Injured Athletes: Appraisal, Coping, Optimism, Rehabilitation Adherence, and Rehabilitation Engagement

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i. Abstract

The relationship between optimism, appraisal of injuries, coping processes, engagement with the rehabilitation program, and injury rehabilitation adherence, in injured athletes has not been extensively examined. These factors have been examined extensively individually and some of the factors have been extensively investigated together, but these factors have not been examined in detail as a complete process (Albinson & Petrie, 2003; Chang, 2002; Gustafsson & Skoog, 2012; Walker, Thatcher, & Lavallee, 2007)

A group of 23 injured athletes participated in this research. Data collection was undertaken across a period of 8 weeks, with questionnaires being administered online through links sent out via email. The questionnaires were examining demographics, optimism, cognitive appraisal, coping, rehabilitation adherence, and rehabilitation engagement. The optimism, cognitive appraisal, and coping questionnaires were completed prior to or as soon as possible after the athletes first treatment session. The rehabilitation adherence and rehabilitation engagement questionnaires were completed at the end of each week for a period of eight weeks after the initial questionnaires were completed.

Psychometric evaluations found an acceptable level of internal consistency for the measures. Correlation analysis found relationships between rehabilitation adherence and rehabilitation engagement. The initial status and rate of change for rehabilitation adherence and engagement were examined. Suggesting that; injured athletes that are high in rehabilitation adherence at the beginning of their rehabilitation treatment become less adherent at a slower rate than injured

athletes who are initially low in adherence, athletes who are initially high in rehabilitation engagement become less engaged at a slower rate than injured athletes who initially are low in rehabilitation engagement, and that injured athletes who are becoming less adherent will become less engaged at a faster rate as time passes from when the injured athlete suffered their injury. Limitations and implications for future research are discussed.

ii. Acknowledgements

I would like to thank Dr Richard Fletcher for being my supervisor. Your support, guidance, and advice has been greatly appreciated. You encouraged me to challenge myself.

Thank you to my parents; Grant and Lynne, for encouraging me and supporting me whilst I did my thesis.

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This project has been reviewed and approved by the Massey University Human Ethics Committee: Northern 14/018.

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1 Introduction to Current Research

Athletes do their very best to avoid injuries but depending upon the age and the competitive level of an athlete their level of injury risk varies (Wall, Morton, & van Loon, 2015). Sport participation is increasing in popularity and as a direct result of that sport injuries are increasing (Chang, 2002; Garrison, Westrick, Johnson, & Benenson, 2015). Sport injuries can have a range of effects on an athlete including negative physical, psychological, and societal complications (Emery & Tyreman, 2009; Steffen & Engebretsen, 2010; Wall et al., 2015). When injuries can have such a strong and influential effect on the athlete, it is important to examine the psychological processes that the athlete goes through as a result of an injury. Research into the psychological aspects of sport injuries has been becoming increasingly more common over the last several decades (Williams & Andersen, 1998). Clement, Granquist, and Arvinen-Barrow (2013) found that stress/anxiety, anger and treatment adherence problems were rated as the primary psychological responses that athletes may present upon injury.

Sport injuries not only involve physical trauma but also psychological consequences. Even a minor injury for an athlete can have a major impact on both the athletes' physical and psychological states which in turn can have a negative impact on the athletes' performance. How an athlete perceives an injury can have an effect on how they cope with the injury as well as having an effect on their rehabilitation process (Albinson & Petrie, 2003). It is also suggested that an athletes' optimistic or pessimistic nature may have an effect on this process (Gustafsson & Skoog, 2012). These findings are to be expected, if an athlete

decides that their injury is within their capabilities to cope with, they will be better adjusted to deal with their injury. The consequences of this decision will have a strong effect on the athletes' rehabilitation process. These processes are not happening independently of each other but rather they are operated as part of a dynamic system that has the potential to change over time (Wiese-bjornstal, Smith, Shaffer, & Morrey, 1998).

Malinauskas (2010) classified a minor injury as one that contributed to a loss of participation of less than one week. Most research has used defined sports injury using similar common elements. The common elements include; the injury occurred while training for or competing in a sport, medical care was sought, and time loss from practise, training and/or competition occurred (Hootman, Dick, & Agel, 2007; Wiese-Bjornstal, 2010). However using a definition based upon these elements excludes injuries that have an effect on an athlete but not necessitate any time off from practise, training and/or competition.

It has been suggested that a broader definition of injury should be used that not only includes time loss type injuries but also injuries that have a more transient nature that do not involve time off (Hodgson, Gissane, Gabbett, & King, 2007). This is an important distinction to make because it is entirely possible that these injuries cause no time loss from participation in the athletes' sport due to the normative culture of sport that expects athletes to train and compete irrespective of injury (Bianco, 2001; Curry, 1993; Young, McTeer, & White, 1994) This pressure can also be coupled with a sense of fear that the athlete will be denied a chance to train or compete by medical professionals or coaches if the injury is reported, or to

compete whilst still injured (Podlog & Eklund, 2006). Injuries can also not be intrusive enough in and of themselves to prevent participation (Wiese-Bjornstal, 2010). There is a wide variety in the causes and types of sport injury ranging from micro-trauma to macro-trauma, which can be comprised of structural damage, and of a one off or recurring nature. (Wiese-Bjornstal, 2010). The injuries can range from overuse type injuries that are caused by cumulative trauma over time through to acute impact or other specific traumatic event type injuries.

An athletes' rehabilitation engagement and adherence, their appraisal and coping process, and their optimism have not been examined in detail as a complete process (Albinson & Petrie, 2003; Chang, 2002; Gustafsson & Skoog, 2012). The benefit of examining these factors as a holistic process to the athletic population is increasing the understanding of how athletes cope with injury. Another benefit is increasing the understanding of how the appraisal and coping process influences the athletes' rehabilitation engagement and rehabilitation adherence. This increased understanding is beneficial to the athletic population because injuries can have a negative effect on their training which in turn can have a negative effect of their performance in competition. Aspects of this process have been examined and links have been found between optimism, stress, and burnout in athletes (Gustafsson & Skoog, 2012) and relationships between optimism and the stress appraisal process (Chang, 2002). Albinson and Petrie (2003) looked at injury rehabilitation adherence, cognitive appraisals, stress, and coping but due to low participant numbers could not analyse injury rehabilitation adherence. Albinson

and Petrie (2003) found a relationship between stress mood disturbance and coping, but the effect of this on rehabilitation adherence is unknown.

Engagement with a treatment program has been assessed in a medical setting and researchers have found that high levels of engagement can have a positive effect on long term treatment outcomes (Kortte, Falk, Castillo, Johnson-Greene, & Wegener, 2007; Lequerica et al., 2006). This creates an interesting area to examine due to the possibility that athletes who have high levels of engagement in their rehabilitation program are more likely to have positive long term treatment outcomes. Rehabilitation engagement is an area of research that is currently growing after interesting results have been found in non-athletic settings (Furlong & Christenson, 2008; Matthews et al., 2002; Schaufeli, 2006; Schaufeli, Salanova, González-romá, & Bakker, 2002).

2 Literature review

2.1 Stress Appraisal and Coping

Research into the psychological aspects of sport injuries has increased over the last several decades (Williams & Andersen, 1998). With this increased level of research the understanding of the psychological aspects of sport injuries has correspondingly increased. Most frameworks that have been proposed for understanding an athletes' psychological response to sport injury have focused on stress and grief process models (Wiese-bjornstal et al., 1998). There have been a number of studies that have supported the idea that injured athletes perceive sport injuries to be stressful (Bianco, Malo, & Orlick, 1999; Brewer & Petrie, 1995; Gould, Udry, Bridges, & Beck, 1997; Heniff et al., 1999). This creates the opportunity for sport injuries to be classified as a stressor, which aids the understanding of the psychological process that an athlete goes through when suffering from an injury. This classification suggests that may be beneficial to view the psychological processes that an injured athlete goes through from a stress based theoretical perspective.

In relation to stressors, research examining the effects of injury on athletes have found that injured athletes use a variety of cognitive, emotional, and behavioural coping methods to deal with the stress that they experience as a result of injury (Bianco et al., 1999; Gould et al., 1997; Quinn & Fallon, 1999; Quinn & Fallon, 2000). Bianco et al. (1999) found that coping strategies that injured athletes used could be divided into two classes; cognitive strategies, and behavioural strategies. The cognitive strategies started with accepting the injury, moved into

focussing on recovery, and keeping a positive perspective. The behavioural strategies used were adopting an aggressive rehabilitation approach, trying alternate treatments, education, imagery, and in some cases taking a break from rehabilitation.

Attention to both the psychological consequences of sport injuries as well as the physical consequences is important. Even a minor injury for an athlete can have a major impact on both the athletes' physical and psychological wellbeing. In turn this can affect the athletes' physical performance in their sport. The main research efforts in this area have been examining the psychological antecedents of athletic injury. However research into the psychological consequences of athletic injury has not received as much attention (Walker et al., 2007). This trend has changed in recent times with more studies being conducted that are looking at psychological responses to sports injury and more psychological interventions for injured athletes being published (Andersen & Williams, 1999; Brewer & Petrie, 1995; Fisher, Domm, & Wuest, 1998; Gordon, 1986; Leddy, Lambert, & Ogles, 1994; Malinauskas, 2010; Quinn & Fallon, 1999; van Wilgen, Kaptein, & Brink, 2010). Clement et al. (2013) found evidence that athletic trainers perceive injured athletes to experience psychological responses as a result of their injuries. This supports the findings of Larson, Starkey, and Zaichkowsky (1996), who found that athletes were psychologically affected by athletic injury. Clement et al. (2013) suggest that the most common psychological responses to injury were stress, anger and treatment adherence issues. The psychological responses experienced by athletes who were successfully coping with their injuries were likely to be positive outlook, adherence

and treatment compliance, and showing up for treatment. Athletes who weren't coping well were more likely to experience poor rehabilitation adherence and attendance, noncompliance, and negative attitudes (Clement et al., 2013; Larson et al., 1996; Wiese, Weiss, & Yukelson, 1991)

2.1.1 Transactional model of stress.

Lazarus and Folkman (1984) proposed a transactional model of stress and coping that suggests that stress can be portrayed as resulting from an imbalance between the demands and resources of an individual. Or when the pressure an individual is experiencing exceeds their perceived ability to cope with the pressure. This process focuses on the transaction between an individual and their external environment. Lazarus and Folkman (1984) theorize that there is a two part appraisal process occurring when an individual encounters something that is classified by the individual as a stressor. The first part of the process is the primary appraisal; which is the evaluation of the significance of a stressor, effectively evaluating the potential threat of the stressor. The second part of this process is the evaluation of the controllability of the stressor and the individual's coping resources. The individual evaluates what coping options are available, the probability that the coping strategy will accomplish what it is supposed to do, and the probability that they can apply a particular strategy or strategies effectively (Lazarus & Folkman, 1984). The result of this process is that the individual will experience stress if they perceive that the demands of a significant stressor outweigh their abilities to cope with the demands. These outcomes that occur as a response to a stressor are influenced by the individuals attributes (Lazarus &

Folkman, 1984). They will then apply both cognitive and behavioural strategies to master, reduce, or tolerate the demands that are a result of the stressor (Albinson & Petrie, 2003).

The coping process for injured athletes begins with the injured athletes' cognitive appraisal of the stressor (in this case their injury). Athletes need to view this injury as either benign, harmless or stressful (Anshel, Jamieson, & Raviv, 2001; Lazarus & Folkman, 1984) In the case of an athlete who has suffered an injury this would not normally result in a harmless categorisation. From here Lazarus and Folkman (1984) designated stressor appraisals as either challenging or threatening. After the challenge or threat appraisal the injured athlete moves through the coping process. This can only happen once the athlete has appraised the stressor as stressful. Coping is the conscious use of cognitive, affective, or behavioural efforts to deal effectively with demands that the individual perceives as unpleasant or harmful (Anshel & Sutarso, 2007; Crocker, Kowalski, & Graham, 1998; Nicholls, Hemmings, & Clough, 2010). For the purposes of this research this is the injury that the athlete is suffering from. The aim of the coping process is to enable outcomes that reduce psychological distress, resolve the stressful situation, reduce physiological reactions that may impair motor performance, improve mental wellbeing, and to produce a desirable affective or performance outcome (Anshel & Anderson, 2002; Nicholls & Polman, 2007). For the purposes of this study the desirable performance outcome is an increased level of engagement with the rehabilitation process and an increase in rehabilitation adherence. The selection of coping strategies can be often influenced by the athletes' disposition to use

particular types, or categories of, coping strategies. These dispositional categories are referred to as the athletes' coping style. The coping style significantly predicts the athletes use of coping strategies following selected types of stressful events (Anshel, Sutarso, & Sozen, 2012; Poliseo & McDonough, 2012; Scou, Ekeberg, & Ruland, 2005)

2.1.2 Stress process model.

Weiss and Troxel (1986) identified the importance of examining personal and situational factors as affecting athletes' response to injury stress. At the time that this research was being conducted there was very little empirical research that had been conducted on this topic so Weiss and Troxel (1986) drew upon the literature from the related area of sports stress. This idea was expanded by Wiese and Weiss (1987) who proposed a version of the stress process model to aid the understanding of the sport injury process based on the model that was originally created by Selye (1976). Figure 1 displays the stress process model; in this model the sport injury is considered a stressor that prompts cognitive appraisals which in turn influence emotional responses which then affect behavioural responses.

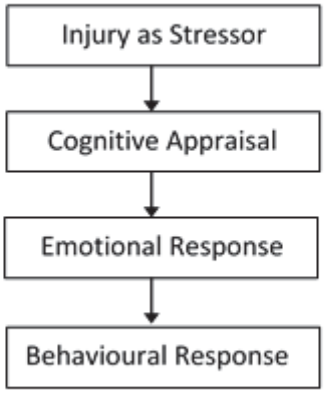


Figure 1. Sports injury stress process model

2.1.3 Grief response model.

At the same time that this stress process model was being developed, Pedersen (1986) and Gordon (1986) were researching the concept that athletes exhibited a grief response after suffering from a sports injury. This research was based upon the work of Kubler-Ross (1969) who had identified a five stage grief reaction response. The first stage was denial, the second stage was anger, the third stage was bargaining, the fourth stage was depressions and the fourth stage was acceptance or reorganization. Researchers looking into this area explain an athletes' psychological reaction to sports injury as similar to those an individual would experience following the death of a loved one (Rotella & Heyman, 1986). Research has not supported the major claims of the stage based model of psychological reaction to sport injury. Examples of the issues with the stage based model were presented by Brewer (1994) and the main objection was that there has been no documented sequence of discrete emotional reactions to sport injury.

Evans and Hardy (1995) thought that conceptualizations of the grief response expressed in clinical psychology literature presented grief response as less stage like and more dynamic than earlier models. Evans and Hardy (1995) suggested that grief be conceptualized in the context of sport injury as "an emotional response to perceived loss, and as a process characterized by behavioural and psychological manifestations" (p.242). The idea behind this change in perspective around the athletes' grief response is that it allows for a much more fluid relationship between the injury and the mental processes as the athlete goes through the injury process. It recognizes that the emotional response can vary over time and it is not necessarily always a case of moving smoothly from one stage to another.

2.1.4 Cognitive appraisal model.

It has been suggested that cognitive appraisal models allow for better explanations for understanding the psychological to athletic injury (Chang, 2002). Gordon (1986) suggested that it may be beneficial to examine the sport injury response in athletes from a cognitive-behavioural perspective. Rose and Jevne (1993) proposed an inductive qualitative grounded theory approach to understanding the sport injury process in athletes. Rose and Jevne (1993) interviewed seven competitive athletes and came up with a four phase risk model which was comprised of the following stages; getting injured, acknowledging the injury, dealing with the impact of injury and achieving a physical and psychosocial outcome. An important aspect of this model was the "acting on the lessons" (Rose & Jevne, 1993, p. 322) of injury that bears a strong similarity to the adaptation

process model that was identified by Gavin and Taylor (1992). Brewer (1994) suggested that cognitive appraisals can be influenced by both personal and situational factors. In turn the cognitive appraisal process determines the athletes' emotional response to the injury which then influences the athletes' behavioural responses. This suggests that the cognitive appraisal process is not occurring in isolation, and that both internal and external factors have a strong influence on how an injured athlete will appraise their injury.

The next development in the cognitive appraisal model for understanding the injury process in athletes was developed by Brewer (1994), Udry (1995), Daly, Brewer, Van Raalte, Petitpas, and Sklar (1995) and Wiese-Bjornstal, Smith, and La Mott (1995). Udry (1995) extended the cognitive appraisal model by examining the injured athletes' emotional response which was defined by the way in which the athlete perceived and reacted to the stressor; the injury. Both coping response and physical recovery steps were added and the athletes' physical recovery was considered the final stage of the model. Daly et al. (1995) conducted a partial test for the cognitive appraisal model with recreational and competitive athletes undergoing rehabilitation following knee surgery. They examined cognitive appraisal, emotional disturbance and behavioural responses (e.g. injury rehabilitation adherence). Based on their findings they suggested that the cognitive appraisal model might be a useful framework for understanding how athletes responds to injury and how they cope with emotions during the rehabilitation process.

Adaptations of the stress process and cognitive appraisal model have extended the pre-injury model of Williams and Andersen (1998) into the post injury phase. Wiese-Bjornstal and Smith (1993) and Wiese-Bjornstal et al. (1995) proposed both conceptual and operational models of post injury psychological response derived from a deductive analysis of existing empirical research.

The main advantage of cognitive appraisal models that is presented in the literature is that they allow researchers to distinguish differences among individuals. According to Lazarus and Folkman (1984) this individual examination will allow researchers a large number of possibilities for explaining and understanding the nature of individual differences. This is supported by Gill (1994) who presents stress and how to cope with stress as being an individual process. Unlike stage based models of stress the cognitive appraisal models understand injuries as a stress based process in which the injury serves as the stressor.

2.1.5 Integrated model of response to sport injury.

Wiese-bjornstal et al. (1998) suggested that it is possible that the grief process (staged based) and cognitive appraisal models are not necessarily mutually exclusive. Researchers have found that in injured athletes there is a sense of loss, which in this context is a type of cognitive appraisal that results in emotions and behaviours that are commonly associated with grief (Astle, 1988; Hardy 1992). Wiese-bjornstal et al. (1998) suggested that grief process models when used in the context of examining sport injury in athletes could become a part of a broader integrated model of psychological response to the sport injury and rehabilitation

process, as depicted in Figure 2.

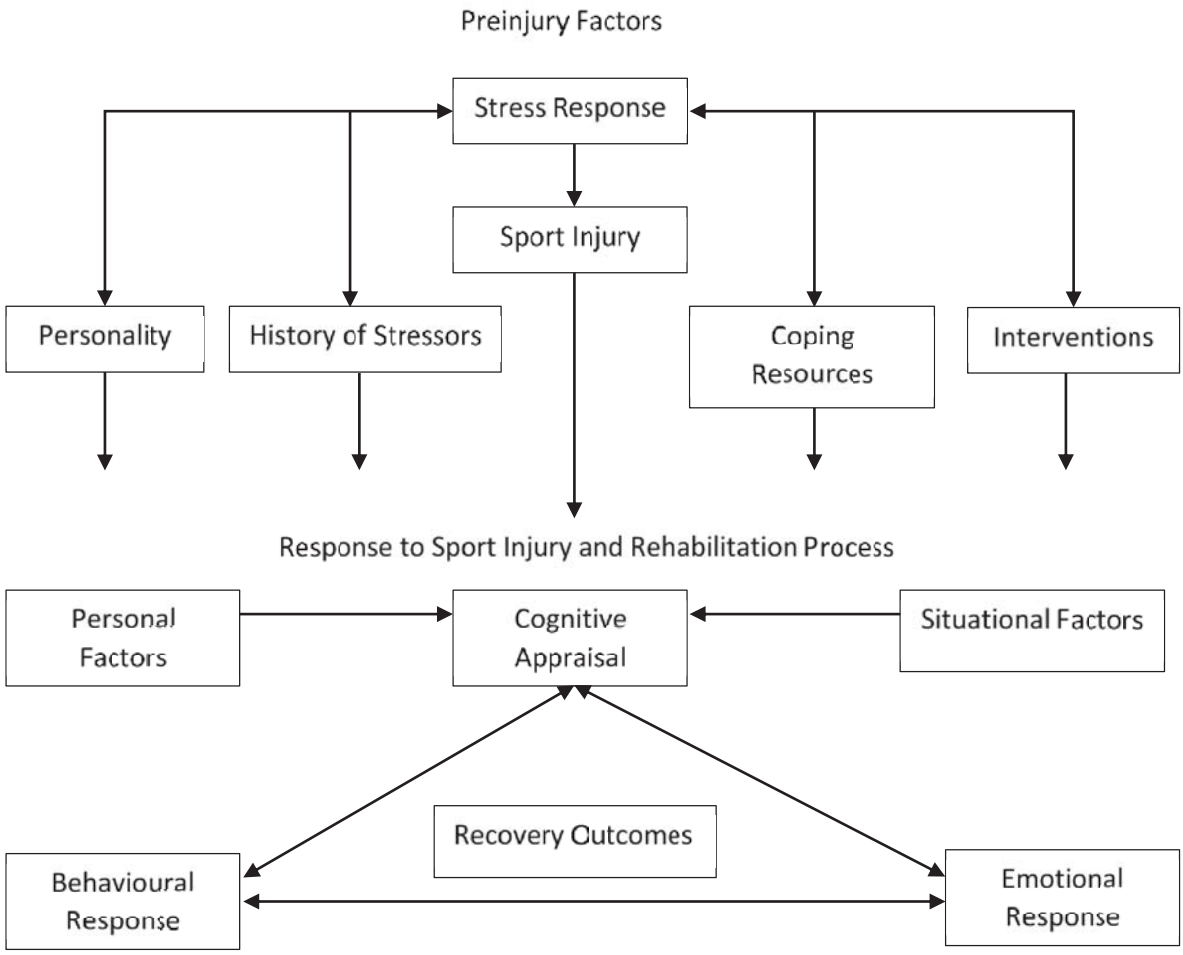


Figure 2. Integrated model of psychological response to the sport injury and rehabilitation process. Adapted from "An Integrated Model of Response to Sport Injury: Psychological and Sociological Dynamics," by D. Wiese-Bjornstal, A. Smith, S. Shaffer, and M. Morrey, 1998, *Journal of Applied Sport Psychology, 10,* p. 49. Copyright 1998 by Association for Advancement of Applied Sport Psychology

This broader integrated model suggests that pre injury and post injury factors both influence an athletes' psychological response to injury (Andersen & Williams, 1988; Wiese-Bjornstal et al., 1995). The psychological response will change over time in a dynamic process and the athletes' recovery is the outcome of the dynamic process. In this model recovery refers to both physical recovery as well

as psychological recovery (Wiese-bjornstal et al., 1998). The implications of this is that when grief based models are used in the context of the sport injury process they could aid the understanding of the process when used in conjunction with stress process and cognitive appraisal models. This integrated model suggests that an individual athlete's cognitive appraisal of the injury as well as their emotional and behavioural responses, are influenced by a range of personal and situational factors. It suggests that the relationship between the cognitive appraisal and emotional and behavioural responses are a dynamic and bidirectional cyclic process which will have an effect on both the physical and psychological recovery of the injured athlete (Wiese-bjornstal et al., 1998).

There have been a number of research studies that have supported the integrated model. Lafferty, Kenyon, and Wright (2008), Arvinen-Barrow, Hemmings, Weigand, Becker, and Booth (2007), and Hemmings and Povey (2002) have found that most athletes appear to be psychologically affected when injured; this means that most athletes will experience an emotional response to injury. This supports research conducted by Brewer (1994), Pearson and Jones (1992), and Ievleva and Orlick (1991) which found that psychological responses experienced by injured athletes can have a significant influence on the quality and speed of the sport injury rehabilitation process. If a psychological response experienced by an injured athlete is a reduction in their level of engagement with the rehabilitation process it could have a negative effect on the quality and speed of the sport injury rehabilitation process.

The integrated model suggests that athletes will experience a variety of cognitive, emotional and behavioural responses to an injury as they cope with the stress that has been generated by the injury (Albinson & Petrie, 2003). It has been suggested that variables that have been found to act as predictors for, or to predispose athletes to, sport injury can continue to have an effect on the athlete post injury. This is due to the influence they have on the athletes' cognitive, emotional and behavioural responses (Wiese-bjornstal et al., 1998). This in turn can have an effect on the athletes' recovery outcomes.

Another interesting suggestion of this model is that personal and situational factors have an influence on emotional responses and this relationship is mediated by cognitive processes. However this pathway has not been extensively examined in the literature (Albinson & Petrie, 2003).

Another area of the model that hasn't been extensively examined is the appraisal process that injured athletes go through when appraising the initial stress that they experience due to their injury or how the injured athlete appraises their ability to cope with the injury (Albinson & Petrie, 2003). It has been suggested that the cognitive appraisal of the injury plays a central role in the injured athlete's psychological reaction to the injury (Albinson & Petrie, 2003). This is important because it suggests that the long term psychological reaction is strongly influenced by the initial appraisal of the injury. This highlights the potential relationship between the appraisal process and the psychological reactions to the injury of rehabilitation engagement and rehabilitation adherence. However in the study

performed by Albinson and Petrie (2003) they were unable to statistically examine their participant's rehabilitation adherence due to a small sample size.

There has been limited empirical examination of cognitive appraisals, stress and coping in the context of this integrated model, however it is an area that could potentially have strong positive practical implications for an injured athlete going through the recovery process. Understanding the relationship between athlete's emotional and behavioural responses is important.

According to Wiese-bjornstal et al. (1998) and Williams and Andersen (1998) the injured athlete's previous history of stressors, their personality characteristics, and existing coping resources act as antecedents to sport injuries. When these factors are combined with personal and situational factors it is probably that the pre injury stressors coupled with feelings of anxiety will influence an athlete's cognitive appraisal of a stressor, in this case their injury.

Research has been conducted examining aspects of the integrated model of response to sports injury. Clement et al. (2013) performed a study which found that poor rehabilitation adherence was the third highest response injured athletes experienced (as reported by the athletes' athletic trainers). They also found that rehabilitation adherence and compliance was determinant of whether or not an athlete coped successfully with their injuries. This supports the findings of Larson et al. (1996) and Arvinen-Barrow et al. (2007) who found that compliance with the rehabilitation program as one of the key characteristics of an athlete who coped effectively with their injuries.

Clement et al. (2013) found that stress/anxiety, anger and treatment adherence problems were rated as the primary psychological responses that athletes may present upon injury. Their study used athletic trainers to examine perceived psychological response and coping behaviours athletes may present, the psychosocial strategies athletic trainers currently use with injured athletes, and athletic trainers current practises in referring athletes to counselling or sport psychology services. Clement et al. (2013) also found that the main characteristics of athletes that exhibited successful coping behaviours were; positive outlook, high levels of rehabilitation adherence, and treatment compliance. These findings supported previous research that found injured athletes experienced stress/anxiety, anger and treatment adherence problems (Arvinen-Barrow et al., 2007; Hemmings & Povey, 2002; Lafferty et al., 2008).

These research projects used the treatment provider to report on what the injured athletes were experiencing. It would be beneficial for future research projects to examine the issues in such a way that would result in self-report questionnaires or something similar being used which would allow the injured athletes themselves to answer these questions. This idea is supported by Clement et al. (2013) who suggested that understanding the influence of stress and anxiety on the injury recovery process is important to those who are working with injured athletes, as well as to the injured athletes themselves.

When considering the injury rehabilitation process from the perspective of the integrated model of psychological response to the sport injury and rehabilitation process, it is important to investigate an athlete's previous history of

stressors, their personality characteristics, and existing coping resources (Wiese-bjornstal et al., 1998). These factors all act as antecedents to sports injuries. To aid with this understanding it would be beneficial to get data examining these parts of the integrated model of response to sports injury directly from the athletes themselves if at all practically possible.

2.2 Optimism

Grove (1993) recommended a stress based model, which focused on personality as a variable that influenced the thoughts, feelings and behaviours of athletes during rehabilitation. That is of particular interest for the purposes of this study because it suggests that internal factors outside of the appraisal and coping process can have an effect of the rehabilitation process. This helps to support the idea that an athlete's level of optimism or pessimism could have an effect on their stressor appraisal, coping and rehabilitation process. Before considering this in more detail it is important to discuss what optimism and pessimism are as constructs and why they are important to this study.

Optimism is explained as a personality disposition that reflects an expectation that good things can and will happen (positive future outcomes) whereas pessimism can be thought of as the expectation that bad things can and will happen (negative future outcomes) (Anshel et al., 2012; Scheier & Carver, 1992; Scheier & Carver, 1985). These are effectively differing ways in which individuals approach the world, some are more optimistic in their outlook and some are more pessimistic. There is accumulating evidence that suggests that dispositional optimism has a beneficial relationship with both physical and psychological wellbeing (Scheier, Carver, & Bridges, 1994). This creates interesting possibilities for examining the effect of dispositional optimism in an injury rehabilitation setting because there are both psychological and physical processes that an injured athlete goes through.

It has been suggested that the differences in physical and psychological outcomes is partially influenced by the different ways in which optimists and pessimists cope with the challenges in their lives, which for the purposes of this study is how they cope with an injury. The way in which optimists and pessimists differ revolves around optimists using more problem focused coping strategies than pessimists do, and when problem focused coping is not possible, optimists then normally use more adaptive emotion focused coping strategies (Carver et al., 1993; Matthews, Räikkönen, Sutton-Tyrrell, & Kuller, 2004; Scheier & Carver, 1985; Scou et al., 2005; Segerstrom, Taylor, Kemeny, & Fahey, 1998). Pessimists tend to cope by using denial and disengaging from goals that the stressor conflicting with both mentally and behaviourally (Scheier et al., 1994).

In terms of an injury process and the associated rehabilitation process that an athlete is going through it would be expected that this difference would be portrayed by an optimistic athlete to change the focus from their injury, to ways in which they can resolve the problem. This can be contrasted with people of a more pessimistic nature who would be more likely to try to ignore the injury and ignore the fact that the injury could potentially have a negative effect on their sport, both in competitions and in training. An individual's level of optimism appears to be trait like and relatively stable over time (Carver, Scheier, & Segerstrom, 2010). This should mean that the differences in approaches to injuries between individuals that are more optimistic in nature and individuals that are more pessimistic in nature should stay relatively constant also.

The outcomes of this process would be that you would expect athletes of a more optimistic nature to progress through the rehabilitation process in a smoother manner. This isn't to say that they will move through the process at a faster rate because this comes down to the severity of their injury but perhaps that they would be likely to use a coping strategy that would result in higher levels of rehabilitation engagement and adherence which in turn would have a beneficial effect on their rehabilitation process.

Kavussanu and McAuley (1995) examined the relationship between optimism and exercise and found that the highly active tend to have higher optimism levels than the less active. This suggests that athletes as a generalization may have higher levels of optimism, due to their increased levels of physical activity when compared to non-athletes (Venne, Laguna, Walk, & Ravizza, 2006). This could have an effect on the athlete's cognitive appraisal and coping process as well as influencing their rehabilitation. This concept wasn't supported by research conducted by Albinson and Petrie (2003) which found that dispositional optimism did not significantly predict primary and secondary appraisals. They had some large correlations but it was suggested that the failure to reach statistical significance could potentially be due to small sample size rather than an inadequate effect. If the limitation of the small sample size accounts for the inability to find a significant relationship it creates an interesting possibility for this study to expand upon this area of stress appraisal and coping research. It is possibly that even if dispositional optimism doesn't predict primary and secondary appraisal it could still have a relationship with rehabilitation adherence and rehabilitation engagement. Chang

(2002) found that dispositional optimism and appraised stress were significantly related to each other. However Scou et al. (2005) suggest that optimists may use different coping strategies when confronting stressful events than pessimists.

Tracey (2003) examined the emotional response to the injury and rehabilitation process in athletes. One of the findings from the study was that the cognitive appraisal of the participants greatly influenced their emotional response to the injury and rehabilitation process. The participants reported experiencing negative thoughts briefly at the onset of the injury coupled with feeling depressed, they then quickly summoned their resolve and optimism to work diligently during the rehabilitation phase. This is supported by the research performed in several other studies that found optimists confronting stressful situations experience less distress than pessimists (Epping-Jordan et al., 1999; Räikkönen, Matthews, Flory, Owens, & Gump, 1999; Schou, Ekeberg, Ruland, Sandvik, & Kåresen, 2004). The link between the findings of these studies revolves around utilizing optimism to reduce the experience of distress and to aid them during the injury rehabilitation process, which in turn should have a positive effect on the injury process as a whole. Scheier and Carver (1985) conducted a study that examined the concept that dispositional optimism acted as a buffer against stress. They found that optimists and pessimists employ different coping strategies when forced to face stressful situations. Optimism was positively correlated with active coping and seeking social support. As well as being inversely correlated with disengagement from the goal.

Gustafsson and Skoog (2012) found that optimism had a significant negative relationship with both stress and burnout. The findings of this study suggest that

individual factors, such as optimism, may play an important role in the development of burnout by virtue of their association with stress.

2.3 Rehabilitation Adherence

How an athlete perceives an injury can have an both a positive and a negative effect on how they cope with the injury, as well as effecting the athletes rehabilitation process (Albinson & Petrie, 2003). Rehabilitation will normally involve adherence to a form of treatment and is vital in achieving successful recovery from a sports injury (Taylor & Taylor, 1997). Sport injury patients adherence to their rehabilitation has been shown to have a positive influence on treatment success and the speed of recovery (Marshall, Donovan-Hall, & Ryall, 2012). There are a variety of differing definitions of rehabilitation adherence, with most sharing common themes.

Granquist, Gill, and Appaneal (2010) define rehabilitation adherence as the "behaviours an athlete demonstrates by pursuing a course of action that coincides with the recommendations of the athletic trainer" (p. 251). Brewer (1999) suggests that the concept of sport injury rehabilitation adherence can be broken down into two parts; the first is the adherence to clinic sessions, and the therapy that occurs in them, and the second part is the adherence to home based exercise programs and rehabilitation treatments that are performed by the athlete between treatment sessions. When considering rehabilitation adherence in this way it would some more likely that an injured athlete would experience higher adherence in the sessions that are supervised by the sports medicine professional. When the athlete is responsible for their own rehabilitation treatment in an unsupervised setting you would expect in most athletes that their adherence would be lower.

Bassett (2003) examined the rates of adherence to the home based component of physiotherapy treatment programs and the results suggest that 65% of patients will demonstrate some degree of non-adherence to their rehabilitation. Supporting this finding is the study performed by Larson et al. (1996) that found that injured athletes will typically experience treatment adherence problems. There have been numerous studies that have reported similar results (Arvinen-Barrow et al., 2007; Heaney, 2006; Lafferty et al., 2008; Leddy et al., 1994; Milne, Hall, & Forwell, 2005; Roh & Perna, 2000). Clement et al. (2013) conducted a study which suggests that one of the most common psychological responses to sports injury is treatment adherence issues. These studies serve to highlight the prevalence of treatment adherence issues in the sports injury rehabilitation context.

This is of concern to sports medicine professionals and researchers alike because adherence to the rehabilitation treatment programme is considered integral in achieving the desired optimal outcomes (Fisher, Mullins, & Frye, 1993). Rehabilitation adherence is acknowledged as being very important for attaining successful results in both the rehabilitation programme and for the athlete's return to play/competition outcomes (Bassett, 2003; Brewer et al., 2003; Niven, 2007). Clement et al. (2013) suggest that one could expect injured athletes to be highly motivated to attend rehabilitation sessions and perform unsupervised rehabilitation exercises in order to return to their sport participation as soon as possible. A lack of adherence could potentially be a signal that there is a deeper emotional response with which the injured athlete is unable to cope, and this should be addressed as a priority so as to allow for the best possible rehabilitation

treatment outcomes. This is supported by the findings of Arvinen-Barrow et al. (2007) who reported that poor treatment adherence was the most common identifying trait of an athlete who is not coping successfully with their injury.

Research has found that a factor influencing the success of the rehabilitation process is the injured athlete's commitment and engagement to the rehabilitation program (Fisher et al., 1993). The predictors of rehabilitation adherence have been the main focus of early investigations into sport injury rehabilitation. A number of variables have been identified that can be classified as either personal factors or situational factors (Brewer, 1998). Personal factors include pain tolerance, motivation, assertiveness and self-assurance. Situational factors are comprised of elements such as convenience, environment, perceived exertion, and belief in treatment efficacy (Brewer, 1998).

Granquist, Podlog, Engel, and Newland (2014) reported that poor levels of rehabilitation occur frequently in collegiate athletic training settings in the United States. Issues with rehabilitation adherence have been reported by a number of studies (Arvinen-Barrow et al., 2007; Bassett, 2003; Brewer, 1998; Heaney, 2006; Lafferty et al., 2008; Larson et al., 1996; Leddy et al., 1994; Milne et al., 2005; Roh & Perna, 2000). However even though rehabilitation adherence plays a very important role in ensuring a successful return to competition for an injured athlete, there has been limited amounts of data addressing rehabilitation adherence rates across time (Brewer, 1998; Byerly, Worrell, Gahimer, & Domholdt, 1994; Duda, Smart, & Tappe, 1989; Gould et al., 1997).

Johnston and Carroll (2000) found that athletes' perceived their injury recovery to be reduced towards the end of their rehabilitation process. This could have a potential effect on their rehabilitation adherence due to the effect that this perception could influence the factors that control an athlete's adherence. According to Wiese-bjornstal et al. (1998) this would be the cognitive and emotional responses that the athlete goes through as a result of their injury. These responses occur due to the interaction between both personal and situational factors that could potentially be influenced by the injured athlete's perceptions.

Daly et al. (1995) conducted research that examined cognitive appraisals and emotional adjustment in athletes. The findings of this study offer support to the use of cognitive appraisal models for understanding rehabilitation adherence. They suggest that injured athletes who suffer from psychological distress are more likely to miss rehabilitation sessions and to not perform their unsupervised rehabilitation exercises. This is supported by research performed by Arvinen-Barrow et al. (2007). However these findings are contradicted Brewer et al. (2000) who found no relationship between psychological distress and rehabilitation adherence.

Research that has been performed on injured athletes and their rehabilitation adherence has focused on the sport medicine professional's views of the injured athletes that they are treating. This does give insights into rehabilitation adherence but it has been found that patients and practitioners have differing views of health issues and monitor rehabilitation in different ways (St Claire, Watkins, & Billinghurst, 1996). This makes it important to consider the difference in

the patients view of their rehabilitation adherence, especially across time (Johnston & Carroll, 2000).

2.4 Rehabilitation Engagement

In an organizational setting engagement is viewed as the opposite of burnout (Schaufeli, 2006). This idea is drawn from a movement within the discipline of psychology that has been developing over the past 25 years; positive psychology. Positive psychology refers to the scientific study of human strength and optimal functioning (Seligman & Csikszentmihalyi, 2000). A positive psychology approach to sport injury rehabilitation places an emphasis on the patients abilities and strengths to promote positive adjustment to injury and injury rehabilitation (Chou, Chan, Phillips, & Chan, 2013).

When thinking about engagement in a workplace context, highly engaged employees have a strong sense of an effective and energetic connection with their work activates and they see themselves as being able to cope well with the demands of their role (Schaufeli, 2006). This type of work engagement is defined as a positive, fulfilling work-related mind-set which is characterized by vigour, dedication, and absorption (Schaufeli et al., 2002). In this context engagement refers to an affective-cognitive state that is not focused on any one object, event, individual, or behaviour. Schaufeli et al. (2002) defined the three aspects of engagement as follows; vigour, which is categorized by "high levels of energy and mental resilience while working, the willingness to invest effort in one's work, and persistence even in the face of difficulties" (p. 702), dedication, which is when one is "strongly involved in one's work and experiencing a sense of significance, enthusiasm, inspiration, pride, and challenge" (p.702), and absorption, which refers

to “being fully concentrated and happily engrossed in one’s work, whereby time passes quickly and one ha difficulties with detaching oneself from work” (p.702).

This explanation of engagement has strong parallels with engagement in a rehabilitation setting. Bright, Kayes, Worrall, and McPherson (2015) conducted a review of rehabilitation engagement and developed the following definition of rehabilitation engagement: “a co-constructed process and state. It incorporates a process of gradually connecting with each other and/or a therapeutic program, which enables the individual to become an active, committed and invested collaborator in healthcare.” (p.650). Defining engagement in this way suggests that engagement is a fluid internal state influenced by a number of factors including the rehabilitation practitioner. It is important to view engagement as a process rather than a static behaviour. This is an important distinction because a patient can move both towards a state of engagement, as well as move away from a state of engagement.

Research performed by Matthews et al. (2002) found that engagement can be viewed on a continuum with high engagement resulting in enthusiasm and interest, and low engagement resulting in apathy and indifference. High levels of engagement should be associated with increased involvement and participation in the patients’ rehabilitation. This supports the findings of Bright et al. (2015) to do with the fluid nature of rehabilitation engagement as well as highlighting the important effect that engagement can have on the rehabilitation process.

Patient engagement with rehabilitation is a topic that is being starting to be examined in much greater detail in both the rehabilitation setting, and the broader

healthcare setting (Horton, Howell, Humby, & Ross, 2011). It is of particular interest to researchers because studies have found that increased levels of engagement are associated with higher levels of rehabilitation affect, adherence, and attendance (Kortte et al., 2007; Lequerica et al., 2006). The opposite of this is also true, the benefits of rehabilitation engagement will be limited if the patients are not fully engaged in the rehabilitation process (Kortte et al., 2007; Medley & Powell, 2010). Any interference with the patient's capacity to become fully engaged in their recovery process can impede the progress towards functional improvement (Lequerica, Donnell, & Tate, 2009).

Disengagement or low levels of engagement are often portrayed as the patient's problem and the responsibility for this falls on the patient not the provider. But when viewing rehabilitation engagement as a holistic process it seems important to consider all factors that may influence the patient's engagement, including the role of the rehabilitation provider. It would be beneficial to look for ways to facilitate engagement between the patient and their rehabilitation. This is supported by research performed in differing settings such as education where engagement has been identified as needing connections between different parties and it is these connections that facilitate the engagement in the education process (Furlong & Christenson, 2008).

Approaching rehabilitation engagement in this manner challenges the traditional individualist viewpoint towards engagement, which presents engagement purely as the responsibility of the patient and a wholly internal trait (Maclean & Pound, 2000; Watkins, Shaner, & Sullivan, 1999).

If engagement has a positive effect on the patient's rehabilitation it could be argued that complete and total engagement should be the desired outcome for all patients in a rehabilitation setting. It isn't known if this level of engagement is necessarily required for all injured individuals (Bright et al., 2015). However it is possible that in certain circumstances or certain settings a lower level of rehabilitation engagement might still have the desired effect on the rehabilitation outcomes. If engagement is viewed on a continuum there is no clearly defined threshold that is the point where maximum positive rehabilitation outcomes for the patient occur.

Lequerica et al. (2009) performed research that found rehabilitation engagement to be an important consideration when working with rehabilitation patients, due to the positive effects high levels of engagement had on patient's rehabilitation. This research was conducted using the sports medicine professional as respondents to complete questionnaires on their experiences of their patients. They also found that patient engagement was influenced by attitudes towards rehabilitation (cognitive appraisal), and a range of environmental factors.

Existing measures of rehabilitation engagement are predominantly completed by the practitioner (Bright et al., 2015). It is possible that a patient is entirely engaged in their rehabilitation process but do not display the signs of engagement that the practitioner is used to seeing. This could result in difficulties when using rating scales of engagement that are scored by the practitioner with the ratings assigned to the patient. It could be argued that practitioners are not well positioned to judge engagement due to the subjective nature of the internal

aspects of engagement. It is possible that the practitioners view of their patients engagement is at best a partial view and at worst it could be totally inaccurate (Chase et al., 2012). A study performed by Meltzer, Steinmiller, Simms, Grossman, and Li (2009) examining staff engagement in a medical setting found that clinician engagement could be influenced by their perception of the patient and the patient's behaviour. This clearly demonstrates the effect that the clinicians perceptions can influence there evaluation of the patients engagement.

A change in the way that engagement is measured in a rehabilitation context would be beneficial. Due to the non-static nature of engagement it would be beneficial to measure engagement across multiple time points. (Bright et al., 2015). A more comprehensive model of patient engagement is needed to take into account more than just direct influencing factors. It should also include environmental factors that influence the patient (Lequerica et al., 2009). This idea is supported by the integrated model of psychological response to the sport injury and rehabilitation process (as discussed in section 2.1) (Wiese-bjornstal et al., 1998).

2.5 Purpose of Current Study

The purpose of the present study is to examine the relationship between an athlete's rehabilitation engagement, rehabilitation adherence, their appraisal and coping process, and optimism. As discussed, most of the literature has focused on time loss injuries and hasn't examined stress appraisal, coping, optimism, rehabilitation engagement, and rehabilitation adherence, as a holistic process.

2.6 Research Questions

1) Is there a relationship between rehabilitation adherence and optimism, injury appraisal, and coping?
2) Is there a relationship between rehabilitation engagement and optimism, injury appraisal, and coping?
3) Is there a relationship between rehabilitation adherence and rehabilitation engagement?
4) Does rehabilitation adherence and rehabilitation engagement change over time?

3 Methodology

3.1 Participants

The population used for this study was recruited from injured athletes. Athletes had to be over 18 years of age to satisfy this studies Massey University Human Ethics Committee: Northern ethics approval. The athletes had to be currently suffering from an injury and receiving treatment from a sports medicine professional e.g. physiotherapist, sports doctor, podiatrist etc., at the time of volunteering to take part in the study. The injury that the participants were suffering from had to have had a negative effect on their normal training and/or competition schedule of at least three days. This is supported by research performed by Malinauskas (2010) which classified a “minor” injury as one that contributed to a loss of participation for less than one week. The loss of participation definition used by Malinauskas (2010) was changed to a negative effect for the purposes of this study after consulting with a range of sports medicine professionals about effects of injuries on athletes and the effect that this would have on participant recruitment.

3.2 Procedures

The Massey University Human Ethics Committee: Northern was approached for ethical approval and the project was approved in July 2014.

The participants were recruited by using email advertisements that were sent out to potential participants via the Athletics Auckland email database, through referral from their sports medicine professional or through word of mouth

recruitment. In all instances the potential participant either approached the researcher directly or agreed when approached by the researcher to give the researcher their contact details. The researcher contacted sports medicine professionals and sent them copies of the study's information letter, fact sheet and consent letters to pass onto interested clients and ask them to make contact with the researcher.

When a potential participant made contact with the researcher they were asked to read the study's information letter and if they were satisfied with the information in the letter and had all their questions satisfactorily answered by the researcher, they were asked to complete the consent form and to give the researcher their email address.

Upon agreeing to take part and completing the study's consent form the participant was sent a link via email to the first set of questionnaires that asked demographic questions, and examined the athletes dispositional optimism, their injury appraisal and injury coping methods.

One week after the link to the first set of questionnaires was sent to the participants a link to the second set of questionnaires was sent to the participants via email. These questionnaires examined the participant's rehabilitation adherence and their rehabilitation engagement. This set of questionnaires was sent to the participants weekly for a period of eight weeks.

The length of the study was set to 8 weeks as suggested by Wesch et al. (2012) and to expand upon the work performed by Albinson and Petrie (2003) who

examined pre injury and post injury stress, coping, personality, mood state, and rehabilitation adherence over a period of 28 days post injury.

Upon completion of the participants involvement in the study they were sent a debrief email thanking them for taking part. All participants were set a summary of the results of the study when the results had been analysed and if the participants requested it they would be sent a full copy of the results.

The questionnaires were delivered and managed using the Qualtrics Online Survey Software package of Qualtrics, using an existing Massey University School of Psychology Qualtrics licence. The participant's completion of questionnaires was tracked using a Microsoft Excel (2013) spread sheet that was maintained by the researcher.

3.3 Measures

3.3.1 Appraisal and coping questionnaire.

The Appraisal and Coping Questionnaire was developed by Shoji, Harrigan, Woll, and Miller (2010). It was designed to assess participants responses to an anxious experiences, cognitive appraisals during anxious events, and activities engaged into to cope with the anxiety. It was created to allow the researchers to examine specific activities to cope with anxiety at the moment of the situations (Shoji et al., 2010). This is important for this study because it allows the researcher to examine the injured athlete's appraisal and coping mechanisms with regards to their injuries whilst they are injured rather than looking back and filling out the questionnaires retrospectively.

The Appraisal measure was made up of 5 sub scales that were comprised of 33 items. The Coping measure was made up of 3 sub scales that were comprised of 19 items. Responses were provided to both measures on a 9 point scale anchored by '0 = not at all' and '8 = very'.

3.3.2 Life orientation test revised.

The Life Orientation Test Revised (LOT-R) is a brief modified version of the original Life Orientation Test (LOT) which was developed to assess individual differences in generalized optimism versus pessimism (Scheier & Carver, 1985; Scheier et al., 1994). The Lot-R scale contains 10 items which are comprised of three positively worded (e.g. 'In uncertain times, I usually expect the best'), three negatively phrased (e.g. 'If something can go wrong for me, it will'), and four filler items (e.g. 'It is easy for me to relax'). Responses were provided on a 5-point scale, anchored by 1'I disagree a lot' and 5'I agree a lot'. Earlier research has indicated the validity of using the LOT-R with athletes (Brannan, Petrie, Greenleaf, Reel, & Carter, 2009; Venne et al., 2006).

Scheier et al. (1994) have provided support for the validity and reliability of the LOT-R by calculating that it is has a Cronbach's alpha for the 6 items of the scale of .78 which suggests the scale has an acceptable level of internal consistency. The test-retest correlations were .68, .60, .56 and .79 which suggest that the scale is stable across time.

3.3.3 Rehabilitation adherence questionnaire.

The Rehabilitation Adherence Questionnaire (RAQ) is being used to enable the self-assessment of adherence to a rehabilitation program during the course of this study (Fisher et al., 1998). It was redeveloped by Shin, Park, Song, Kim, and Kwon (2010) to address issues with the original RAQ. The issues were; there was no confirmed reliability and validity data, and the factorial validity of the RAQ was unavailable due to the small sample size used in the development of the scale (Brewer, Daly, Van Raalte, Petitpas, & Sklar, 1999). The redeveloped RAQ consists of twenty five questions across six sub-scales, 'Support from Significant Others', 'Pain Tolerance', 'Scheduling', Self Motivitation', 'Perceived Exertion' and 'Environmental Conditions'. Responses were provided on a 4-point scale, anchored by 1 'Strongly disagree' and 4 'Strongly agree'.

Shin et al. (2010) found for the validity and reliability of the RAQ that it had a Cronbach's alpha for the six scales of .82, .79, .87, .83, .86 and .79 which suggests the scales have acceptable levels of internal consistency. The psychometric properties of the RAQ in the Shin et al. (2010) study were consistent with previous studies performed by Fisher et al. (1998) and Brewer et al. (1999).

3.3.4 Utrecht work engagement scale-9.

The Utrecht Work Engagement Scale (UWES-9) is a short questionnaire designed to measure work engagement. Engagement is a positive work related state of fulfilment that is characterized by absorption, dedication and vigour (Schaufeli et al., 2002). The UEWS-9 is comprised of nine items that measure three

scales ‘Vigour’, ‘Dedication’ and ‘Absorption’. Responses were provided across a 7 point scale, anchored by ‘0 = Never’ and ‘9 = Always’. For the purposes of this study the UWES-9 was modified slightly by the researcher, instead of the 9 items referring to ‘work’ and ‘my job’ they were changed to ‘my treatment sessions’, ‘treatment’, ‘rehabilitation’ and ‘rehabilitation exercises’. This was done so that the UWES-9 could be used in a novel situation examining injured athletes engagement with their rehabilitation.

Schaufeli, Bakker, and Salanova (2006) found that the Cronbach’s Alpha scores for UWES-9 ranged between .85 to .92 depending upon the country that the sample had been drawn from which suggests the measure has an acceptable level of internal consistency. The correlations between the sub scales of the UWES-9 and the sub scales in the original 6 item scale ranged from .83 to .90 which suggest that the shorter UWES-9 is an accurate measure of the ‘Vigour’, ‘Dedication’ and Absorption’ sub scales (Schaufeli et al., 2002).

3.4 Analyses

The data from the study was analysed using IBM SPSS for Windows, version 22.0 (released 2013). Firstly, the descriptive statistics were calculated (means and standard deviations) for the overall scores for the cognitive appraisal measure, coping measure, optimism measure, rehabilitation adherence measure, and the rehabilitation engagement measure. The means and standard deviations were also calculated at the subscale level for the cognitive appraisal measure, the coping measure, the rehabilitation adherence measure, and the rehabilitation engagement measure.

Then internal consistency analyses were conducted on all scales. The Cronbach's alpha value was used to examine reliability on all scales, as well as the reliability at the subscale level (Cronbach, 1951).This allowed for the identification and removal of items that were decreasing the consistency of measurement in any of the scales. After such items were identified and removed the reliability analysis was performed again. The internal consistency analyses were also performed at each time point for the rehabilitation adherence and rehabilitation engagement measures.

After this the data was examined by conducting exploratory analyses that described how individuals' scores in the data set change over time for rehabilitation adherence and rehabilitation engagement (Singer & Willett, 2003). As suggested by Singer and Willett (2003) this was done by; creating empirical growth plots, superimposing smooth nonparametric summaries on the empirical growth plots, then superimposing ordinary least squares trajectories on empirical growth plots, then comparing the collection of fitted ordinary least squares trajectories and smooth nonparametric trajectories, and then two fitted individual growth trajectories were created (for athletes who competed at social and competitive levels).

Correlation analysis using the Pearson product-moment correlation coefficient was used to determine the extent of a linear relationship between variables (Howell, 2013). All variables were correlated with each other to determine relationships.

To examine rehabilitation adherence and rehabilitation engagement changes across time individual growth parameters were obtained by fitting separate within-person ordinary least squares regression models for the target variables (rehabilitation adherence and rehabilitation engagement) as a function of linear time (Singer & Willett, 2003).

4 Results

4.1 Descriptive Statistics

Means and standard deviations of the studies variables are shown in Table 1. The mean score of Cognitive Appraisal ($\hat{x}$ = 103.86, SD = 22.58) sits approximately in the middle of the range of possible scores, which range from a minimum of 0 to a maximum of 240. The Cognitive Appraisal subscales all had mean scores sitting approximately in the middle of the possible scores on their respective scales (refer to Table 1). However the Others Expectations ($\hat{x}$ = 8.59, SD = 10.33) subscale mean score is at the lower end of the scale which ranges from a minimum of 0 to a maximum of 48.

The mean score for Coping ($\hat{x}$ = 55.05, SD = 18.54) was towards the lower end of possible scores on the scale which range from 0 to a maximum score of 99. The mean scores and standard deviations for the Mental Positives, Mental Restraint, and Inefficient Confrontation subscales are all presented in Table 1.

Optimism had a mean score with $\hat{x}$ = 22.27 (SD = 3.43).This is approximately two thirds of the total maximum score of 35, with the minimum score being 6.

The mean score for Rehabilitation Adherence ($\hat{x}$ = 31.16, SD = 13.20) was almost halfway between the minimum score for the scale of 18 and the maximum score of 72. At the subscale level the mean scores were all very similar, as seen in Table 1.

The mean Rehabilitation Engagement total score ($\hat{x}$ = 3.07, SD = 1.05) was very close to the three subscales mean scores; Vigour, Absorption, and Dedication (refer to Table 1).The range of the rehabilitation engagement total score as well as

the range of the subscales scores was from a minimum of 0 to a maximum of 6.

Table 1.

Descriptive Statistics of all Measurement Variables

	N	$\hat{x}$	Std. Deviation
Cognitive Appraisal	22	103.86	22.58
Unthreatening Behaviour	22	26.09	5.34
Avoidance of Situations	22	24.23	4.36
Concerns about Outcomes	22	28.23	6.89
Negative Appraisals	21	17.52	6.21
Others Expectations	22	8.59	10.33
Coping	22	55.05	18.54
Mental Positives	22	30.09	8.48
Mental Restraint	22	13.64	10.76
Inefficient Confrontation	22	11.32	7.23
Optimism	22	22.27	3.43
Rehabilitation Adherence	23	31.16	13.20
Support from Significant Others	21	2.67	0.21
Pain Tolerance	21	2.25	0.40
Scheduling	21	2.15	0.41
Self-Motivation	21	2.33	0.22
Physical Exertion	21	2.59	0.34
Environmental Conditions	21	2.32	0.51
Rehabilitation Engagement	21	3.07	1.05
Vigour	21	3.01	1.06
Absorption	21	3.47	1.16
Dedication	21	3.39	1.18

4.2 Reliability Analysis

Internal consistency analyses were conducted on all scales. Decisions on item inclusion were made using negative corrected item-total correlations and followed by a Cronbach's alpha test after item deletion to ensure reliability (Nunnally & Bernstein, 1994).

Table 2 present the reliability coefficients for the Rehabilitation Adherence Questionnaire (RAQ) and the Modified Utrecht Work Engagement Scale (UWES) across each time point. The values in Table 2 for each questionnaire were calculated using all of the scales items at each time point. Some of the RAQ reliability results were unsatisfactory, with the internal consistencies ranged from α = .40 to α = .51. However the reliability results for the RAQ at time points 5,6, and 8 were acceptable (refer to Table 2). The UWES internal consistency values ranged from α = .80 to α = .91, which were satisfactory. The decision about the internal consistency values being satisfactory or not was based on a recommended criterion level of .70 (Nunnally & Bernstein, 1994).

Table 2.

Reliability Coefficients of the Rehabilitation Adherence Questionnaire (RAQ) and Modified Utrecht Work Engagement Scale (UWES) using All Items at Each Time Point

	Time 1	Time 2	Time 3	Time 4	Time 5	Time 6	Time 7	Time 8
RAQ	.40	.46	.50	.49	.70	.71	.56	.71
UWES	.85	.91	.88	.91	.91	.90	.89	.80

To examine the reliability of the scale's in more detail, the Cronbach's alpha values for the RAQ and UWES were calculated at the sub scale level across time, as presented in Table 3. The UWES subscale reliability results were acceptable using the criterion level of .70 (Nunally & Bernstein, 1994). With only two time points for the Vigour subscale scoring below this criterion. However the majority of the RAQ subscale reliability results were below the criterion level of .70 (Nunally & Bernstein, 1994) and some of the values were negative, or above 1.

Table 3.

Subscale Reliability Coefficients of the RAQ and UWES Using All Items at Each Time Point

		Time 1	Time 2	Time 3	Time 4	Time 5	Time 6	Time 7	Time 8
RAQ									
	Support from Significant Others	-.50	.30	.23	-.14	.02	-.59	-1.46	-.89
	Self-Motivation	-2.25	-2.07	-.53	.14	.12	.40	.22	-.08
	Scheduling	-.90	.38	-.19	.21	.22	.53	.36	.32
	Pain Tolerance	.58	.66	.58	.56	.73	.71	.77	.78
	Perceived Exertion	.64	.64	.52	.71	.68	.56	.45	-.73
	Environmental Conditions	.78	.63	.48	.45	.43	-.04	-3.00	-.61
UWES									
	Vigour	.52	.49	.69	.75	.87	.76	.80	.79
	Dedication	.70	.84	.73	.70	.81	.87	.86	.59
	Absorption	.80	.88	.72	.92	.83	.80	.85	.79

There were internal consistency issues of the RAQ, which were; the low reliability coefficients in the RAQ using the total scores at each time point (as seen in Table 2), and the negative reliability coefficients as seen in Table 3. To address

these issues the items with negative corrected item-total correlations were removed from the analyses. The purpose of this was to increase the reliability coefficients of the subscales, and to increase the reliability coefficients for the RAQ total scores. The items that were removed from the RAQ were; Support from Significant Others subscale: Items 1 and 4; Self-Motivation subscale: Items 1 and 5; Scheduling subscale: Item 4; and Pain Tolerance subscale: Items 1 and 5. After the items with negative corrected item-total correlations were removed, the reliability results as presented in Table 4 were found. These results refer to the RAQ scale as a whole at each time point. The internal consistencies ranged from average (α = .63) to good (α = .80).

Table 4.

Reliability Coefficients of the RAQ After Items With Negative Corrected Item-Total Correlations Were Removed at Each Time Point

	Time 1	Time 2	Time 3	Time 4	Time 5	Time 6	Time 7	Time 8
RAQ	.69	.69	.74	.63	.80	.78	.65	.81

Then to examine the RAQ's reliability in greater detail the Cronbach's alpha values were calculated at the subscale level after the items with negative corrected item-total correlations were removed, as presented in table 5. These Cronbach's Alpha values for the subscales across time were still below an acceptable threshold so it was decided to not examine the RAQ data at the subscale level (Nunnally & Bernstein, 1994).

Table 5.

Subscale Reliability Coefficients of the RAQ at Each Time Point With Negative Corrected Item-Total Correlations Removed

	Time 1	Time 2	Time 3	Time 4	Time 5	Time 6	Time 7	Time 8
Support from Significant Others	.13	.50	.33	-.57	.12	-.31	-1.85	-.76
Self-Motivation	.42	.48	.40	.29	.63	.65	.76	.81
Scheduling	.70	.81	.80	.83	.78	.92	.93	.88
Pain Tolerance	.70	.56	.55	.47	.78	.79	.60	.66
Perceived Exertion	.64	.64	.52	.71	.68	.56	.45	-.73
Environmental Conditions	.78	.63	.48	.45	.43	-.04	-3.00	-.61

The Cronbach's alpha values for the optimism, appraisal, and coping questionnaires were also calculated. Table 6 presents these results; all three measures had a satisfactory level of reliability.

Table 6.

Reliability of the Optimism, Appraisal, and Coping Questionnaires

Optimism	Appraisal	Coping
.67	.79	.78

4.3 Data Exploration

4.3.1 Rehabilitation adherence.

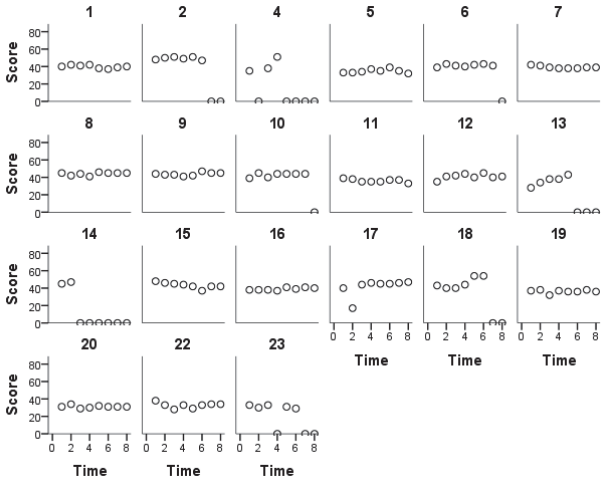


Figure 3. Empirical growth plots for 21 participants' total rehabilitation adherence score changes over time.

Inspection of Figure 3 suggests that rehabilitation adherence scores stay reasonably constant across the 8 week period that the questionnaires were completed. Subjects 2, 4, 6, 10, 13, 14, 18 and 23 did not complete the rehabilitation adherence questionnaire every week so their data reflects this with scores of zero in the weeks that they did not complete. Most participants sit in approximately the middle of the outcome scale, with the highest possible score being 64 for each time point in the rehabilitation adherence questionnaire.

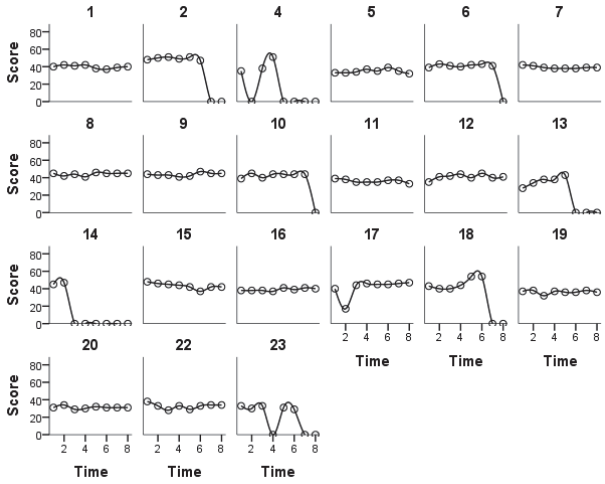


Figure 4. Smooth nonparametric trajectories superimposed on empirical growth plots for participants' total rehabilitation adherence scores. Showing smooth nonparametric summaries of how individuals change over time.

Figure 4 plots the rehabilitation adherence empirical growth records and superimposes a smooth nonparametric trajectory. The trajectories reinforce the initial conclusion that rehabilitation adherence scores stay reasonably constant across the 8 week period that the questionnaires were completed. Subjects 1, 5, 7, 8, 9, 11, 15, 19, 20 and 22 all have very similar shaped smooth nonparametric trajectories. Both subject 13 and subject 18 show smoothed trajectories that are curving upwards, however subject 13 starts at a lower estimated intercept than subject 18. Across subjects there seems to be a limit of the highest scores being around 50 with no subject getting close to the maximum time point score of 64. The overall pattern of change appears to be curvilinear with reasonably smooth changes. Most of the non-smooth changes can be accounted for by the fact that the subjects haven't completed the questionnaire across all time points, whenever the data points are zero it means the participant didn't complete the questionnaire at that particular time point.

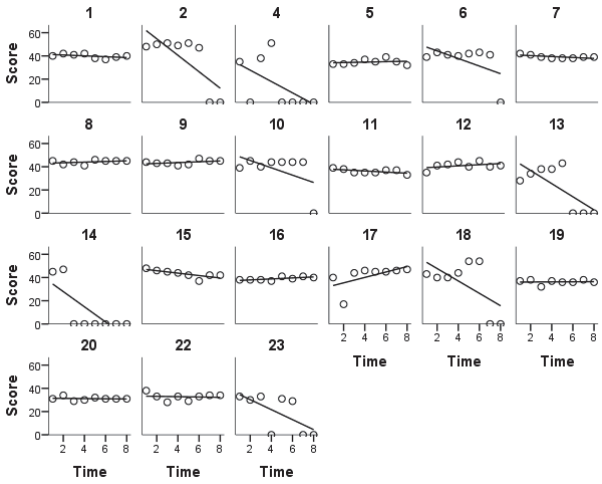


Figure 5. Empirical growth plots for participants' total rehabilitation adherence scores with fitted OLS trajectories overlaid, displaying change over time.

Figure 5 super imposes each participants fitted ordinary least squared (OLS) trajectory on their empirical growth plot. For subjects 1, 5, 7, 9, 11, 16, 19, and 20, the linear change model fits their results well; the observed and fitted values match closely. For some of the other subjects a linear change trajectory may also be reasonable, in this case subjects 8, 12, 15 and 22. However subjects 2, 4, 6, 10, 13, 14, 17, 18, and 22, the observed and fitted values are more disparate. Subject 17's empirical growth record may suggest that their change over time may fit a curvilinear model better. Subjects 2, 4, 6, 10, 13, 14, 18 and 23 all have missing data at certain time points. This undoubtedly has an effect on the fitted OLS trajectory, in all these cases it results in a strong downwards slope for the linear change trajectory.

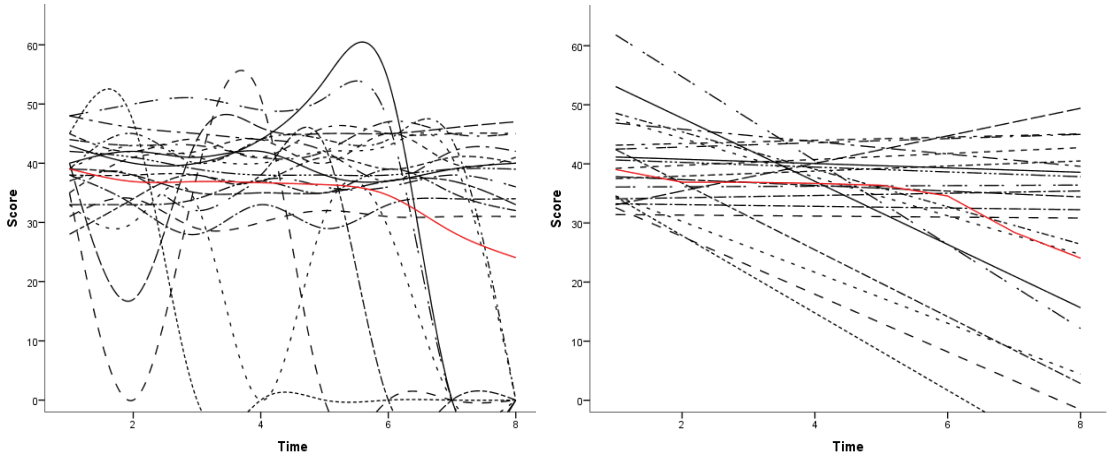


Figure 6. Comparing the collections of smooth nonparametric and fitted OLS trajectories across participants' total rehabilitation adherence scores. Presenting average change trajectories for the both the smooth nonparametric and fitted OLS trajectories. Panel A displays all participants' smooth nonparametric trajectories. Panel B displays all participants' fitted OLS trajectories.

The left panel of Figure 6 presents 21 participants' rehabilitation adherence scores smoothed individual trajectories using a smooth nonparametric trajectory and the right panel represents a similar display using OLS regression methods. In both panels the observed data has been omitted to decrease clutter. The line in red is an average change trajectory for the entire group. Both panels suggest that on average the change in rehabilitation adherence behaviour is negative over time. This suggests that as time passes from an injury the athlete gradually behaves in a less adherent way to their injury rehabilitation. Panel A's smooth nonparametric trajectories present large changes in rehabilitation adherence scores, these changes appear more dramatic than they otherwise might due to the time points with missing data. These time points result in large changes in some of the smooth nonparametric trajectories.

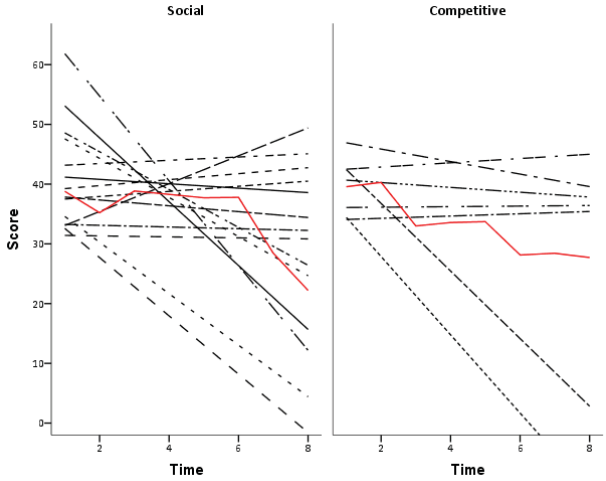


Figure 7. Identifying potential predictors of change by examining fitted OLS trajectories for participants' total rehabilitation adherence scores displayed separately by level of sport competition. With average trajectories in red.

Figure 7 presents OLS fitted individual growth trajectories separately by the subject's level of sport that they compete in. The red trajectory in each panel depicts the average trajectory for each sub group; Social or Competitive. When comparing groups it seems that there is more variation in the slope of the trajectories within the social group (depicted in the left panel) than the competitive group (right panel). There is also more variation among the intercepts for the social group compared to the competitive group, but this could be due to greater numbers in the social group. It appears that on the whole subjects with a higher intercept are more likely to have a decrease in their rehabilitation score over time. Whereas subjects with a score closer to the midpoint are more likely to either increase their rehabilitation adherence scores over time or at least remain reasonably constant. The subjects with the strong negative sloping trajectories are the ones that did not complete all off the data collection points, so the missing time points may result in the negative slopes that are displayed in this figure.

4.3.2 Rehabilitation engagement.

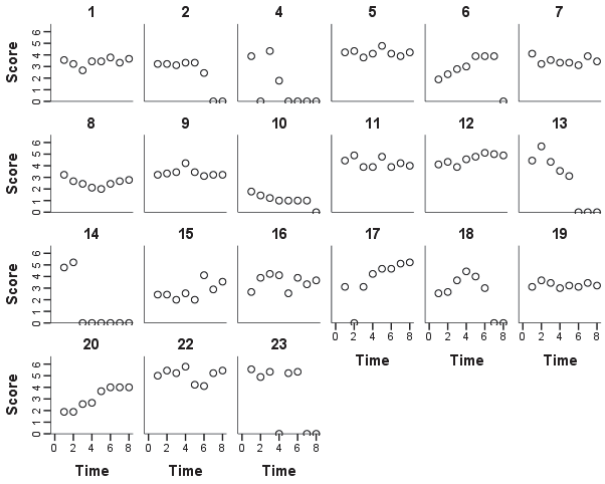


Figure 8. Empirical growth plots for 21 participants' total rehabilitation engagement scores changes over time.

Figure 8 presents the individuals in this studies rehabilitation engagement scores over time. There is a small amount of missing data from participants 2, 4, 6, 10, 13, 14, 17, 18, and 23. This is shown by the data points being on zero, which means there was no response at that time point. Subjects 1, 2, 5, 11, and 19's engagement scores are reasonably consistent across time. Subjects 6, 12, 15, 17, and 20 all show an increase in rehabilitation engagement scores across time, with subjects 7, 10, and 13 showing a decrease over time. Subject 8's results are interesting because the rehabilitation engagement scores decrease across time till about the mid-point of the study before starting to gradually increase. Subject 9 is the opposite to this, their rehabilitation engagement scores increase up until have the mid-point of the study with a slight peak and then decrease back down to the original level.

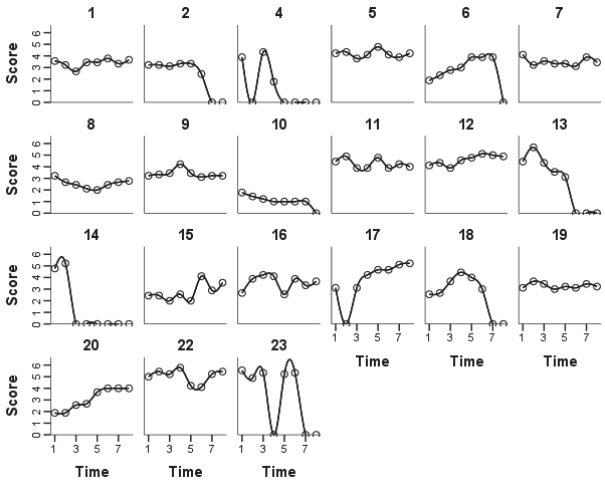


Figure 9. Smooth nonparametric trajectories superimposed on empirical growth plots for participants' total rehabilitation engagement scores. Showing smooth nonparametric summaries of how individuals change over time.

Figure 9 plots the rehabilitation engagement empirical growth records and superimposes a smooth nonparametric trajectory on them. The trajectories support the general trend analysis presented in the previous paragraph, as well as suggesting that there is no overall conclusion that fits all of the engagement data. Subject 8 and subject 9 both have engagement scores that start at similar intercepts however subject 8's decrease and then increase, whereas subject 9's increase and then decrease. Subject 6, 15, 17, and 22's engagement scores all increase in a clear manner across time. Whilst there are similarities between some of the smooth nonparametric trajectories in figure 7, there is no one shape of trajectory that is more common than any other.

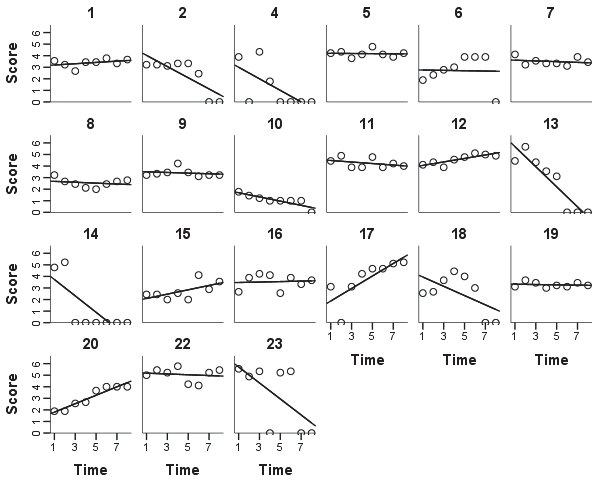


Figure 10. Empirical growth plots for participants' total rehabilitation engagement scores with fitted Ordinary least squares (OLS) trajectories overlaid, displaying change over time.

Figure 10 shows each individual subject's rehabilitation engagement scores with an OLS trajectory fitted to their empirical growth plot. Some of the OLS trajectories have been influenced by the missing data, making their slopes more severe than they perhaps might have been. For subject's 1, 5, 7, 10, 12, 19, and 20 the linear change model fits well. For subjects 6, 8, 9, 11, 13, 15, 16, 17, 18, and 22 the observed and fitted values are more dissimilar. This can be seen in the way that the fitted trajectories are not a particularly accurate fit for the data, they are not successfully predicting the individuals change over time. These participants' empirical growth records suggest that their rehabilitation engagement change over time might fit a curvilinear model better.

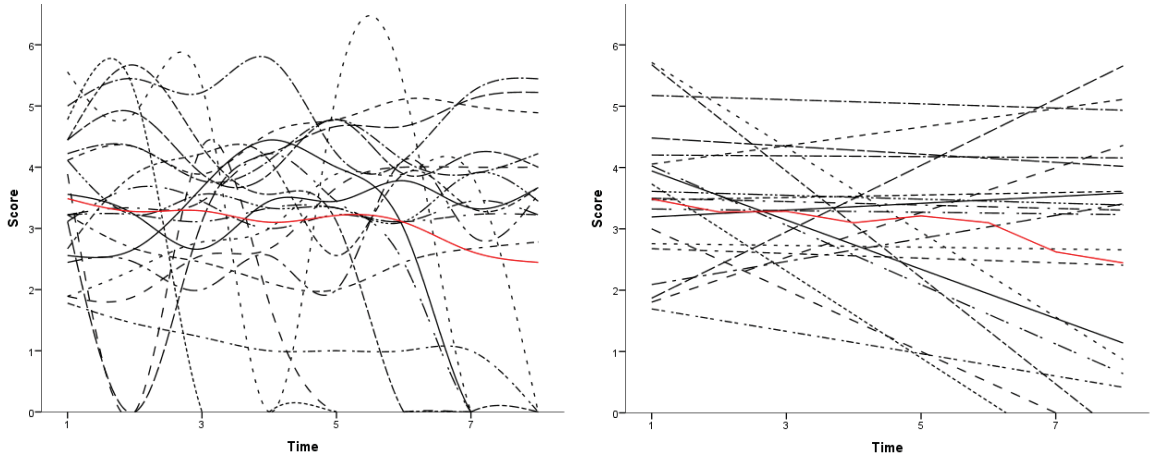


Figure 11. Comparing the collections of smooth nonparametric and fitted OLS trajectories across participants' total rehabilitation engagement scores. Presenting average change trajectories for the both the smooth nonparametric and fitted OLS trajectories. Panel A displays all participants' smooth nonparametric trajectories. Panel B displays all participants' fitted OLS trajectories.

When examining Figure 11 and comparing Panel A to Panel B it seems that the average change trajectory for the fitted OLS trajectories (Panel B) is a better fit for the data than the trend line in Panel A. Panel B's trajectories are sitting in a more compact grouping than the trajectories in Panel A, which is reflected in how accurately the average change trajectories predict the group data. But both Panel A's and Panel B's average change trajectories are predicting the same change on rehabilitation engagement as time passes. The intercepts for the average change trajectories are very similar, as are the end points. Both the left and right panels suggest that on average the change in rehabilitation engagement is decreasing across time. This could be interpreted to mean that after an injury, as time passes, an athlete will gradually behave in a less engaged manner towards their injury rehabilitation.

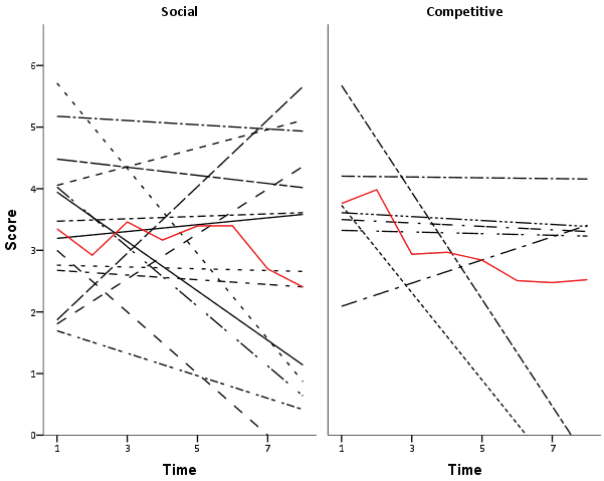


Figure 12. Identifying potential predictors of change by examining fitted OLS trajectories for participants' total rehabilitation engagement scores displayed separately by level of sport competition. With average trajectories in red.

When looking at Figure 12 and comparing the social group to the competitive group it appears that there is more variation in the slope of the fitted OLS trajectories in the social group (the left panel) when compared to the competitive group (the right panel). This is similar to the variation displayed in rehabilitation adherence (refer to Figure 7). There is also more variation in the intercepts of the social group when compared to the competitive group. These differences could be due to the differing approaches to their injuries that social athletes may have when approaching rehabilitation engagement compared to competitive athletes. Or it could be due to the larger number of athletes in the social group. This figure suggests that subjects with a lower intercept are more likely to have an increase in their engagement score over time or at least a more minimal decline in their rehabilitation engagement. As well as suggesting that athletes with a higher estimate are more likely to have a decrease in their

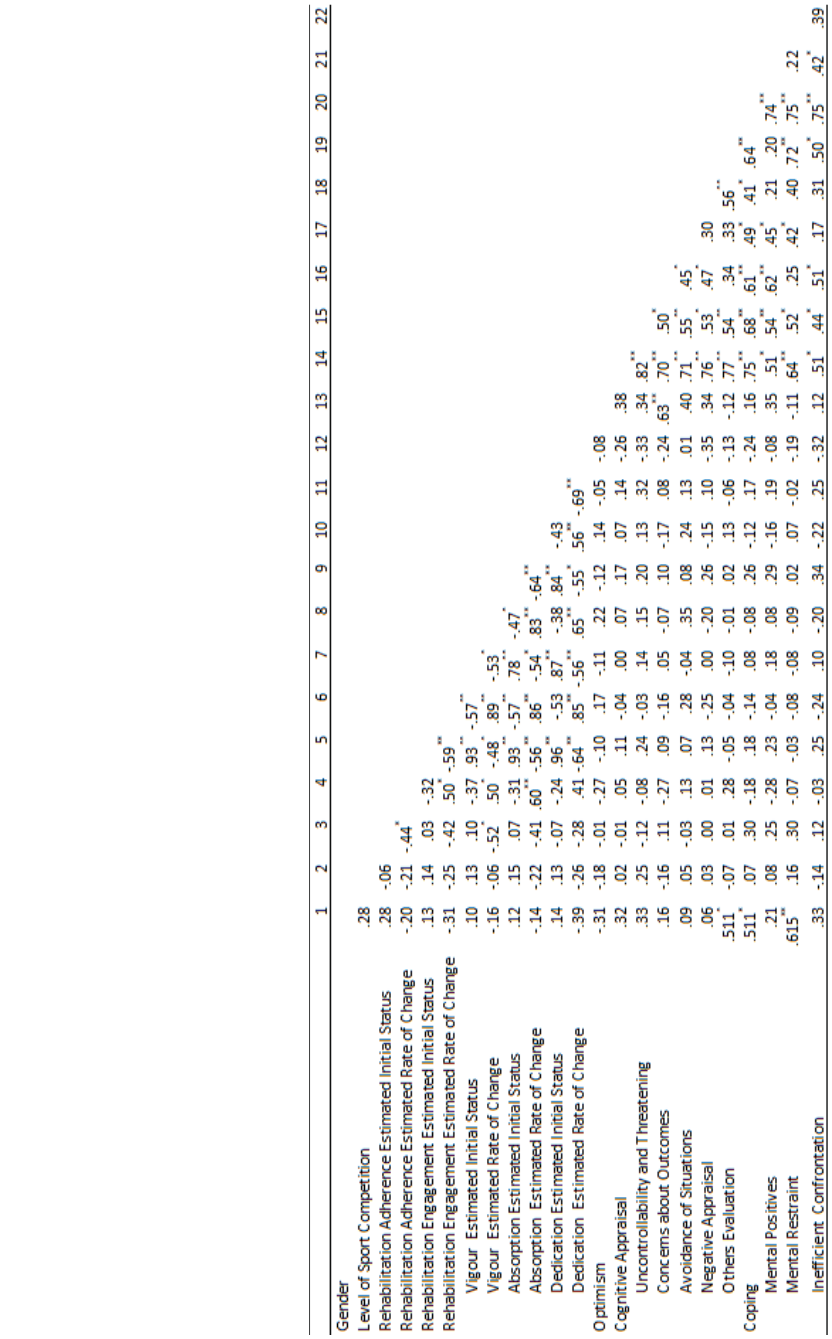
engagement score over time. Subject's with an intercept around the midpoint of the score axis seem more likely to have either a small increase or decrease in their rehabilitation engagement, with the subject's that have large differences normally having intercepts at the higher or lower ends of the score axis.

4.4 Correlation Analysis

The bivariate correlation matrix shown in Table 7 displays the Pearson product-moment correlation coefficients for each of the variables in this study. The correlations in Table 7 range from weak to strong (.004 to .964) with a number of statistically significant correlations.

Table 7.

Bivariate Correlation Matrix for Target Variables in Study



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Gender	.28																					
Level of Sport Competition	.28	-.06																				
Rehabilitation Adherence Estimated Initial Status	-.20	-.21	-.44*																			
Rehabilitation Adherence Estimated Rate of Change	.13	.14	.03	-.32																		
Rehabilitation Engagement Estimated Initial Status	-.31	-.25	-.42	.50*	-.59**																	
Rehabilitation Engagement Estimated Rate of Change	.10	.13	.10	-.37	.93**	-.57**																
Vigour Estimated Initial Status	-.16	-.06	-.52*	.50*	-.48*	.89**	-.53*															
Vigour Estimated Rate of Change	.12	.15	.07	-.31	.93**	-.57**	.78**	-.47*														
Absorption Estimated Initial Status	-.14	-.22	-.41	.60**	-.56**	.86**	-.54*	.83**	-.64**													
Absorption Estimated Rate of Change	.14	.13	-.07	-.24	.96**	-.53	.87**	-.38	.84**	-.43												
Dedication Estimated Initial Status	-.39	-.26	-.28	.41	-.64**	.85**	-.56*	.65**	-.55*	.56*	-.69**											
Dedication Estimated Rate of Change	-.31	-.18	-.01	-.27	-.10	.17	-.11	.22	-.12	.14	-.05	-.08										
Optimism	.32	.02	-.01	.05	.11	-.04	.00	.07	.17	.07	.14	-.26	.38									
Cognitive Appraisal	.33	.25	-.12	-.08	.24	-.03	.14	.15	.20	.13	.32	-.33	.34	.82**								
Uncontrollability and Threatening	.16	-.16	.11	-.27	.09	-.16	.05	-.07	.10	-.17	.08	-.24	.63**	.70**	.50*							
Concerns about Outcomes	.09	.05	-.03	.13	.07	.28	-.04	.35	.08	.24	.13	.01	.40	.71**	.55**	.45*						
Avoidance of Situations	.06	.03	.00	.01	.13	-.25	.00	-.20	.26	-.15	.10	-.35	.34	.76**	.53*	.47*	.30					
Negative Appraisal	.511*	-.07	.01	.28	-.05	-.04	-.10	-.01	.02	.13	-.06	-.13	-.12	.77**	.54*	.34	.33	.56**				
Others Evaluation	.511*	.07	.30	-.18	.18	-.14	.08	-.08	.26	-.12	.17	-.24	.16	.75**	.68**	.61**	.49*	.41*	.64**			
Coping	.21	.08	.25	-.28	.23	-.04	.18	.08	.29	-.16	.19	-.08	.35	.51*	.54*	.62**	.45*	.21	.20	.74**		
Mental Positives	.615**	.16	.30	-.07	-.03	-.08	-.08	-.09	.02	.07	-.02	-.19	-.11	.64**	.52*	.25	.42*	.40	.72**	.75**	.22	
Mental Restraint	.33	-.14	.12	-.03	.25	-.24	.10	-.20	.34	-.22	.25	-.32	.12	.51*	.44*	.51*	.17	.31	.50*	.75**	.42*	.39
Inefficient Confrontation																						

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

4.5 Change Over Time

Table 8.

Descriptive Statistics for the Change in Rehabilitation Adherence and Rehabilitation Engagement Over Time. Using Fitted Separate Within-Person OLS Regression Models for Rehabilitation Adherence and Rehabilitation Engagement as a Function of Linear Time (n = 21)

		Initial Status (Intercept)	Rate of Change (Slope)
Rehabilitation Adherence	Mean	42.51	-0.24
	Standard Deviation	9.16	0.51
	Bivariate Correlation		-.44
Rehabilitation Engagement	Mean	3.66	-0.14
	Standard Deviation	1.41	0.58
	Bivariate Correlation		-.59
Vigour	Mean	3.45	-0.05
	Standard Deviation	1.33	0.61
	Bivariate Correlation		-.53
Absorption	Mean	3.40	-0.17
	Standard Deviation	1.45	0.53
	Bivariate Correlation		-.64
Dedication	Mean	4.13	-0.22
	Standard Deviation	1.72	0.61
	Bivariate Correlation		-.69

For the following analyses refer to Table 7 and Table 8.

The rehabilitation adherence results across time suggest an average estimated intercept of 42.51 and an averaged estimated slope of -0.24. This can be interpreted to show that the average injured athlete in this sample has an observed rehabilitation adherence score of 42.51 at week one and this decreases by an estimated 0.24 points per week. The correlation between these two variables is a low to moderate negative correlation ($r = -.44$, $n = 21$, $p < 0.05$). These results relate to the fourth research question of this study. The negative relationship between fitted initial statues and fitted rate of change outlined above suggests that an

injured athlete has their highest level of rehabilitation adherence at the beginning of their rehabilitation treatment programme, at the time of injury. Then as time passes their rehabilitation adherence level gradually decreases. The speed of the decline in rehabilitation adherence is dependent on the injured athletes' initial levels of adherence. An athlete who is high in adherence will have a slower decline in their adherence over time, whereas an athlete who is low in adherence will have a more rapid decline in their rehabilitation adherence as time passes from their injury occurrence.

When looking for relationships between rehabilitation adherence's average estimated intercept and optimism, injury appraisal and coping there were no significant correlations. There were no significant correlations between rehabilitation adherence's estimated slope and optimism, injury appraisal, and coping. These analyses were aimed at addressing the first research question of this study "Is there a relationship between rehabilitation adherence and optimism, injury appraisal, and coping?"

The rehabilitation engagement results in Table 8 indicate that an athlete who has a high level of rehabilitation engagement at the beginning of their treatment program will experience a decline in their rehabilitation engagement levels as time passes. The speed of the decrease in their engagement level is slower than that experienced by an athlete who has a low level of rehabilitation engagement initially. Athletes with a low level of rehabilitation engagement will experience a faster decrease in their rehabilitation engagement through the course of their rehabilitation treatment program. These findings relate to the fourth

research question of this study “Does rehabilitation adherence and rehabilitation engagement change over time?” The interpretation above is supported by rehabilitation engagement’s average estimated intercept of 3.66 and an average estimated slope of 0.14. These values can be interpreted to suggest that the average injured athlete has an observed rehabilitation engagement score of 3.66 at week one. This rehabilitation engagement score decreases by an estimated 0.14 points per week. There is a moderately strong negative correlation between the fitted initial status and fitted rate of change ($r = -.59$, $n = 21$, $p < 0.01$). This correlation suggests that injured athletes with higher initial levels of engagement tend to become less engaged less rapidly as time passes from their injury occurrence.

When look to address the second research question of the current study it was found that there were no significant correlations between rehabilitation engagement’s average estimated intercept and optimism, injury appraisal and coping. Rehabilitation engagement’s estimated slope had no significant correlations with optimism, injury appraisal and coping.

To examine rehabilitation engagement in greater detail the following analyses were conducted at the subscale level. This allowed the vigour, absorption, and dedication components of rehabilitation engagement to be examined. By doing this it enabled the fourth research question of this study to be investigated in further detail. The trends for each of the subscales supports the trend for the total rehabilitation engagement results; a negative change over time.

The results for the vigour subscale of rehabilitation engagement across time give an average estimated intercept of 3.45 (fitted initial status) with an averaged estimated slope of -0.05 (fitted rate of change), as seen in Table 8. There is a negative relationship between fitted initial status and fitted rate of change as suggested by the moderately strong negative correlation between them ($r = -.53$, $n = 21$, $p < 0.05$). These relationships suggest that an athlete who is high in vigour at the start of their rehabilitation treatment program will become less vigorous with their rehabilitation as they progress through their rehabilitation process. The speed of this decline in their vigour levels will be faster for athletes who are low in vigour initially, when compared to athletes who are initially high in vigour.

The absorption subscale results of rehabilitation engagement suggest that the average injured athlete in this study has an observed absorption score of 3.40 which decreases each week at a rate of 0.17 points per week. There is a moderately strong negative relationship between the average estimated intercept of 3.40 and the average estimated slope of -0.17 ($r = -.64$, $n =21$, $p < 0.01$). An interpretation of these results could be that athletes with a high level of absorption in their rehabilitation programme will become less absorbed with their rehabilitation as time passes after the initially date of their injury. Athletes who are not very absorbed in their rehabilitation programme initially will experience a faster decline in their absorption with their treatment program than an athlete who is initially highly absorbed.

The results of the analysis of the dedication subscale of rehabilitation engagement suggest that; if an athlete is initially highly dedicated to their

rehabilitation programme after their injury they will become less dedicated at a slower rate as time passes from when they first suffered from their injury. Athletes who are not highly dedicated initially will experience a faster decline in their dedication to their rehabilitation over time. This is supported by the observed average estimated intercept of 4.13 and an averaged estimated slope of -0.22. This means that in this study the average injured athlete had an observed dedication subscale score of 4.13 and it decreases at a rate of 0.22 points per week. There is a negative relationship between fitted initial status and fitted rate of change. This is supported by the correlation between these two variables being a moderately strong negative correlation ($r = -.69$, $n = 21$, $p < 0.01$).

As seen in Table 7, there is a significant correlation between rehabilitation adherence's average estimated slope (-0.24) and rehabilitation engagement's average estimated slope (-0.14) ($r = .50$, $n = 21$, $p < 0.05$). This suggests that an injured athlete who is experiencing decreasing levels of adherence to their rehabilitation program will also be experiencing a decrease in their level of engagement with their rehabilitation. The positive correlation indicates that the reduction in the injured athlete's engagement with their rehabilitation program will increase in speed as time passes from when their injury occurred, whilst their rehabilitation adherence is decreasing. This relates to the third research question of the current study, with the analyses below examining this question in greater detail.

There were two significant correlations between rehabilitation adherence's estimated slope (-0.24) and two subscales of rehabilitation engagement's average

estimated slopes; vigour (-0.05) and absorption (-0.17). These support the relationship between rehabilitation adherences' average estimated slope and rehabilitation engagements' average estimated slope.

Both of these supporting correlations suggest that injured athletes will experience a decline in their adherence to their rehabilitation programme, this decline will accelerate as time passes from when the athlete suffered their injury. The correlation between vigour's estimated slope (-0.05) and adherence's estimated slope (-0.24) suggests that an injured athlete that has decreasing levels of vigour towards their rehabilitation, will become less adherent more rapidly ($r = .50$, $n = 21$, $p < 0.05$). The second supporting correlation (Between rehabilitation adherence's estimated slop (-0.24) and the absorption subscale of rehabilitation engagement (-0.17)) indicates that as time passes after the occurrence of an injury, an injured athlete whose absorption in their rehabilitation is decreasing will experience a faster decline in their adherence towards their rehabilitation program ($r = .60$, $n = 21$, $p < 0.05$).

5 Discussion

5.1 Summary

The primary aim of the present research was to examine rehabilitation engagement and rehabilitation adherence, in the context of the integrated model of psychological response to the sport injury and rehabilitation process model (as proposed by Wiese-bjornstal et al. (1998)), to see if there was a relationship between them and optimism, injury appraisal and coping. This study found that rehabilitation adherence and rehabilitation engagement both changed over time, as the integrated model of psychological response to the sport injury and rehabilitation process model would predict (Wiese-bjornstal et al., 1998). It also found that there was a relationship between rehabilitation adherence and rehabilitation engagement, which again would be predicted by the integrated model (Wiese-bjornstal et al., 1998).

There were no significant relationships between rehabilitation adherence (both average estimated intercept, and estimated slope) and optimism, injury appraisal and coping. When examining rehabilitation engagement (both the average estimated intercept, and estimated slope) there were no significant relationships with optimism, injury appraisal and coping. This lack of relationship could be a result of a small sample size rather than a lack of effect, as experienced by Albinson and Petrie (2003).

A second research question was to examine the relationship between rehabilitation adherence and rehabilitation engagement. There was a significant

relationship between rehabilitation adherence (average estimated slope) and rehabilitation engagement (average estimated slope). This relationship suggests that an injured athlete who is experiencing decreasing levels of adherence to their rehabilitation program will also be experiencing a decrease in their level of engagement with their rehabilitation. These findings were supported by a significant relationship between rehabilitation adherence change over time and two subscales of rehabilitation engagement's change over time.

The third aim of the current research was to examine rehabilitation adherence and rehabilitation engagement over time. It was found that an injured athlete has their highest level of rehabilitation adherence at the beginning of their rehabilitation treatment programme, at the time of injury. Then as time passes their rehabilitation adherence level gradually decreases. As well as suggesting that injured athletes that have higher levels of initial rehabilitation engagement will experience a decline in their rehabilitation engagement levels as time passes. The speed of the decline in rehabilitation adherence and rehabilitation adherence is dependent on the injured athlete's initial levels, an athlete who has high levels of either adherence or engagement will experience a slower decrease in their levels over time, whereas an injured athlete with low levels will experience a faster decrease in their rehabilitation adherence and/or engagement levels as time passes.

5.2 Findings

The results of the current study suggest that both rehabilitation engagement and rehabilitation adherence were decreasing over time, with the speed of the decrease dependent on the initial levels of either rehabilitation adherence or rehabilitation engagement. This change as time passed from the occurrence of the injury is to be expected according to the integrated model of psychological response to the sport injury and rehabilitation process (Wiese-bjornstal et al., 1998). This model encourages researchers to consider that an athlete's response to a sports injury is not just a one off incident. It is important to investigate an athlete's previous history of stressors, their personality characteristics, and existing coping resources. Both pre-injury and post injury factors will influence an athlete's psychological response to injury (Andersen & Williams, 1988; Wiese-Bjornstal et al., 1995). The psychological response will change over time in a dynamic process and the athlete's recovery is the outcome of this dynamic process.

In this study it was found that for both rehabilitation adherence and rehabilitation engagement the levels that the injured athlete experienced changed over the course of the 8 week period that they were measured for, with the average result in this a study a decline in rehabilitation adherence and/or rehabilitation engagement. These findings address the fourth research question of the current study. These findings are of interest because of the findings of studies performed by Brewer (1994), Pearson and Jones (1992), and Ievleva and Orlick

(1991), who found that psychological responses experienced by injured athletes can have a significant influence on the quality and speed of the sport injury rehabilitation process. The rehabilitation engagement and rehabilitation adherence results of this study are an example of a psychological response to a sports injury. There is a possibility that this decrease experience by the injured athletes in this study could have had a negative influence on the quality and speed of their recovery process.

However the analyses of the rehabilitation adherence and rehabilitation engagement data suggest that the change in time is not the same for all of the injured athletes in the current study. The results of the current study suggest that athletes who are high in adherence at the beginning of their treatment process will experience a slower decline in their adherence levels as time passes from when the athlete suffered the injury. This is compared to athletes that are low in adherence at the beginning of the treatment process, who will experience as faster decline in their rehabilitation adherence levels. The results also suggest that injured athletes who have higher levels of initial rehabilitation engagement tend to become less engaged with their rehabilitation at a slower rate. When compared to injured athletes who initially have low levels of rehabilitation engagement, who experience a faster drop in their rehabilitation engagement levels. This is interesting because it is the athletes who have low levels of rehabilitation engagement or rehabilitation adherence that are experiencing the faster decline in their rehabilitation adherence/engagement levels. The injured athlete's initial level of rehabilitation adherence or rehabilitation engagement is what seems to predict the decline in

adherence or engagement. This reduction in the injured athlete's levels of rehabilitation adherence and rehabilitation engagement could potentially be influenced by the athlete perceiving that the benefits of the injury recovery to be minimal when coming towards the end of their recovery process (Johnston & Carroll, 2000). The integrated model suggests that this type of perception would be a cognitive and emotional response which has occurred due to the interaction between both personal and situational factors that were influencing the injured athlete at the time (Wiese-bjornstal et al., 1998). In a practical sports injury treatment setting this would suggest that an injured athlete would be continuously making judgements about their rehabilitation process throughout the treatment process. These judgements would result in the responses that lead to the decrease in either rehabilitation adherence or rehabilitation engagement. So when an athlete feels that they are close to being able to return to their sport or training at an acceptable level they would begin to not place as much value on their rehabilitation. This attitude could then manifest itself as the drop in rehabilitation adherence or rehabilitation engagement.

The negative change over time in rehabilitation engagement that was found has potential negative consequences for an injured athlete's recovery. Studies have found that high levels of engagement can have a positive effect on long term treatment outcomes (Kortte et al., 2007; Lequerica et al., 2006). The decreasing levels of engagement as found in this study potentially suggest that the process may have a negative effect on recovery. Being able to examine rehabilitation engagement across multiple time points allows for the fluid nature of engagement

to be examined, and to address a possible gap in the literature (Arvinen-Barrow et al., 2007; Bassett, 2003; Brewer, 1998; Bright et al., 2015; Heaney, 2006; Lafferty et al., 2008; Larson et al., 1996; Leddy et al., 1994; Milne et al., 2005; Roh & Perna, 2000).

Researchers have found that increased levels of engagement are associated with higher levels of rehabilitation affect, adherence, and attendance (Kortte et al., 2007; Lequerica et al., 2006). These findings were supported by the findings of this study, with rehabilitation adherence's change over time being significantly related to rehabilitation engagement's change over time. This relationship suggests that an injured athlete who is becoming less adherent to their rehabilitation will become less engaged with their rehabilitation at a faster rate as time passes from when their injury occurred.

The lack of a significant relationship between rehabilitation adherence's estimated intercept and rehabilitation engagement's estimated intercept is interesting. It may suggest that it an athlete's initial level of adherence has no bearing on their initial level of engagement. Then as time passes the significant relationship between adherence over time and engagement over time comes into effect.

The relationship between rehabilitation adherences change over time and rehabilitation engagements change over time has positive implications in the sports rehabilitation setting because studies have found that athletes who experience high levels of both adherence and engagement are more likely to experience successful results, in both their rehabilitation programme and for their return to play

outcomes (Bassett, 2003; Brewer et al., 2003; Fisher et al., 1993; Niven, 2007). The practical effects of this relationship may be that sports medicine practitioners will be able to develop one intervention or strategy that will be able to influence both an injured athletes' rehabilitation adherence and rehabilitation engagement, which in turn will have a positive effect on the rehabilitation outcome.

The primary aim of the research was to examine rehabilitation adherence and rehabilitation engagement the context of integrated model of psychological response to the sport injury and rehabilitation process, to see if there was a relationship between rehabilitation adherence, engagement and optimism, injury appraisal and coping (Wiese-bjornstal et al., 1998). This model suggests that an athlete's cognitive appraisal of the injury, their emotional responses, and their behavioural responses all play a part in the recovery process. The integrated model also places importance on the influencing factors that can have an effect on the sports injury rehabilitation process. The relationship between rehabilitation engagement and adherence, as well as what happens to them as time passes, has been discussed in the prior paragraphs. In the context of the integrated model rehabilitation adherence and engagement were emotional/behavioural responses. The personal factors that were examined in this study were the injured athletes' cognitive appraisal, coping, and optimism levels.

When examining the personal and emotional behavioural factors as part of the rehabilitation process no significant relationships were found between rehabilitation adherence (both average estimated intercept, and estimated slope) and optimism, injury appraisal and coping. Coupled with this, no significant

relationships were found between rehabilitation engagement (both the average estimated intercept, and estimated slope) and optimism, injury appraisal and coping. This lack of significant relationships includes both the athletes' initial levels of rehabilitation adherence and engagement, as well as the change over time in the athletes' levels of rehabilitation adherence and engagement.

The lack of any significant relationships is surprising. According to the integrated model of psychological response to the sport injury and rehabilitation process, there should be a relationship between these variables (Wiese-bjornstal et al., 1998) . If anything the relationships should be stronger due to the multi-dimensional aspects of this model. Cognitive appraisals and coping were significantly related (as seen in Table 7) , which supports the research performed by Anshel et al. (2012). However there was no significant relationship between optimism, and either cognitive appraisals and/or coping. This does not support the research performed by Chang (2002). However Albinson and Petrie (2003) had similar findings, with large correlations being reported, but they had a failure to reach statistical significance. They accredited this failure to reach statistical significance was most likely a result of small sample size rather than an inadequate effect. They had a sample of 18 injured athletes involved in their study. It is possible that the lack of significance in this aspect of the current research could be due to a similar issue of small sample size.

5.3 Limitations

There are some limitations of the present research that need to be acknowledge when considering the findings of this research.

The first is one that was briefly raised in section 5.2. It is one of limited sample size. This study had 23 participants with most parts of the analyses utilizing the data from 21 of the participants. There were issues reaching significance, which may have been aided by having a larger sample. The other main limitation of the research is the issues with the reliability coefficients for the Rehabilitation Adherence Questionnaire, as highlighted in section 4.2. It is possible that both of these limitations are related, as more reliable results will occur when research is conducted from a larger sample (Hoyle & Kenny, 1999).

5.4 Implications of Research Findings

The present research has implications for future research on rehabilitation engagement, rehabilitation adherence, optimism, injury appraisal, and coping.

When considering the results from the view point of the integrated model of psychological response to the sport injury and rehabilitation process, the results of this study have some implications for future research (Wiese-bjornstal et al., 1998). Possibly the most important implication is to do with the rehabilitation process as a whole. The aim of this study was to examine the relationships between rehabilitation adherence, rehabilitation engagement, optimism, injury appraisal, and coping. The present study had some interesting results, but the failure of any

significant relationships between the optimism, appraisal, and coping variables, and the rehabilitation engagement and adherence variables, has not allowed all of the research questions to be fully examined.

The consequences of this lack of significant relationships is that the issues that were discussed in section 2 were unable to be fully investigated. However the relationship between rehabilitation adherence and rehabilitation engagement has some interesting implications. This relationship suggests that injured athletes may be able to have their rehabilitation process positively influenced by interventions that aim at increasing rehabilitation engagement, which would have a beneficial influence on their rehabilitation adherence, which in turn would have a positive effect on their recovery process.

To better understand this process it may be worth investigating the other variables in this study across time. Not just at the beginning of the study, but repeated together with the rehabilitation adherence and rehabilitation engagement.

To address the limitations of this study, similar research performed in the future should aim for a larger sample size, and coupled with repeatedly measuring the appraisal, coping, and optimism variables this should help researchers and sports medicine professional to better understand the sport injury rehabilitation process. Another way to expand the understanding of this process would be to investigate more areas of the integrated model of psychological response to the sport injury and rehabilitation process (Wiese-bjornstal et al., 1998). If more

personal and situational factors were examined it would aid the understanding of this process.

Rehabilitation engagement and rehabilitation adherence both decrease over time according to the results of this study. The reason for this could be that injured athletes are no longer adhering to or engaging with their rehabilitation towards the end of their recovery process. This could be due to the athletes no longer seeing as much benefit from their rehabilitation, that as they become close to their return to sport outcomes they are moving the adherence and engagement from rehabilitation to their sport training, or even that they are no longer as involved with their rehabilitation process as a whole. Athletes who are high in either (or both) of these variables are more likely to experience a slower decline across time than an athlete who is low in them. The implications of this that the athletes who are low in either rehabilitation adherence or rehabilitation engagement at the beginning of their sport injury recovery process will be more at risk of less ideal outcomes. They are more likely to suffer faster decreases in adherence and engagement. Both of these factors have been proven to have beneficial influences on the rehabilitation process. So athletes that are at risk of lower adherence and engagement levels and more likely to suffer from a faster drop in adherence and engagement levels create reasons for concern in sports medicine professionals and rehabilitation providers.

An increased level of awareness amongst rehabilitation providers, sports medicine professionals, and athletes, will be of benefit. It could potentially have a positive effect on the rehabilitation process in injured athletes. As well as

potentially have a positive influence on how rehabilitation providers and sports medicine professionals approach treating injured athletes.

6 Conclusion

By helping to increase the understanding of the broader sports injury process and the implications that it can have on rehabilitation, it is hoped that this research will have positive effects on injured athletes' rehabilitation processes.

A relationship between rehabilitation adherence and rehabilitation engagement was found. As well as allowing changes in rehabilitation adherence and rehabilitation engagement to be examined across time. It was found that injured athletes who are high in adherence at the beginning of the sports injury rehabilitation process will experience a decline in their adherence levels, but at a slower rate than an athlete who is low in rehabilitation adherence initially. It was also found that injured athletes who have high levels of rehabilitation engagement tend to become less engaged with their rehabilitation at a slower rate as time passes from the beginning of their rehabilitation treatment, than an athlete who is initially low in rehabilitation engagement

There were no significant relationships found between optimism, injury appraisal, coping, and rehabilitation adherence and rehabilitation engagement. The potential reasons for this were discussed, and suggestions about how to better examine them in the future were presented.

These findings extend the understanding of the topic in the literature, as well as suggesting some avenues for future research.

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8 Appendices

8.1 Appendix A: Participant Information Sheet

Injury appraisal and coping in athletes, the relationship this process has with optimism, pessimism, engagement and adherence.

INFORMATION SHEET FOR PARTICPANTS

Hi there, my name is Steven Langdon. I am a student researcher at Massey University and I am currently undertaking my Masters in Science (Psychology). I would like to examine the stressor appraisal and coping process of an injury in athletes and the relationship that this process has with optimism, pessimism, engagement and injury rehabilitation adherence. My supervisor is Dr Richard Fletcher at the School of Psychology, Massey University.

I would like to invite you to participate in research that investigates the effect of optimism and pessimism on the appraisal of an injury and how you cope with injury and the effects of this on your engagement with your rehabilitation and your rehabilitation adherence. You will be required to fill out five questionnaires and they will take approximately thirty minutes. You will do three at the beginning of your injury rehabilitation process and two weekly for a period of eight weeks. (Please refer to the flow chart attached at the back of this letter for a step by step explanation of the research project).

To take part in this study you will need to be 18 years or older, a fluent reader of English and an athlete that is competing in a sport who has suffered from an injury that has had a negative effect on your normal training and/or competition for a

period of at least three days. You also need to be currently seeing or about to see a sports medicine professional. For example a physiotherapist, sports podiatrist or sports doctor. I am hoping for a minimum of one hundred athletes to provide enough data to see any possible trends.

You have been sent this information sheet because you contacted the researcher in response to advertisements that have been distributed via email or through your sports medicine professional.

Participation in this research is completely voluntary, and you have the right to withdraw from the study up until two weeks after you start the study. If you do decide to withdraw from the study any questionnaires that you have completed will still be used in the research.

Project Procedures

To participate I would like you to fill out three questionnaires when you are first injured, which will take approximately ten minutes. Then at the end of each week for a period of eight weeks I would like you to fill out another two questionnaires, which will take approximately two minutes.

Emotional Harm and Support Services

Some sensitive questions in the questionnaires may have potential to cause emotional harm. If you experience this as a result of taking part in the student you should contact the following organizations for support services at no cost;

- Youthline: phone 0800 37 66 33 or email talk@youthline.co.nz

- Lifeline: phone 0800 543 354

If you would like to speak to a clinical psychologist you can contact The Centre for Psychology, Albany Campus, Massey University, Auckland; phone 09 441 8175 or email centreforpsychology@massey.ac.nz. Appointments with The Centre for Psychology will cost $140 per hour to see a clinical psychologist and $70 per hour to see an intern clinical psychologist.

Data Management

Data from these questionnaires will be used exclusively for this study. The data from these questionnaires will be stored on a password protected computer system that only the student researcher, Dr Richard Fletcher (the supervisor) and Mr. Harvey Jones (Massey University School of Psychology Computer Programmer/Analyst) will have access to. The data will be stored for five years and then destroyed.

Confidentiality will be ensured by restricting access to your data to the student researcher, their supervisor and the Massey University School of Psychology Computer Programmer/Analyst.. You will not be able to be identified from the analysis in the study.

A summary of the findings will be emailed to you upon completion of the study and a full copy will be available upon request.

Participant's Rights

You are under no obligation to accept this invitation. If you decide to participate, you have the right to:

- decline to answer any particular question;
- withdraw from the study up until two weeks after you start the study.(If you do decide to withdraw from the study any questionnaires that you have completed will still be used in the research.) ;
- ask any questions about the study at any time during participation;
- provide information on the understanding that your name will not be used unless you give permission to the researcher;
- be given access to a summary of the project findings when it is concluded.

If you have any questions about this research please feel free contact me on 021 074 8661 or stevenjlangdon@gmail.com. My supervisor Dr Richard Fletcher can be contacted by email on r.b.fletcher@massey.ac.nz.

Thank you very much for your time.

This project has been reviewed and approved by the Massey University Human Ethics Committee: Northern, Application 14/018. If you have any concerns about the conduct of this research, please contact Dr Lily George, Acting Chair, Massey University Human Ethics Committee: Northern, telephone 09 414 0800 x43279

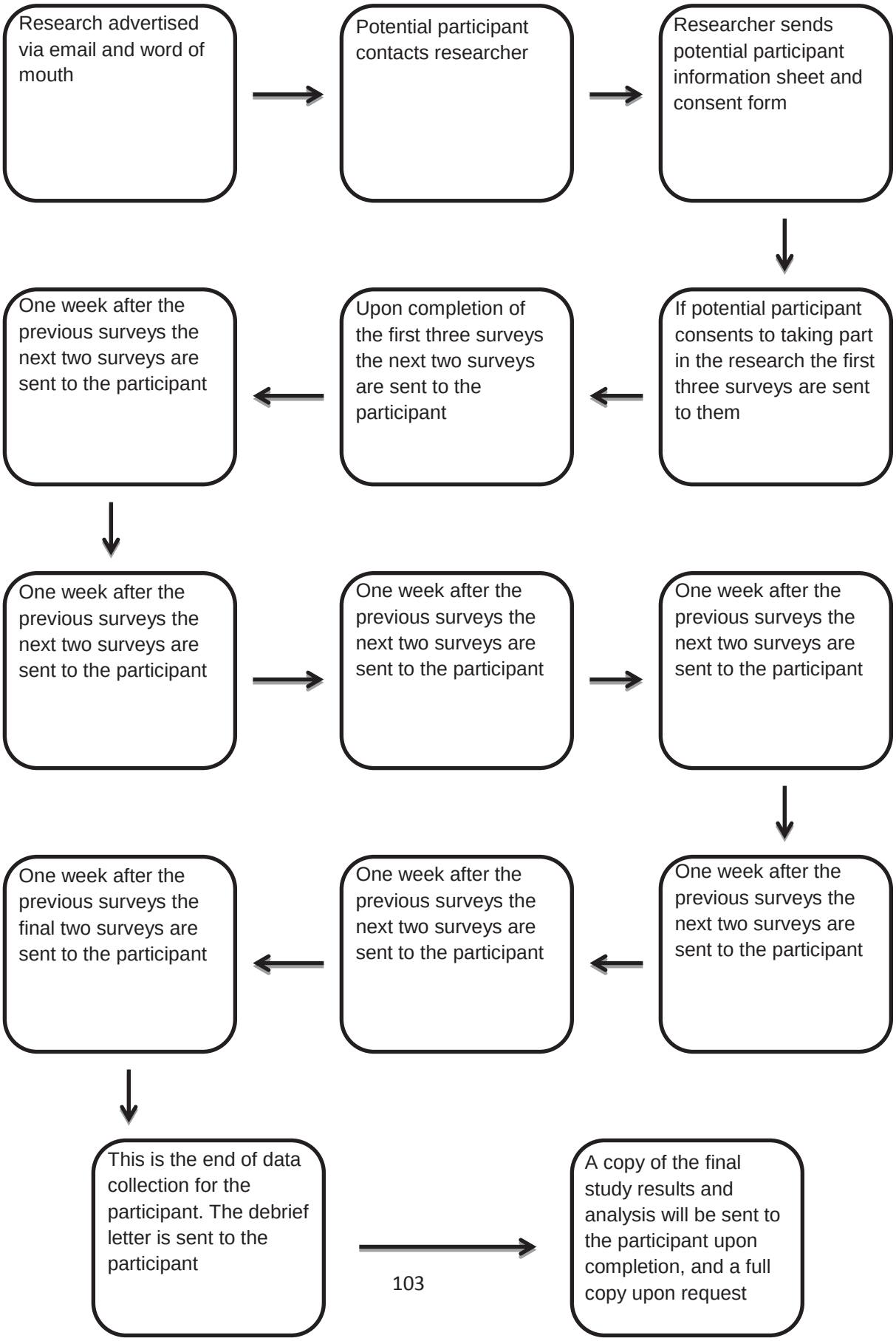
Email: humanethicsnorth@massey.ac.nz

Massey University, School of Psychology – Te Kura Hinengaro Tangata

Private Bag 102-904, North Shore Mail Centre, Auckland 0745, New Zealand

W: www.massey.ac.nz T: +64-9-4140800 extn 41244

Flowchart of Participant Research Project Procedures



8.2 Appendix B: Letter Requesting Access

Dear XXXX,

I am a student researcher at Massey University. I am currently undertaking my Masters in Science (Psychology). I am would like to examine the stressor appraisal and coping process of an injury in athletes and the relationship that this process has with optimism, pessimism, engagement and injury rehabilitation adherence. My supervisor is Dr Richard Fletcher at the School of Psychology, Massey University.

This research is aiming to address questions around injury rehabilitation and the appraisal of an injury by an athlete. Specifically it will look at the effect of optimism and pessimism on the appraisal of an injury and how they cope with injury and the effects of this on their engagement with their rehabilitation and their treatment rehabilitation. The benefits of this research are that it will lead to a greater understanding of the mental processes athletes go through when they are injured, as well as hopefully providing some insights that can be used in a real world practical sense to help increase athletes' injury rehabilitation adherence, which in turn should have a positive effect on the speed of their recovery from injury.

I would like to ask if it would be possible for you to send out an email advertising my research to the XXXX email database please to help with the recruitment of participants for my research.

If your members agree to participate in this research they will be required to fill out five questionnaires and they will take approximately thirty minutes. They will do

three at the beginning of their injury rehabilitation process and two weekly for a period of eight weeks.

Participation in this research is entirely voluntary. I am hoping for a minimum of one hundred athletes to provide enough data to see any possible trends.

To take part in this study potential participants need to be 18 years or older, a fluent reader of English and an athlete that is competing in a sport that has suffered from an injury that has had a negative effect on your normal training and/or competition for a period of at least three days. You also need to be currently seeing or about to see a sports medicine professional. For example a physiotherapist, sports podiatrist or sports doctor.

Data gathered from these questionnaires will be used exclusively for this study. The data from these questionnaires will be stored on a password protected computer system that only the student researcher, Dr Richard Fletcher (the supervisor) and Mr. Harvey Jones (Massey University School of Psychology Computer Programmer/Analyst) will have access to. The data will be stored for five years and then destroyed.

Confidentiality will be ensured by restricting access to your data to the student researcher, their supervisor and the Massey University School of Psychology Computer Programmer/Analyst

You will not be able to be identified from the analysis in the study.

A summary of the findings will be emailed to the participants upon completion of the study and a full copy will be available upon request.

I look forward to hearing from you.

Kind Regards,

Steven Langdon

0210748661

stevenjlangdon@gmail.com

Committee Approval Statement

This project has been reviewed and approved by the Massey University Human Ethics Committee: Northern, Application 14/018. If you have any concerns about the conduct of this research, please contact Dr Lily George, Acting Chair, Massey University Human Ethics Committee: Northern, telephone 09 414 0800 x43279

Email: humanethicsnorth@massey.ac.nz

8.3 Appendix C: Participant Consent Form

I have read the Information Sheet and have had the details of the study explained to me. My questions have been answered to my satisfaction, and I understand that I may ask further questions at any time.

I agree to participate in this study under the conditions set out in the Information Sheet.

Signature: **Date:**

Full Name - printed

This project has been reviewed and approved by the Massey University Human Ethics Committee: Northern, Application 14/018. If you have any concerns about the conduct of this research, please contact Dr Lily George, Acting Chair, Massey University Human Ethics Committee: Northern, telephone 09 414 0800 x43279

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8.4 Appendix D: Participant Debrief Letter

Dear XXXX,

I would like to thank you for participating in this research.

The research was examining the effect of how an athlete perceives an injury on how they cope with the injury. As well as looking at the effect optimism and pessimism have on the perception of an injury and the athlete's coping with the injury, and the effects that this process in turn has on the athlete's engagement with the treatment process and the effect on their injury rehabilitation adherence.

You will be emailed a summary of the results of this study once the data analysis is complete and if you would like a full copy of the results of this study feel free to contact me at stevenjlangdon@gmail.com.

If you have any questions regarding the study or on this topic feel free to also contact me on the above email address.

If you have any concerns about this study or your rights as a participant of this student feel free to contact either myself (contact details above) or my supervisor Dr Richard Fletcher at r.b.fletcher@massey.ac.nz

Once again I would like to thank you for taking part in this research.

Kind Regards,

Steven Langdon

This project has been reviewed and approved by the Massey University Human Ethics Committee: Northern, Application 14/018. If you have any concerns about the conduct of this research, please contact Dr Lily George, Acting Chair, Massey University Human Ethics Committee: Northern, telephone 09 414 0800 x 43279 email humanethicsnorth@massey.ac.nz

8.5 Appendix E: Demographic Questionnaire

What is your gender?

What is the sport that you compete in?

What level of sport do you currently compete in?

a. International level
b. National level
c. Regional level
d. Club level
e. Social level

What is your injury?

8.6 Appendix F: Cognitive Appraisal and Coping Questionnaire

The following statements are about your stressful situation (your injury). Please read each statement carefully and decide if you ever feel this way about your injury. Please cross out the appropriate that matches your feeling number with “0” meaning not at all to “8” meaning very.

Cognitive Appraisal Questionnaire

Uncontrollability and Threatening

I do not have control over this situation

I cannot change an outcome

I cannot cope with this situation

I do not know what to do in this situation

I am fearful of what is happening

I have control over this situation

I am over whelmed by this situation

I believe I can change this situation

I am unprepared for this situation

Concerns about outcomes

I must succeed

I must perform well

I knew this was coming

I can make something productive

I am not sure if I get a desirable outcome

Avoidance of Situation

I hope this situation goes away soon

I hope this situation will be over soon

I hope time passes by faster

I do not want to face this situation

I want to run away from this situation

I am anxious about this situation

Negative Appraisal

I want to give up

I regret what I did just before this situation

This is not good

I have no hope

I am not being rational

I can have a favourable outcome

Others Evaluation

I am afraid of others thinking of me

Others see me as incompetent

I am making a bad impression on others

Everyone is watching me

Others are evaluating me negatively

I will fail

Coping Questionnaire

Mental Positives

Talking more positively

Trying to get as much information as possible

Visualizing myself being successful

Deep breathing

Trying to come up with a solution

Trying not to think about negative emotions

Praying

Mental Restraint

Trying ignoring the situation

Trying not to think about the situation

Distracting myself

Making less eye contact with others

Focusing less on myself and more on others

Holding something in my hands

Inefficient Confrontation

Biting lips

Thinking about the anxious situation

Biting and picking nails

Focusing on the issues

Chewing gum

Thinking about things after this anxious situation is over

8.7 Appendix G: Life Orientation Test Revised

Please be as honest and accurate as you can throughout. Try not to let your response to one statement influence your responses to other statements. There are no "correct" or "incorrect" answers. Answer according to your own feelings, rather than how you think "most people" would answer.

5 = I agree a lot

4 = I agree a little

3 = I neither agree nor disagree

2 = I Disagree a little

1 = I Disagree a lot

1) In uncertain times, I usually expect the best.

2) It's easy for me to relax

3) If something can go wrong for me, it will.

4) I'm always optimistic about my future.

5) I enjoy my friends a lot.

6) It's important for me to keep busy.

7) I hardly ever expect things to go my way.

8) I don't get upset too easily.

9) I rarely count on good things happening to me.

10) Overall, I expect more good things to happen to me than bad.

8.8 Appendix H: Rehabilitation Adherence Questionnaire

Using a 4-point Likert scale (1=strongly disagree; 2=disagree; 3=agree; 4=strongly agree), Rate the following statements.

Support from significant others

I know my teammates, family, or friends are there when I need support

My trainer must be present and available to assist me in order for me to initiate and pursue my session

I work harder when my trainer is present during my rehabilitation session

I find rehabilitation to be very lonely and isolating

My teammates, family, or friends give me a lot of support during my rehabilitation

Pain tolerance

My rehabilitation program is physically painful

There are times when I feel that it is just not worth going through my rehabilitation program

I work out until I feel pain and then stop

I find myself missing rehabilitation session because I experience too much pain during my program

I enjoy working out until it hurts

Scheduling

I often miss my rehabilitation sessions because I find better things to do

I sometimes sleep instead of getting up to make my rehabilitation appointment

I sometimes forget about my rehabilitation appointment

My rehabilitation is almost always a high priority for me

Self-motivation

If my season ends, I do, or I will continue with my therapy until my rehabilitation program ends

When doing my exercises, all I think about is to get them over with fast

Because the season is almost over when I become injured, I see no need to do rehabilitation

I do not get anything out of my rehabilitation program

I enjoy doing my rehabilitation program

Perceived exertion

I nearly always work at 100% effort

I find the exercises to be very difficult

I always do my best

Environmental conditions

The training room makes me feel unpleasant

I do not like the training room

The training room environment is comfortable and conductive to my needs

8.9 Appendix I: Modified Utrecht Work Engagement Scale

The following statements are about how you feel during you injury rehabilitation. Please read each statement carefully and decide if you ever feel this way about your rehabilitation. Indicate how often you felt this feeling by crossing the number from “0” (Never) to “7” (Always) that best describes how frequently you feel that way.

1) At my treatment sessions, I feel bursting with energy

2) At my treatment sessions, I feel strong and vigorous

3) I am enthusiastic about my treatment

4) My rehabilitation inspires me

5) When I get up in the morning I feel like completing my rehabilitation exercises

6) I feel happy when I am doing my rehabilitation exercises intensely.

7) I am proud of the rehabilitation work that I do

8) I am immersed in my rehabilitation

9) I get carried away when I am doing my rehabilitation exercises