted the dependent relationship of these variables.

Heil (2000) debated that the model of stress and athletic injury does not clearly explain how the interventions included in the model should be structured and implemented. He suggested that interventions should target injury risk and related cognitive appraisals. He proposed that programs should focus on the following: knowledge of factors in training and competition that make one more susceptible to injury; skills to differentiate between pain and injury; awareness of what initiates risk-taking behaviour; and cognizance of implicit and explicit decision-making strategies when faced with perceived risk.

Many coaches and physical trainers, as alluded to previously, are not skilled in helping athletes master all these techniques; consequently, the involvement of a sport psychologist is important (Evans et al., 2000). However, because of their regular contact with their athletes, it is imperative that coaches are involved in helping their athletes deal with stress (Sachs et al., 1993). In an investigation of organizational stress in elite sport, athletes indicated that coaches did not practise psychological skills (Woodman & Hardy, 2001). Although Heil (2000) criticized Andersen and Williams for not providing directives for the implementation of training of psychological skills in their model, Heil's model of psychology and injury risk (1993) is also limited in this respect. It may be advantageous for coaches to attend courses in sport psychology in order to help their athletes master the techniques listed above. Furthermore, they may also need assistance on how to relate to their athletes so as not to create a stressful environment for them.

2.3.2.6 Summary

Andersen and Williams' interactional model of stress and athletic injury has provided a viable theoretical foundation for conducting research on the psychosocial factors involved in injury risk (Williams, 2001; Williams & Roepke, 1993). Most of the studies conducted on factors that make one more susceptible to sport injury have tested one or more components of their stress-athletic injury model. Although most of this research has supported the proposals of the model, it has also highlighted some of the limitations of the model and of the research conducted. Because of the proliferation of studies conducted on the stress-athletic injury model, one could erroneously assume that Andersen and Williams are the only researchers who developed a conceptual framework to explain injury risk. Heil (1993) and Junge (2000), as stated previously, also developed models to explain susceptibility to injury. Both these models are modifications of Andersen and Williams' model and thus, will not be discussed. Pike and Maguire (2003) developed a model to explain the risk of injury in women's sport. Their model offers a different perspective to that of the Andersen and Williams' model and hence, is briefly discussed.

2.3.3 A model of contributory factors to injury risk in women's sport

Pike and Maguire (2003), in their model of contributory factors to injury risk in women's sport, sought to trace the combination of enabling and coercive social forces that influence athletes to participate in sport to the extent of risking injury. The framework of the model resulted from a two-year study of female rowers in the United Kingdom. The focus of the model is mostly on social factors that make athletes susceptible to injury; however, in order to develop a comprehensive model of psychosocial factors involved in athletic injury its inclusion is justified. The model is presented diagrammatically in Figure 2.2.

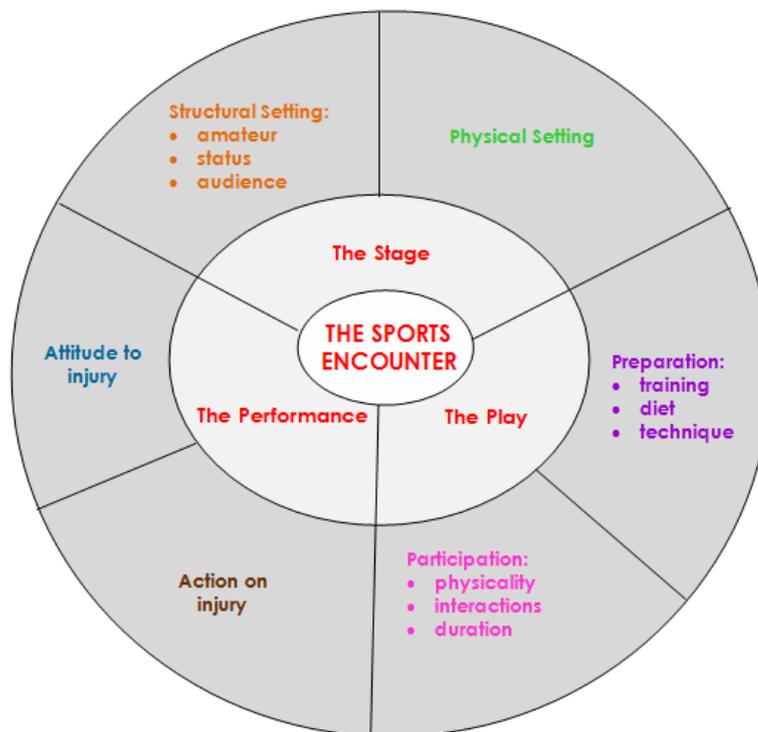


Figure 2.2: A Model of Contributory Factors to Injury Risk in Women's Sport

The core of Pike and Maguire's (2003) model, the sports encounter, contains three principal social realms, namely the stage, the play and the performance. The first social realm is termed the stage as it deals with the physical and structural settings of the sporting activity. They viewed the structural setting as a significant factor in taking risks. Whether athletes takes risks or not will depend on whether they compete professionally or as amateurs, the status of the sport, and the presence and involvement of significant others. Pike and Maguire found that as rowing was considered a minority sport with not many competitors, the chances of success were great and thus, the rowers were more inclined to take risks in order to enjoy athletic success. Significant others include team mates, opponents, coaches, referees and spectators; athletes may perceive that these significant others are putting pressure on them to do well and subsequently, may take risks.

The second social realm of Pike and Maguire's (2003) model is termed the play; it takes cognizance of the different risks encountered in preparation for competition and the competition itself. Hence, the second social dimension is the activity itself and is accordingly, subdivided into preparation and participation. The former category includes training, diet and technique, and the latter physicality, interactions and duration. Pike and Maguire placed emphasis on the risks involved in training and in particular, pain tolerance that should prohibit participation. Dissociating from pain is a mechanism that enables one to cope with pain, but it may increase serious injury risk. Many of the rowers in their study viewed the physical signs of pain as appropriate images of themselves. Diet is also a factor involved in injury risk as many athletes pursue what they perceive to be the ideal weight for their particular sport. One of the rowers in the study stated that severe dieting had resulted in exhaustion, but was worth it as her performance was more efficient and it won her other rowers' admiration. According to Noakes (2001), some women who are obsessive about their weight run competitively in order to control their anorexic tendencies. Runners who have a low dietary calcium intake are more prone to bone strain and stress fractures. Pike and Maguire stress the importance of interactions with significant others in the second social realm too; being part of a team may lead to pressure to perform.

The final social realm of the model is termed the performance and is comprised of the athlete's attitude to injury and action taken when injured. Many athletes perceive injuries to be a sign of a defective body and thus, conceal pain and injury in order to avoid shame. Based on the findings of their study, Pike and Maguire (2003) concluded that athletes often tolerate injury in order to maintain their athletic image. Much of the emphasis in this model is on taking risks that may cause injury. Pike and Maguire stated that there are different types of injury risk evident in different sports. The final realm of their model deals with the action taken by the injured. According to Noakes (2001), injured runners can be divided into two groups. The first group comprises those who want to be in control of their treatment; they usually only need simple advice. The second group of injured runners need exact and detailed advice, and will probably only recover if given advice in that manner. It is of vital importance that medical practitioners understand the needs of injured athletes when treating them.

2.3.4 Conclusion

This section has considered psychological factors involved in the risk and prevention of sports injuries. Most of the research conducted on these factors has examined one or more components of the model of stress and athletic injury (Andersen & Williams, 1988). Although this model has provided a feasible theoretical model to explain psychosocial factors involved in injury risk, it is more applicable to explain acute injuries than chronic

injuries in sport. As most injuries sustained in long-distance running are chronic, it would be beneficial to develop a theoretical model that attempts to explain psychosocial factors involved in injury risk in long-distance running. The next section of this chapter concerns itself with the psychological responses of injured athletes.

2.4 Psychological responses to injury

2.4.1 Introduction

In the previous section, psychosocial factors that are involved in the susceptibility and prevention of injuries sustained in sport were examined. Regardless of an athlete's ability and experience, and despite advances in coaching methods and programs, injuries will never be eradicated. Injury can befall every athlete (Quinn & Fallon, 1999; Udry & Andersen, 2002). When athletes sustain injuries the norm is for medical practitioners to attend to the physical causes, symptoms and treatment thereof. However, injuries may also have a profound psychological effect on the athlete (Brewer, 2001a).

Many studies which will be referred to subsequently have examined the effect injuries have on the psychological and in particular, the emotional well-being of the athlete. Furthermore, several conceptual models have been developed to explain and support the findings of these studies. These theoretical models can be broadly divided into two broad categories, namely stage models and cognitive appraisal models. Very few studies have tested these theoretical models; however, they provide frames of reference for understanding psychological responses to injury. An understanding of the nature of an athlete's response to injury as well as how the individual's response may change during rehabilitation is a primary step in helping the athlete cope when injured (Crossman, Gluck & Jamieson, 1995). It is of the utmost importance to understand how the athlete perceives the injury; in other words, what the implications of the injury for the athlete are (Williams & Roepke, 1993). In the next section, athletes' emotional responses to injury are discussed briefly. An examination of the theoretical models follows in subsequent sections.

2.4.2 Emotional responses to injury

Athletes experience a period of emotional duress after sustaining an injury (Brewer, 2001b). Typical psychological responses to injury include depression, anger, hostility, anxiety, tension, disgust, negative mood, confusion, fear, panic, frustration, discouragement and a loss of self-esteem (Acevedo et al., 1992; Brewer, 2001a; Brewer, 2001b; Callen, 1983; Chan & Grossman, 1988; Potgieter, 1997; Quackenbush & Crossman, 1994). In a study that compared injured athletes to uninjured athletes, Leddy, Lambert and Ogles (1994) found that although the two groups did not differ in levels of depression, anxiety and self-esteem prior to injury, the injured athletes reported significantly higher levels of depression and anxiety, and lower levels of self-esteem than

the uninjured athletes following injury. Reactions of runners when unable to run are often manifested in physical withdrawal symptoms such as restlessness, irritability, listlessness, insomnia, loss of appetite, generalized fatigue and muscular tension (Chan & Lai, 1990; Morgan, 1979; Sachs & Pargman, 1979). These psychophysiological reactions may contribute and magnify the pain of the injury (Lynch, 1988).

Epidemiological studies have advised that 5 to 24% of injured athletes suffer clinical levels of emotional disturbance (Brewer, 2001a; Brewer, 2001b). Some injured athletes have become so depressed that they have attempted suicide (Smith & Milliner, 1994). Studies have indicated that the psychological distress of some injured athletes is comparable to hospitalized patients suffering from acute myocardial infarction (Udry & Andersen, 2002). Even though most of the emotional distress experienced by injured athletes is subclinical, this should not mean that injured athletes may not need psychological help. Forty-seven percent of the athletic trainers in a study conducted by Larson, Starkey and Zaichkowsky (1996) believed that every injured athlete suffers some form of psychological trauma. Arvinen-Barrow, Hemmings, Weigand, Becker and Booth (2007) reported that 99.7% of the physiotherapists in their study perceived that 83% of the time all athletes were psychologically affected by their injuries. These findings highlight the necessity for all those who treat injured athletes to have an understanding of the psychological effects of injury.

Regardless of the type and severity of injury, injured athletes may perceive a sense of personal loss (Hardy & Crace, 1993). According to Lynch (1988), athletes experience both physical and emotional loss when injured. There are a considerable number of responses to loss; however, the more athletes have invested emotionally in the sport of their choice, the more threatened they are likely to feel when injured (Evans & Hardy, 1995). Injury and performance are intricately linked. Furthermore, many athletes' perceptions of self are based on physicality. They depend on a unity of body and self to participate in their chosen sport. When they are injured this unity is broken; they experience a sense of failure because their sense of wholeness is disrupted (Cashmore, 2002). Consequently, injury can be a threat to one's basic identity (Van Raalte & Brewer, 2002) and may lead to an attack on self-image, a loss of self-confidence and a loss of self-worth (McGowan, Pierce, Williams & Eastman, 1994; Petrie, 1993; Rotella & Heyman, 1986). Those who have a high athletic identity tend to exhibit more depressive symptoms when injured (Manuel et al., 2002). According to Rotella and Heyman, an attack on self-image may be the cause of irrational thoughts which may, in turn, lead to the athlete exaggerating the meaning of the injury, oversimplifying the injury as good or bad, overgeneralizing from this single event and drawing unwarranted conclusions. A minority of athletes also perceive themselves as responsible for the injury and interpret themselves as failures. These athletes are likely to have feelings of guilt. Guilt has been found to be

associated with an escalation in pain, increase in emotional distress and less successful recovery outcomes (Heil, 2000).

Other emotions experienced by the injured athlete include separation, loneliness, isolation and loss of independence. These feelings may arise from the stress of perceived losses (Hardy & Crace, 1993) as the athletes may feel cut off from their teammates as they may no longer be able to train with them. Furthermore, the athletes may also suffer a loss of self-worth as they may no longer be able to contribute to the team (Crossman et al., 1995). According to Noakes (2001), quiet introverted runners may become even more so when injured and it can be very difficult to extract information from them. On the other hand, extroverted runners may avoid facing the reality of the injury by denying and/or joking about it; this may be problematic if these athletes ignore the severity of their injuries and continue to run.

The degree of perceived social support may moderate the negative psychological responses of the injured athlete. Manuel et al. (2002) found that increased social support was linked to decreased depression in injured athletes. Research by Green and Weinberg (2001) revealed that after an injury, less mood disturbance was displayed by those injured athletes who were more content with their social support networks than those who were not. These findings do not only have important implications for those involved in rehabilitation, but also for coaches and others responsible for team dynamics. To reiterate what was stated previously, physiotherapists and coaches may not have expertise in this field; hence, sport psychologists may play a significant role in this regard.

Many athletes also experience feelings of denial following an injury. According to Heil (2000), denial may emerge as distortion, minimization, avoidance or blatant rejection of the obvious. It may also surface as unacknowledged distress. At times denial can be functional: it can enable the athlete to remain positive and protect the athlete from distressing thoughts and negative emotions. However, if denial results in evasion of the emotional work of recovery and disregard for prescribed limits and rehabilitation, it can be dysfunctional (Heil, 1993).

In order to examine the level of emotional distress of elite athletes, Shuer and Dietrich (1997) administered the Impact of Event Scale to 280 inter-collegiate athletes. Results showed that the athletes with chronic injuries scored higher on the Avoidance/Denial subscale than fire and earthquake victims. Furthermore, as there was no significant decrement in the Avoidance score with increased injury duration, Shuer and Dietrich stated that "chronically injured athletes may be 'frozen' in the avoidant state" (p.107). Eighty-one percent of the injured athletes acknowledged that they avoided thinking about the injury so as not to upset themselves. Their continued difficulty in processing the serious effects of the injury is indicative of their need for psychological help. Long-

distance runners are more inclined to suffer chronic injuries than acute injuries. Thus, in view of the present study, the findings of Shuer and Dietrich's study may be regarded as significant.

In Shuer and Dietrich's study (1997), elite athletes who had sustained chronic injuries continued to train. This is not a phenomenon restricted to elite athletes. Morgan (1979) reported that in an observation of eight injured runners, two developed withdrawal symptoms when forced to stop running because of injury while three continued to train. Runners who are prevented from training have reported feeling sluggish, expressed concern about a loss of training and have been obsessed with guilty thoughts that they will lose form and that their bodies will deteriorate. They feel remorse for not fulfilling their commitment and for letting themselves down (Carmack & Martens, 1979; Carroll, 1981; Summers, Sargent, Levy & Murray, 1982; Symonds, 1995). Many runners participate in the sport for stress management; being deprived of consistent running may result in a loss of coping mechanisms (Smith, Scott, O'Fallon & Young, 1990). Therefore, they are likely to continue training despite medical advice to the contrary. Baekeland (1970) had to abandon a study to determine what effects runners would encounter when unable to run for a period of time. Despite financial incentives, the runners refused to participate because they did not want to stop training. It appears that training with pain and physical discomfort is easier to cope with than tension, anxiety, depression and interpersonal discord. These athletes need to train regularly in order to maintain emotional equilibrium and avoid intense negative emotions that surface when the desired training is not sustained (Heil, 1993). However, Shuer and Dietrich (1997) contended that injured athletes who continue to train not only risk further injury, but may exacerbate their initial emotional distress by training in discomfort and pain.

Not all injured athletes suffer emotional turmoil; rather, some derive emotional benefits from being injured. Experiences of personal growth, challenge and an improvement in sport performance have been reported by athletes who have sustained an injury. Sustaining an injury may heighten an athlete's desire to enhance his/her performance (Brewer, 2001b). Udry, Gould, Bridges and Beck (1997) examined elite skiers' psychological reactions to season-ending injuries and found they experienced the following benefits because of their injuries: personal growth such as clarified priorities; psychological based performance enhancement such as becoming mentally tougher; and physical/technical development such as being technically better skiers. On the other hand, some athletes experience relief from the drudgery of practice and/or frustration of poor performance (Rotella & Heyman, 1986). Some athletes experience personal growth such as time for reflection, development of interests outside of sport and opportunities to display courage (Brewer, 2001a). On the contrary, some athletes benefit because of secondary gains such as special attention and sympathy (Potgieter, 1997).

Long-distance runners who have difficulty with the pressure of competing and/or fear success, but at the same time wish to be part of a group because they fear isolation may benefit from injury (Noakes, 2001). The plight of these 'training-room athletes' was discussed in section 2.3.

Understanding athletes' complex psychological responses from the onset of injury until full recovery has posed a challenge to researchers (Udry & Andersen, 2002). As stated previously, two broad categories of theoretical models have been developed to explain psychological responses to injury, namely stage models and cognitive appraisal models. These are discussed in the following two sections.

2.4.3 Stage Models

At first, attempts to understand the athlete's emotional response to injury drew on the writings of Kubler-Ross (Brewer, 2001a; Heil, 2000). In *On Death and Dying* (1969), Kubler-Ross described a sequence of five stages that terminally ill patients typically are confronted with: disbelief, denial and isolation; anger; bargaining; depression; and acceptance and resignation. Heil (1993; 2000) asserted that Kubler-Ross' model clarifies the dynamic and contradictory nature of emotional response to illness without assuming underlying pathology. Furthermore, it stresses that recovery is an active process: terminally ill people need to work willingly through their negative emotions and attempt to energize their positive emotions. It can be argued that the same processes apply to injured athletes.

Several researchers such as Lynch (1988) and Rotella and Heyman (1986) applied Kubler-Ross' stage theory to the field of sport injuries. The fundamental assumption of the adaptation is that injury epitomizes a loss of a facet of self (Brewer, 2001b). It is proposed that injured athletes proceed through stages of denial, anger, bargaining, depression and acceptance. In the first stage, denial, the athletes are in a state of disbelief and often do not acknowledge the severity of the injury, believing that they will soon resume training and/or competing. It is possible that those who continue to participate do not deny their pain, but as suggested previously do so for more complex reasons. The second stage is characterized by anger. This anger is often directed at those who are closest to the injured athletes, but may be generalized to include God and life. The stage may also be portrayed by irrational thought as the anger may be pointed at teammates and self. In the third stage, the athletes may start bargaining as they wish away the injury; this signifies that they have not accepted the injury. Depression and a sense of loss depict the fourth stage. During this stage the athletes often withdraw, reject social support and become isolated. Finally, they accept the severity of the injury as well as the limitations it imposes on them. This acceptance facilitates the recovery process (Brewer, 2001a; Heil, 1993; Potgieter, 1992; Silva & Hardy, 1991).

Noakes (1992; 2001) also adapted Kubler-Ross' model in describing long-distance runners' reactions to injury, but omitted the stage of bargaining. Noakes (2001) expressed the opinion that once injured runners reach the final stage of acceptance they are likely to have recovered from the injury. Noakes (2001) asserted that during the final stage of acceptance, runners modify their goals and ambitions to accommodate their genetic limitations; thus, implying that they get injured because they over-train. He also contended that the once-injured runners will eventually desire to train more than their inadequacies allow. They will then become very anxious; this is caused by the tension between the recognition of their genetic limitations and the neurotic need to train more in order to achieve greater ambitions. Altshul (1981) referred to this as the stage of renewed neurotic disequilibrium.

Although Kubler-Ross' (1969) stage model of grief has received support from sport psychologists, similar stage models that differ in the number of stages and the content thereof have been proposed. It is not within the scope of this thesis to describe each of these in detail, but suffice to mention a couple.

McDonald and Hardy (1990), after examining the affective responses of severely injured athletes, presented a two-stage model. Five injured athletes from a university athletic program were monitored within 24 hours of injury for four weeks during which time they underwent rehabilitation. During this time they completed the Profile of Mood States twice a week. Results showed that the injured athletes' emotions changed significantly during the four weeks of rehabilitation: they progressed from a negative to a more positive mood state during this time. Post hoc analyses indicated that this change fitted a two-stage process. Subsequently, McDonald and Hardy described the first stage which is intense and relatively brief as one of shock and encounter. Shock is a feeling of detachment while encounter is a feeling of panic, disorganization and helplessness. The second stage is marked by retreatment and acknowledgement. Retreatment is regarded as a form of denial; the athlete either withdraws into injury or moves into health. According to Heil (2000), even if a two-stage model has an empirical foundation, its merits are limited in applied situations.

Brown and Stoudemine (1983) put forward a three phase model: Phases I, II and III are characterized by sudden shock, obsessive preoccupation, and psychological adjustment and reorganization respectively. This model is based on the grief response to irreversible loss and thus, assumes that injured athletes will never be able to participate again or will never be able to achieve their athletic ambitions.

Some proponents of stage models have indicated that individuals can move back and forth between stages in a cyclical process. The affective cycle of injury proposed by Heil (1993; 2000) is depicted in Figure 2.3.

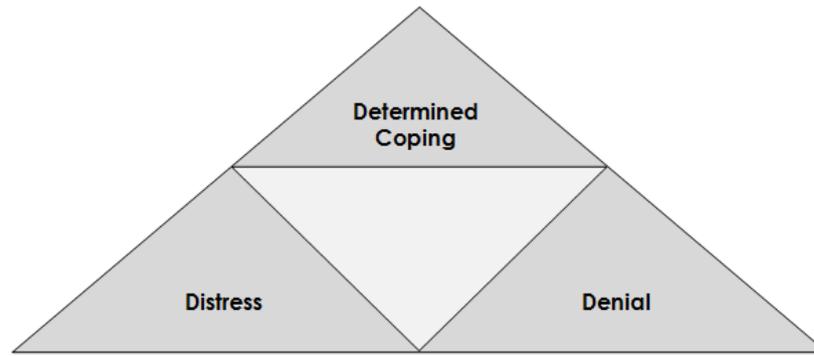


Figure 2.3: The Affective Cycle of Injury

The affective cycle of injury is a three component model that attempts to explain how an injured athlete may vacillate between negative and positive emotions. The model presumes that emotional recovery is cyclical and not linear. The three components of the model are distress, denial and determined coping. Distress is an indication of the disrupting effect injury has on the athlete's emotional equilibrium. It includes symptoms such as shock, anger, bargaining, anxiety, depression, isolation, guilt, preoccupation and helplessness. It can also involve more subtle behaviours such as complaining, redirected anger and self-doubt. Denial which Heil (2000) also refers to as unacknowledged distress is the second component of the model; this component was examined earlier in section 2.4.2. Determined coping entails more than passive acceptance. The athlete uses his/her coping resources to deal with the injury. It includes clarifying goals, exploring alternatives and learning new skills. During recovery an athlete usually progresses from distress and denial to determined coping. However, at any stage of the recovery process, the athlete may fluctuate between the three elements; in fact, during any 24 hour period it is unlikely that only one element will be dominant. Heil (2000) alleged that the affective cycle facilitates an awareness and understanding of the challenges of injury and rehabilitation. Brewer (2001a), however, maintained that the predictive utility of stage models is limited unless such models specify what prompts injured athletes to vacillate between different components.

Udry et al. (1997) examined the range of psychological reactions of elite skiers to season-ending injuries. Although the intent of their study was not to place the themes that emerged from their study into a sequence, Udry et al. compared the athletes' responses to existing stage models. The results from the study supported the anger, depression and acceptance components of the Kubler-Ross model (1969), but showed minimal support for the denial stage and no support for the bargaining stage. When the results were compared to Heil's (1993) affective cycle of injury, a significant number of themes supported the distress and determined coping components of the model, but provided minimal support for the denial component. The results of the study are similar to those of Quackenbush and Crossman (1994) who found that denial was not apparent in their study of the emotional responses of 25 athletes. However, Udry et al. found that the

results of their study provided support for McDonald and Hardy's (1990) two-stage model, namely shock and encounter, and retreatment and acknowledgement.

Petrie (1993) maintained that an athlete's response to injury is a personal thing. As portrayed previously, this claim has been verified by research as well as medical practitioners and sport psychologists who have treated injured athletes. The primary limitation of stage theories is that they fail to take individual differences into account. Furthermore, stage models presume that an athlete's psychological response to injury follows a predictable sequence. Noakes (2001) stated that irrespective of athletes' personalities, they respond to injury in similar patterns. Not much research in the field of sport psychology has been conducted on stage models per se, but studies have applied the models to sport injury. It has been shown that emotional responses to injury are compatible to those of grief (Brewer, 2001a). However, athletes do not necessarily respond in a stereotypic pattern of distinct emotional responses (Brewer, 2001b; Quinn & Fallon, 1999). This is illustrated by the two studies that follow.

Crossman et al. (1995) monitored the emotional responses of 30 male athletes who were injured playing football or hockey during rehabilitation. Results indicated that the most predominant emotion experienced immediately after injury was anger. As they progressed through recovery the athletes experienced less anger and disgust, and significantly more joy and excitement. Immediately after the injury most athletes were not fearful; however, at times during rehabilitation and on their return to training they experienced fear. While the results suggest that injured athletes proceed from negative to positive emotions in an orderly pattern, they can also vacillate through emotional highs and lows. Crossman et al. reasoned that the athletes' fear on return to competition may be due to fear of failure and re-injury. This, once again, emphasizes the invaluable role sport psychologists can play.

Quinn and Fallon (1999) also examined the changes in reactions to injury throughout rehabilitation in 136 elite athletes. Results indicated that the athletes did not move through a grief model similar to that of the Kubler-Ross (1969) model. They also did not move through cycles of emotional highs and lows. However, during the course of rehabilitation, the athletes' negative emotions, highest at the onset of the injury, decreased while the positive emotions of vigour and confidence increased. These changes were not always at a constant rate; athletes would be better able to cope if they were reassured that this could happen. Results also showed that the athletes' levels of confusion were high immediately after sustaining injury. Quinn and Fallon asserted that this suggests that medical practitioners should explain the nature of the injury and rehabilitation to injured athletes.

According to Brewer (2001a), the erroneous judgement of medical practitioners who take for granted that injured athletes pass through predictable stages may thwart their rehabilitation and be harmful to patient-practitioner relationships. A practitioner, for example, may fail to attend to the athletes' psychological needs because of the assumption that they will naturally pass through a sequential response pattern. On the other hand, injured athletes who immediately come to terms with their injury may become frustrated if the practitioner expects them to be emotionally upset. Even though it is improbable that any two athletes will react to injury in an identical stage-like pattern, it is beneficial for them to realize that it is normal if they experience distressing emotions and thoughts (Crossman et al., 1995; Noakes, 2001; Williams & Roepke, 1993).

As noted previously, although athletes' responses to injury are similar to responses of those who are suffering from grief (Brewer, 2001a), they do not necessarily respond in a stereotypic pattern (Brewer, 2001b; Quinn & Fallon, 1999). According to Udry and Williams (2002), stage models have not been tested sufficiently to draw conclusions about their utility. They further noted that before research can be conducted on these models a variety of measurement issues may have to be addressed. It may be concluded that stage models of response to athletic injury that can be tested and verified need to be developed.

2.4.4 Cognitive appraisal models

Some researchers have explored psychological responses to athletic injury from cognitive appraisal or stress and coping perspectives (Udry & Andersen, 2002). Cognitive appraisal models comprise the second major category of models that attempt to explain psychological responses to injury (Brewer, 2001b). To a large extent these models were developed to account for individual differences stage models are unable to explain (Brewer, 1994). Most of these models have originated from the stress and coping literature of general psychology. The principal tenet of cognitive appraisal models is that athletes' psychological responses to sports injury are influenced by their cognitive appraisals or interpretations of the injury. Furthermore, injured athletes' psychological responses have an effect on the injury and thus, may have an important impact on how they react during rehabilitation (Brewer, 2001a; Brewer, 2001b; Udry & Andersen, 2002).

Several cognitive appraisal models have been put forward; however, it is not within the scope of this thesis to review all these models. Rather, one of the cognitive appraisal models will be discussed; namely, an integrated model of psychological response to the sport injury and rehabilitation process which was developed by Wiese-Bjornstal et al. (1998). According to Brewer (2001b), this model is the most evolved and well-developed cognitive appraisal model. Udry and Andersen (2002) captured this view when they noted that Wiese-Bjornstal et al. "are responsible for the most enduring line of theory

development and model construction related to the application of cognitive appraisal models among injured athletes" (2002, p.539).

2.4.4.1 Integrated model of psychological response to the sport injury and rehabilitation process

The integrated model of psychological response to the sport injury and rehabilitation developed by Wiese-Bjornstal et al. (1998) is displayed in Figure 2.4. This model will hereinafter be referred to as the integrated model.

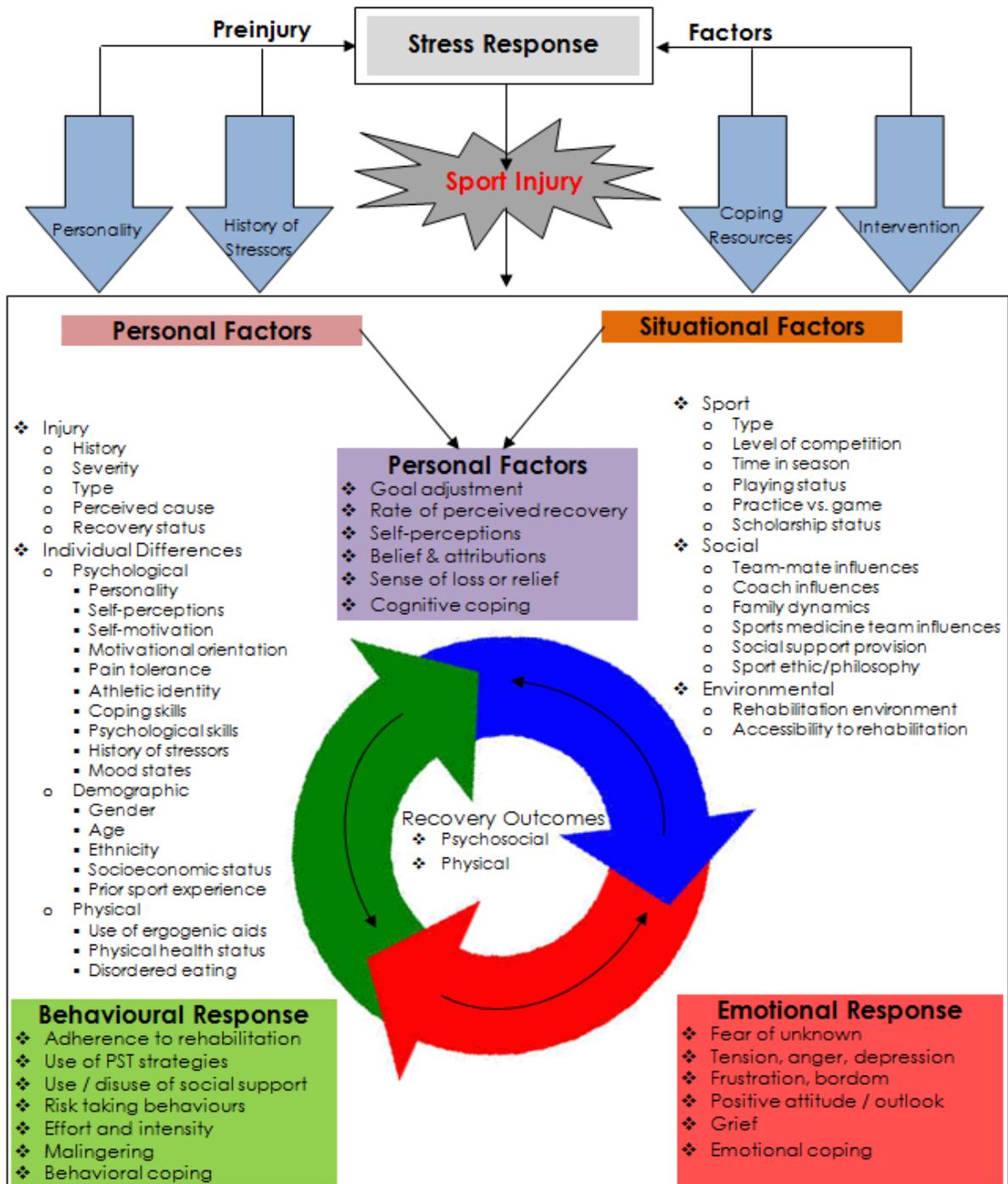


Figure 2.4: Integrated model of psychological response to the sport injury and rehabilitation process

The chief tenet of the integrated model is that athletes' cognitive appraisals of their injuries are affected by both their situational and personal factors. Injured athletes' cognitive appraisals, in turn, have an effect on three interrelated parameters, namely their emotional responses, behavioural responses and recovery outcomes (Brewer, 2001b). In other words, situational and personal factors are presumed to influence emotions because they have an effect on how athletes think about their injuries as well as themselves in relation to their injuries. Thus, athletes' cognitive appraisals of their injuries mediate the relationship between their emotional responses, and personal and situational factors (Brewer, 2001a).

The integrated model, as depicted diagrammatically, contends that responses to injury are influenced by both pre-injury and post-injury factors. The pre-injury variables consist of personality, history of stressors, coping resources and interventions; thus, revealing a possible connection between Andersen and Williams' (1988) stress and athletic injury model, and the integrated model. Wiese-Bjornstal et al. (1998) noted that their model was developed as an extension of Andersen and Williams' model. In particular, Wiese-Bjornstal and colleagues postulated that the factors that may make athletes more vulnerable to injury risk might also play a role in their adjustment to injury (Udry & Andersen, 2002).

Wiese-Bjornstal et al. (1998) divided the post-injury variables that are posited to have a direct effect on cognitive appraisal into two broad categories, namely personal factors and situational factors. Personal factors, as illustrated in Figure 2.4., incorporate a diversity of variables such as the type and severity of the injury, personality characteristics, self-perceptions, athletic identity, pain tolerance, history of stressors, demographic data, health status and the use of ergogenic aids. An injured athlete, for example, who has a strong athletic identity, might perceive injury as being more disruptive than the injured athlete whose athletic identity is not as strong. Granito and University (2002), in a study that examined gender differences in response to injury found that compared to male athletes, female athletes perceived their coaches to be more negative towards them following their injury and they were also more concerned about how the injury would affect their future health.

Wiese-Bjornstal et al. (1998) included the following under situational factors: type of sport; level of competition; time of season; coach and teammate influences; the provision of social support; and the rehabilitation environment. One can postulate, for instance, that a long-distance runner who sustains an injury one month before the Comrades Marathon, a 90 kilometre ultra-marathon, will appraise it more negatively than had he/she sustained the injury six months prior to the event or immediately after the event. Wiese-Bjornstal et al. stated that the athlete's personal and situational factors continue to

exert influences on the individual's cognitive appraisal throughout the injury and rehabilitation process.

Wiese-Bjornstal et al. (1998), in their integrated model, further postulated that how athletes appraise their injuries may affect their behavioural and emotional responses. As illustrated in the diagrammatical representation of the model, behavioural responses may include adherence to rehabilitation, the use or disuse of social support and malingering. According to Rotella, Ogilvie and Perrin (1993), an injured athlete may mangle in order to get needed or desired attention from others, demonstrate personal courage by participating with the injury, counteract expectations and offset the personal realization of lack of ability. Wiese-Bjornstal et al. (1998) included the following emotional responses in the integrated model: fear of the unknown, tension, anger, depression, frustration, boredom, grief, a positive outlook and emotional coping. The possible emotional responses of injured athletes were discussed in depth in section 2.4.1.

According to Wiese-Bjornstal (1998), the predominant process followed is that cognitive appraisals of the injury affect emotions which, in turn, affect behaviours. However, the authors also stated that the process may be reversed; in other words, behaviours and emotions may have an effect on cognitive appraisals. Injured athletes, for example, may view themselves as a failure; this may lead to depression and then the athletes may isolate themselves from others, especially team-mates. On the other hand, isolation from team-mates may lead to depression and a subsequent sense of failure.

Finally, athletes' cognitive appraisals of injury and subsequent emotional and behavioural responses may have implications for both their physical and psychological recovery outcomes. As shown in Figure 2.4, the bi-directional arrows displayed in this component of Wiese-Bjornstal's (1998) integrated model succinctly capture the dynamic nature of responses to injury and rehabilitation (Udry & Andersen, 2002). Injured athletes, for instance, who experience a setback during rehabilitation or suffer a number of injuries in a short period, may cognitively reappraise the severity and implications of their injuries. According to Brewer (2001a), because cognitive appraisal models are dynamic, the magnitude and direction of relations among the key components of the model may vary during different stages of the athlete's injury. For example, an athlete's level of pain tolerance may influence the individual's post-injury mood states a great deal initially after injury; however, this potential influence may lessen as his/her acute pain becomes less salient during the course of rehabilitation. Support for cognitive appraisal models and in particular the Wiese-Bjornstal et al. (1998) is illustrated by the two studies that follow.

In order to examine the external validity of the Wiese-Bjornstal et al. model (1998) integrated model, Bianco, Malo and Orlick (1999) interviewed 12 elite skiers who had

either recovered from a serious injury or debilitating illness. The findings of the study supported the main tenets of the integrated model. Firstly, the skiers experienced injury as a stressful event; the disruption experienced varied amongst the skiers as well as throughout their rehabilitation and recovery. Secondly, the skiers' varied responses to injury were mediated by both situational and personal factors. Those who had sustained knee injuries, for example, were more confident than those who had suffered less common injuries; the former group felt inspired by the knowledge that many skiers who had had similar injuries had recovered and been successful. The skiers who had not secured places in the national team experienced injury more intensely than those who had already been chosen to be in it. The skiers' experience of disappointment and loss was magnified when they sustained the injury during an important meet such as the Olympics. Thirdly, the skiers responded to injury cognitively, emotionally and behaviourally. Finally, the skiers' responses were influenced by their progress during rehabilitation as well as the outcome of their rehabilitation.

The purpose of Albinson and Petrie's (2003) study was two-fold. Firstly, they investigated the connection between football players' primary and secondary appraisals of their injuries and their use of coping strategies when injured. Secondly, they explored the links between the antecedents and consequences of sport injury; more specifically, they examined the relationships between pre-injury stressors, coping resources and personality characteristics, and post-injury cognitive and emotional responses. The participants, 84 university football players, completed measures to determine their pre-injury life-event stress, social support satisfaction, dispositional optimism and mood state prior to the start of the season. Of the 84 participants, 19 suffered injuries during the season; these players completed post-injury measures of mood state, coping methods, and cognitive appraisals of stress and coping ability 1, 4, 7, 14 and 28 days after sustaining their injuries. The findings of the study displayed support for cognitive-appraisal models of sport and injury. Results suggested that the players who perceived experiencing negative life-stress at the start of the season believed they had greater difficulties coping with their injuries four days after sustaining them. Furthermore, the players who appraised their injuries as difficult to cope with or stressful at one point in time perceived their injuries similarly on the next occasion measures were taken. These players also experienced elevations in mood disturbance, especially 28 days post-injury. Moss-Morris et al. (2003) also revealed that individuals who believe that their injuries are more problematic experience greater emotional disturbances than those individuals who have more positive perceptions of their injuries. Findings of the Albinson and Petrie study further showed that cognitive appraisals were related to the injured athletes' choice of coping methods. Those players who appraised their injuries negatively after day one post-injury were inclined to use avoidance coping after seven days. Results also revealed that 72% of the injured players had returned to competition by day seven; however, 80% of those who were injured at

this point remained so at day 28. These players tended to cope with their disappointment indirectly; for example, they isolated themselves and took their anger out on others. These athletes were also more inclined to partake in active behavioural coping and less cognitive coping at days 14 and 28 post-injury. Thus, they may have displayed a tendency to get information about their injuries from coaches. According to Albinson and Petrie, getting information about their injuries may not be sufficient support for injured athletes who have increased levels of mood disturbance; rather, support from family and friends may be more beneficial for these athletes.

2.4.5 Conclusion

This section has examined athletes' psychological responses, and in particular, their emotional responses to injury. Stage models of grief have been employed to assist in explaining the psychological reactions of injured athletes. On the other hand, cognitive appraisal models have been developed to offer an alternative explanation for injured athletes' psychological responses. Throughout this section, reference has been made to the need for those who treat injured athletes to have an understanding of the psychological reactions injured athletes may experience. The following section considers factors involved in the successful rehabilitation of injured athletes.

2.5 Psychosocial factors involved in the successful rehabilitation of sport injuries

2.5.1 Introduction

It has been customary for those in the medical profession as well as sport coaches to concentrate on the physical aspects of sport injury rehabilitation; the primary goal thereof has been to influence the rate and quality of the athlete's recovery in order to ensure a successful return to sport (Brewer et al., 2002). The way in which athletes deal with sport injury may differ greatly; as denoted in the previous section, some athletes may be devastated by the injury while others may derive emotional benefits because of it. Hence, psychological interventions that address the emotional difficulties of injury may be a valuable adjunct to athletes' physical rehabilitation (Williams & Roepke, 1993). According to Cupal (1998), the medical profession is reluctant to embrace the need for psychological intervention for the 'average' injured athlete during sport injury rehabilitation. On the contrary, research has shown that physiotherapists would welcome more knowledge on psychological interventions that may assist the athlete in recovering from injury (Evans et al., 2000; Larson et al., 1996).

2.5.2 Psychological responses to rehabilitation

In the previous section, athletes' emotional responses to injury were discussed extensively. As stated previously, both stage models of grief as well as cognitive appraisal models have been used and developed in an attempt to explain psychological reactions to sport injury. Consequently, only a few studies that have focused on emotional reactions during rehabilitation specifically will be outlined.

In a study that explored injured athletes' emotional responses before physiotherapy appointments, Dawes and Roach (1997) found the athletes' reactions varied at different stages of their rehabilitation. During the course of their rehabilitative program, their negative emotions decreased and positive emotions increased. Even after their first treatment, they tended to become less negative; the authors stated the athletes may have experienced relief at obtaining a professional opinion and much improvement after their first session. As they started to recover, the athletes became less frustrated. However, they displayed alternating periods of high and low levels of anger; Dawes and Roach expressed the opinion that their varying levels of anger may have been the result of their rate of improvement at each physiotherapy session.

Morrey, Stuart, Smith and Wiese-Bjornstal (1999) also found that athletes who had undergone knee surgery experienced emotional fluctuations during rehabilitation. After surgery, the athletes were inclined to experience mood disturbances, possibly due to pain and concerns about rehabilitation. Morrey et al. attributed the athletes' decrease in negative emotions during the mid-rehabilitation period to the achievement of goals and tangible improvement. The athletes tended to experience fear, anxiety and anger after six months; the authors expressed the view that they may have been anxious about the outcome of their return to competition. In a similar study, Brewer et al. (2006) examined changes in pain and negative mood for the first six weeks of rehabilitation after knee surgery; results showed that as the daily pain ratings of the 91 participants decreased during the course of the study, their negative mood also decreased. In a longitudinal case-study on an injured rugby player, Vergeer (2006) also found that positive emotions were experienced when progress was perceived, but were replaced by negative emotions when the injured rugby player feared he would be unable to achieve the physical self he sought in order to achieve his desired identity.

Carson and Polman (2010) stated that although avoidance coping is usually reported to be debilitating, it may be beneficial in situations where the attainment of goals is unlikely. The aim of a study conducted by the authors was to identify the role of avoidance coping within sport injury rehabilitation. A mixed methodological approach was employed in the study. Interviews were conducted twice a month with four professional male rugby union players who were recovering from anterior cruciate ligament surgery. The interviews focused on their emotions, cognitions and coping resources. Furthermore, the participants were required to keep a self-report diary in which they recorded their day-to-day changes in relation to their emotions and coping strategies. The participants also completed the Coping with Health Injuries and Problems Inventory towards the end of their rehabilitation. Content analysis of the data identified six higher-order themes that were split into two general dimensions. The first dimension, behavioural avoidance coping, included the following: physical distraction which consisted of getting involved

in a new hobby, outside interests, coaching at schools and community development work; social interaction which included time with family and avoiding contact with others; and maladaptive behaviours such as not putting in a 100% effort. The second dimension, cognitive avoidance coping, consisted of the following: denial which involved tolerating pain, trying to continue training while experiencing pain and attributing the pain to other things; thought stopping such as focusing on and speaking about other things; and cognitive distraction which involved becoming engrossed in a hobby and refusing to be a spectator at games. Carson and Polman noted that the avoidance coping employed by the participants had long-term benefits for them; particular benefits included becoming involved in alternative work within a sports organization.

Although it is ideal for athletes to resume competing once they are considered to be both physically and psychologically ready, it is not unusual for them to have recovered physically before they are mentally prepared to return to competition (Morrey et al., 1999; Wiese & Weiss, 1987; Williams & Roepke, 1993). Athletes often experience great anxiety and fear at the thought of returning to competition. Podlog and Eklund (2009) found that athletes returning to sport after injury perceived success as a return to pre-injury levels, achieving pre-injury goals, creating realistic expectations of performance after injury and an absence of injury-related concerns. However, they may fear re-injury or further injury because they have not recovered fully (Podlog & Eklund, 2007); this may lead to overcompensation and/or muscular tension which, in turn, may result in injury (Andersen & Williams, 1988). They may also experience anxiety at the thought of possibly not achieving the levels of performance they achieved before suffering injury (Morrey et al.; Podlog & Eklund, 2007; Vergeer, 2006; Wiese & Weiss). In their case study of an elite fast bowler, Gordon and Lindgren (1990) reported that the subject perceived his return to cricket as an anti-climax because his lack of confidence prevented him from bowling at his best. According to Wiese and Weiss, it is imperative that sport psychology practitioners become involved in injured athletes' rehabilitation in order to assess their psychological readiness to return to sport and subsequently, alleviate their fears concerning the completeness of their recovery.

Furthermore, it is imperative for coaches and medical practitioners involved in the rehabilitation of injured athletes to have the necessary knowledge and understanding of what effective rehabilitation entails over and above the physical aspects thereof. Hence, the following factors are subsequently examined: personal attributes of injured athletes; skills of and techniques used by medical practitioners and in particular, physiotherapists; and social support.

Arvinen-Barrow et al. (2007) reported that the physiotherapists in their study identified a variety of characteristics of injured athletes who cope with injury successfully. These

include a positive and proactive attitude towards injury; compliance with the treatment program; confidence and trust in rehabilitation; understanding of injury; realistic expectations; patience with themselves and the treatment program; motivation, determination and commitment; and social, emotional and medical support. On the contrary, those who were perceived as not coping with injury displayed the following characteristics: a negative attitude towards injury; exercise addiction; a poor understanding of and compliance to rehabilitation; unrealistic goals; impatience; and stress, anxiety, anger and depression. Results of the Arvinen-Barrow et al. study are in accordance with those of Larson et al. (1996). Findings from the latter study also found that athletes who coped with injury had a strong desire to return to sport, asked questions about injury and rehabilitation, and focused on goals during the rehabilitative process while those who did not cope used injury as an excuse and withdrew from team activities, thus displaying introverted behaviour. Rock and Jones (2002) found that athletes who believe in the efficacy of rehabilitation were more inclined to adhere to the program. Physiotherapists in the Gordon et al. (1991) study believed that athletes who were able to communicate well, asked questions about rehabilitation, listened ably to advice and gave feedback had a positive psychological response to injury. Francis, Andersen and Maley (2000) also found that an athlete's willingness to listen to the physiotherapist was perceived by physiotherapists as being important for successful rehabilitation.

Athletes also attribute and perceive successful recovery to personal factors. Francis et al. (2000) reported that athletes believed that knowing how long it would take them to recover helped them in the healing process. The results of two studies that examined the causal attributions for recovery from knee surgery to the rate of recovery showed that athletes who perceived themselves as recovering quickly tended to attribute their progress in rehabilitation to internal and personally controllable factors compared to those who perceived their recovery to be slower. The findings of both studies emphasize the importance of personal control in the rehabilitation of sport injury (Brewer et al. (2000); Laubach, Brewer, Van Raalte & Petipas, 1996). Although the view of athletic trainers and not the athletes themselves, results from the Larson et al. (1996) study revealed that athletes who did not cope with injury tended to blame others.

There are a number of skills and psychological interventions that can be employed by those involved in the rehabilitation of injured athletes that will facilitate their recovery. However, it is imperative that the athlete's perception of the injury be understood first; in other words, members of the rehabilitation program need to comprehend what the injury means for the athlete and what effect it will have on the individual's life (Williams & Roepke, 1993). Furthermore, the practitioners must be acquainted with the athlete's

response to stress, injury history and situation related to his/her current injury (Wiese & Weiss, 1987).

Communication skills and motivation were rated by physiotherapists in a study conducted by Francis et al. (2000) to be the two most important factors in injury rehabilitation. According to Wiese and Weiss (1987), it is imperative that physiotherapists and sport psychologists explain all aspects of injury to athletes; it is necessary that they understand the severity of the injury as well as what the rehabilitation program involves. Having a good rapport with the athlete is crucial. The injured rugby player in Vergeer's (2006) case study consulted a number of medical practitioners when he faced disconcerting information in order to find out more or better information; this highlights the importance of having a good rapport with injured athletes. Listening skills in order to understand what the athlete is really trying to say are essential. Larson et al. (1996) reported that the athletic trainers in their study rated listening skills of athletic trainers as important.

Wiese and Weiss (1987) stated that the question of how to motivate injured athletes to stick to their rehabilitation programs is a critical one. A number of psychological techniques can be utilized to help motivate them. These include setting realistic short- and long-term goals; imagery, visualization and relaxation strategies in order to achieve the goals; self-talk to help assist athletes to replace negative and irrational beliefs with positive, realistic and rational thoughts; and social support which will be discussed subsequently. Analysis of diary and interview transcripts of a study conducted by Gilbourne and Taylor (1995) revealed that athletes believed the process of setting goals helped them organize their rehabilitation. Hamson-Utley, Martin and Walters (2008) found that both athletic trainers and physical therapists held positive attitudes on the effectiveness of mental imagery, setting goals and positive self-talk to speed up the recovery process during rehabilitation. Vernacchia and Henschen (2008) who served as sport psychology consultants for the 2000 USA Olympic Track and Field team maintained that they assisted an injured female discus thrower to compete at Sydney. They taught her mental and relaxation techniques that facilitated her healing and dissipated her levels of pain. They also gave her visualization and relaxing exercises that helped her maintain her throwing technique. However, Francis et al. (2000) reported that both the physiotherapists and athletes in their study perceived visualization and relaxation to be the least effective techniques.

Although the primary focus of injury rehabilitation is physical healing, it is also unavoidably a social process (Brewer, 2001b) and thus, those involved in sport injury rehabilitation must take cognizance of the value of social support in sport injury rehabilitation (Bianco & Eklund, 2001). Support may be classified into three categories;

namely, emotional support such as listening to and comforting the injured athlete, informational support which may include an acknowledgement of progress and further challenging the athlete, and tangible support which may involve giving of time, skills and knowledge (Hardy & Crace, 1993).

In an action research study involving three injured athletes, emotional support was perceived by the athletes as important when they experienced setbacks and progress was slow (Evans et al., 2000). In an exploration of the emotional difficulties encountered in sports-related injuries, Schneider (2006) found that it was more beneficial for therapists to help reduce the emotional distress of athletes during rehabilitation than to rebuild their self-esteem. Rock and Jones (2002), in an examination of the usefulness of counseling skills for three athletes who were in rehabilitation after undergoing knee surgery, found that they regarded physiotherapists and other injured athletes as valuable sources of informational support. The participants showed that they valued information about the injury, surgery and rehabilitation. Furthermore, they appreciated the presence of other injured athletes with whom they could share similar experiences. Robbins and Rosenfeld (2001) explored athletes' perceptions of the social support provided by their coaches before they sustained injury and during rehabilitation. Results revealed the participants would have readily accepted and valued more support from the coaching staff. Furthermore, types of social support, namely task appreciation, task challenge and emotional challenge were given by the coaches pre-injury but not during rehabilitation. Robbins and Rosenfeld stated that involving the injured athletes during rehabilitation could make them feel less isolated and frustrated.

When one considers the difficulties injured athletes encounter during rehabilitation and when they resume competing again, it is evident that it would be advantageous for medical practitioners to be aware of the psychological aspects of sport injury and rehabilitation. Furthermore, sport psychologists can play a multifaceted role during rehabilitation (Evans et al., 2000) and thus, it would be beneficial for injured athletes if they were an integral part of the rehabilitation team. In the light of addressing injured athletes holistically, it is necessary to consider a biopsychosocial model of sport injury rehabilitation which was developed by Brewer et al. (2002).

2.5.3 A biopsychosocial model of sport injury rehabilitation

Brewer et al. (2002) stated that theoretical advancements are necessary in order to link psychological and medical approaches to the rehabilitation of sport injuries. They further noted that conceptual frameworks that embody the multitude of factors that contribute to rehabilitation of sport injury need to be developed. Consequently, in an attempt to explain the myriad of factors that are involved in sport injury rehabilitation they developed a biopsychosocial model of sport injury rehabilitation. This model is depicted in Figure 2.5.

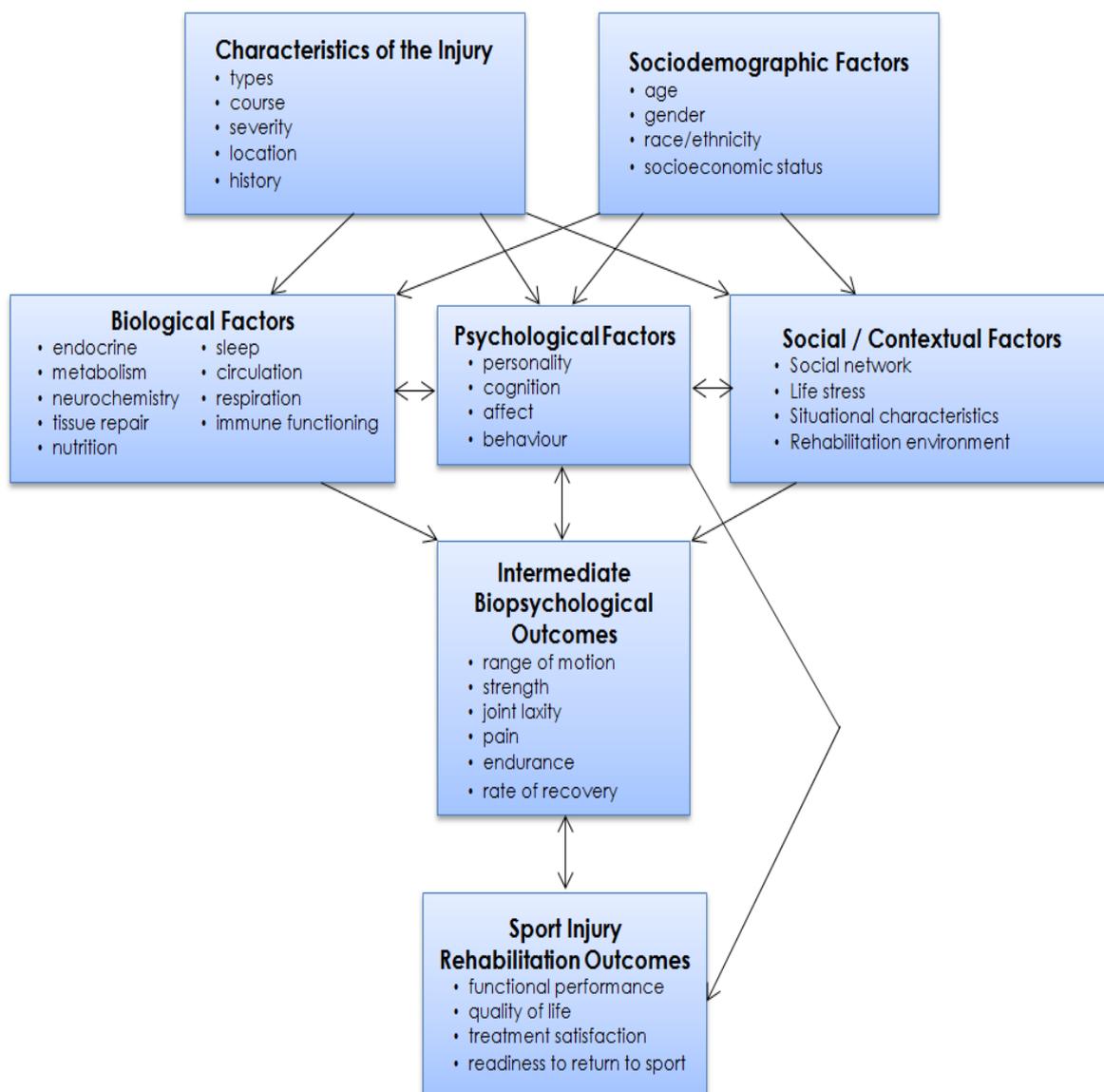


Figure 2.5: A biopsychosocial Model of Sport Injury Rehabilitation

An examination of the model illustrates the processes and interrelationships that occur once an athlete has sustained an injury. Brewer et al. (2002) stressed that injury involves a multitude of factors that have an effect on the outcomes of injury rehabilitation. The interrelatedness, complexity and interactive nature of sport injury rehabilitation are clearly depicted by the bidirectional arrows in the model. A brief outline of each of the components of the model and its relationship with each of the other components follows.

Brewer et al. (2002) stated that injury involves physical damage that may lead to rehabilitation. As stated previously, defining the type and severity of injury may be problematic. Flint (1998) distinguished between microtrauma and macrotrauma injuries whereas Noakes (2001) delineated four stages or grades of injury. Petrie (1993) classified three types of injury on the basis of whether the injured athlete was able to continue participation despite the injury or not. Furthermore, the authors said that some injuries

may have short histories such as an acute ankle sprain whereas injuries such as recurring muscle tears may have may more complicated and long-term histories. These characteristics will determine the type and duration of the rehabilitation process.

Injury is usually viewed in relation to the effects it has on the biological functioning of an injured athlete such as his/her immune system, inflammatory responses, mobilization and tissue repair. Injury may also affect psychological factors; the depression an injured athlete may experience, for example, may be a result of injury. Furthermore, injury may have consequences for the social environment of an injured athlete; for instance, an injured athlete may distance himself from his team mates (Brewer et al., 2002). They also postulated that sociodemographic factors may play a part in both psychological and biological responses to injury. Sociodemographic factors may also have an impact on the context of the rehabilitation process. Male and female athletes may, for instance, may not react to sport injury rehabilitation in similar ways because of differing biological, psychological and social characteristics; these include hormones and societal expectations.

As depicted on the next level of the model, psychological factors hold a principal position. They can affect and in turn, be affected by biological and social / contextual factors. Brewer et al. (2002) explained this interconnected relationship by means of a couple of examples. An injured athlete's thoughts and emotions may have an influence on his/her biological functioning such as sleep patterns and appetite. An injured athlete may also experience depression because of disagreeable rehabilitation conditions; this may lead to social withdrawal.

Biological, psychological and social / contextual factors are also connected to intermediate bio-psychological outcomes which are on the next tier of the model. Biological factors such as circulation and rate of tissue repair have a direct influence on outcomes such as pain reduction, range of motion and rate of recovery. According to Brewer et al. (2002), the link between psychological factors and intermediate bio-psychological outcomes may not be obviously apparent; however, how injured athlete approaches rehabilitation may be influenced by personality factors. Successful intermediate rehabilitation may help improve positive thoughts and emotions. The authors further advanced that social / contextual factors influence intermediate bio-psychological outcomes as well as sport injury rehabilitation outcomes which is on the last level of the model through the mediating role of psychological factors. Adherence to a rehabilitation program, for example, may be affected by disruptive life circumstances; this may hinder the intermediate bio-psychological outcomes and eventually affect desired functional performance at the completion of rehabilitation negatively.

An examination of the model further shows that intermediate bio-psychological outcomes are believed to influence injury rehabilitation directly. Functional performance, for instance, is affected by range of motion, strength and joint laxity. Finally, Brewer et al. (2002) postulated that there is a bi-directional relationship between sport injury outcomes and psychological factors. Functional performance and readiness to return to competition may be directly linked to an injured athlete's level of motivation.

According to Brewer et al. (2002), a biopsychosocial perspective on the rehabilitation of sport injury has heuristic value in guiding research. Furthermore, they stated that medical practitioners usually focus on the biological aspects of injury rehabilitation. However, a biopsychosocial approach will allow those involved in the rehabilitation of injured athletes to focus on all the factors outlined in the model as they all influence rehabilitation outcomes directly or indirectly. This will afford medical practitioners the opportunity to enhance the quality of care for injured athletes.

2.5.4 Conclusion

This section has examined psychosocial factors that are involved in the successful rehabilitation of injured athletes. The psychological responses to the rehabilitation process have been discussed. The need for those medical practitioners who are involved in the rehabilitation of injured athletes to not only treat the physical effects of injury, but to view them holistically has been emphasized. Accordingly, a biopsychosocial model of sport injury rehabilitation proposed by Brewer et al. (2002) was outlined.

2.6 Conclusion

In this chapter, the literature that has focused on psychosocial factors inherent in sport injuries was discussed. Firstly, the difficulties in conducting research on sport injuries which include the various operational definitions of sport injury, and determining the severity of as well as the role and evaluation of pain in injury were reviewed. Secondly, the psychosocial factors that may make athletes susceptible to sport injury were studied in detail; the focal point of this discussion was a critical examination of Andersen and Williams' (1988) model of stress and athletic injury. Thirdly, athletes' psychological responses to injury were examined. In this section, both stage models and cognitive appraisal models, developed to explain athletes' responses to injury, were reviewed. Finally, psychosocial factors that have an effect on the successful rehabilitation of sport injuries were explored. A biopsychosocial model of sport injury rehabilitation was presented (Brewer et al., 2002). The methodology employed in the present study is discussed in the following chapter.