

EXAMINING PERCEPTIONS OF MOTIVATION, ATHLETE BURNOUT, AND INJURY-
RELATED FEAR IN PATIENTS FOLLOWING ACL RECONSTRUCTION

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ABSTRACT

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Approximately 1 out of 3 patients fail to return to previous levels of sport participation after anterior cruciate ligament reconstruction (ACLR), with injury-related fear identified as a potential barrier for return to sport. However, we do not know how injury-related fear is associated with other meaningful psychological responses to injury, or how patient perceptions of these psychological responses relate to their rehabilitation experiences. The purpose of this cross-sectional, explanatory sequential mixed-methods study was to explore how perceptions of self-determined motivation, athlete burnout, and injury-related fear affected psychological experiences during ACLR rehabilitation in patients between 4- and 6-months post-ACLR. 13 participants were recruited and completed questionnaires measuring self-determined motivation, athlete burnout, perceived stress, and injury-related fear. A sub-sample of 5 participants participated in a semi-structured interview to further underline patient experiences during ACLR rehabilitation. A strong, positive relationship was observed between perceived stress and injury-related fear ($\rho = 0.70, p = 0.008$). Thematic analysis revealed five themes related to the rehabilitation experience: 1) struggling with the recovery process, 2) acknowledging negative emotional states, 3) drive to return to sport and normal life, 4) understanding and finding purpose in rehabilitation, and 5) successfully navigating the recovery process. These preliminary data suggest that negative emotional states, such as injury-related fear and athlete burnout, may be related to self-determined motivation and perceived stress after ACLR.

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CHAPTER 1

Introduction

1.1 Overview of the Problem

An anterior cruciate ligament (ACL) injury is one of the most common sport-related injuries, with the number of reported incidents on the rise (Kaeding et al., 2017). It is estimated that anywhere from 120,000 to 200,000 people are affected by this injury each year in the United States (Gornitzky et al., 2015; Kaeding et al., 2017). Because ACL injuries are a traumatic and debilitating injury for individuals, there can be lasting physical effects, such as altered biomechanics, that can increase risk of secondary ACL injury, as well as the potential onset of knee osteoarthritis (Ball et al., 2018). To alleviate some of these risks, it is often recommended that individuals who experience an ACL injury undergo ACL reconstruction (ACLR) surgery to restore knee stability and function (Ball et al., 2018). This surgery is followed by a lengthy rehabilitation process to physically prepare to return to pre-injury levels of sport and physical activity (Ardern et al., 2014; Ball et al., 2018). Many patients expect to return to their pre-injury sport and physical activity levels after ACLR (Feucht et al., 2014), with over 80 percent of patients anticipating a full return to sport within the first year after ACLR (Webster & Feller, 2019). However, even with the extensive rehabilitation process following ACLR, recent studies indicate that only 24 percent of patients are successful in achieving this goal (Webster & Feller, 2019).

Patients who have gone through the rehabilitation process but do not return to sport post-ACLR often struggle with negative emotions, such as depression and anxiety, surrounding sport (Ardern et al., 2013). Thus, one way to understand these struggles is to examine underlying psychological constructs impacting patients during the rehabilitation process

before they attempt to return to sport (RTS). Despite a plethora of research examining psychological responses after ACLR and during rehabilitation, there is limited literature regarding the connection between certain psychological constructs, specifically injury-related fear and self-determined motivation, and their impact on psychological experiences following ACLR. Exploring additional psychological constructs known to affect sport outcomes, such as athlete burnout, may allow for a deeper understanding of the complex emotions and psychological experiences that patients go through during rehabilitation. This knowledge may further explain the psychological struggles individuals undergo when returning to sport.

Specifically, psychological response to injury plays a significant role in individuals returning to their pre-injury levels of sport and physical activity (Baez et al., 2020), with the severity and duration of an injury affecting an athlete's psychological responses (Ruddock-Hudson et al., 2011). For example, an athlete's feelings of motivation, self-identity, and ability to cope with stress can be impacted following ACLR (Everhart et al., 2013), and may influence an individual's ability to RTS more than their actual physical limitations (Filbay et al., 2016). For individuals in rehabilitation post-ACLR, injury-related fear can negatively affect their physical activity levels (Bell et al., 2017). Injury-related fear can impact health outcomes for athletes following ACLR, as well as increase the risk of secondary ACL injury (Filbay et al., 2016; Paterno et al., 2018). Injury-related fear is also associated with failure to return to pre-injury levels of sport after ACLR (Ardern et al., 2014; Kvist et al., 2005). Ultimately, psychological responses such as injury-related fear may negatively alter an athlete's perception of their readiness to RTS, as well as whether they feel capable to return to pre-injury levels of participation (Baez et al., 2020; Kvist et al., 2005).

Alternatively, self-determined motivation is a psychological factor demonstrated to improve rehabilitation outcomes and RTS rates in patients post-ACLR (Pizzari et al., 2002; Sonesson et al., 2017). Motivation plays a significant role in the rehabilitation process because it has the potential to influence an athlete's appraisal of injury and emotions surrounding an injury (Wiese-Bjornstal et al., 1998). Self-determination theory (SDT) has been found to be a relevant framework when examining rehabilitation and RTS following injury (Podlog & Eklund, 2010). As described by SDT, an individual's level of motivation is determined through the satisfaction or thwarting of three basic psychological needs: autonomy, competence, and relatedness (Ryan & Deci, 2000). The amount an athlete perceives their basic psychological needs (i.e., competence, autonomy, and relatedness) to be satisfied or thwarted during injury rehabilitation impacts their self-determined motivation throughout the process (Bejar et al., 2019). For example, when basic psychological needs are thwarted, injured athletes report decreased motivation and a more negative relationship with their athletic trainers (Bejar et al., 2019). In comparison, when these needs are perceived to be satisfied, athletes report a positive effect on their motivation and a greater belief that their athletic trainers care about them (Bejar et al., 2019). Furthermore, increased self-determined motivation in injured individuals leads to more positive perceptions toward returning to sport, and indicates that a greater sense of self-determined motivation relates to enhanced psychological functioning in injured individuals (Podlog & Eklund, 2010). Overall, the influence of SDT and motivation is important to recognize because these factors can affect rehabilitation outcomes, including other psychological responses, in injured athletes. Therefore, it is beneficial to consider how athletes' perceptions of self-determined motivation interact with other psychological responses throughout the ACLR rehabilitation process.

To improve rehabilitation outcomes in this population, it is imperative that additional psychological responses are examined to understand the impact of each factor on individual rehabilitation. Athlete burnout is one psychological factor that has not been extensively explored in ACL populations, although it has been shown to influence outcomes in other sport contexts (Cresswell & Eklund, 2006a, 2006b, 2007). When examining the injury context in particular, injury has the potential to increase an athlete's stress levels (Grylls & Spittle, 2008; Udry et al., 1997), and chronic stress is theorized to be an important antecedent to athlete burnout (Gustafsson et al., 2011). Knowing that an athlete's psychological response can be affected by the severity and duration of an injury (Ruddock-Hudson et al., 2011), ACL injuries could lead to additional negative psychological responses such as the development of athlete burnout. Therefore, because stress can affect outcomes after ACLR (Everhart et al., 2015), and because motivation and injury-related fear have been shown to impact individuals throughout the rehabilitation process, examining a patient's perceived levels of athlete burnout compared to self-determined motivation and injury-related fear may provide insight into psychological experiences during rehabilitation, as well as outcomes following the rehabilitation process.

Overall, it is critical to note that physical and psychological readiness to RTS after ACLR are not always equivalent (Ardern et al., 2014; Baez et al., 2020), with individuals describing different psychological experiences throughout rehabilitation in factors such as motivation (Sonesson et al., 2017). When examining the association between psychological and functional outcomes in individuals returning to sport and physical activity through patient-based and functional outcome assessments, Baez et al. (2020) found that psychological factors play a more significant role than functional outcomes. Specifically, psychological

factors can influence the effectiveness of the injury rehabilitation, as well as an individual's ability to RTS after ACLR (Baez et al., 2020; Everhart et al., 2015). It has been shown that perceptions of psychological factors such as self-determined motivation and athlete burnout are largely driven by individual experiences (DeFreese & Smith, 2013); thus, a relevant next step would be to explore how individual perceptions of psychological factors affect psychological experiences during ACLR rehabilitation. Understanding how a combination of psychological factors can impact the ability of patients post-ACLR to feel successful in their rehabilitation could ultimately improve ACLR outcomes and help individuals return to their pre-injury levels of sport and physical activity (Baez et al., 2020).

1.2 Purpose Statement

This mixed-methods study served as an exploration into how self-determined motivation and injury-related fear were associated with athlete burnout in patients 4- to 6-months post-ACLR. Additionally, patient perceptions of self-determined motivation, athlete burnout, perceived stress, and injury-related fear during the rehabilitation process were examined through semi-structured interviews. This study has contributed to understanding of how psychological outcomes may impact injured patients following ACLR, as well as how athlete burnout and perceived stress relate to feelings of injury-related fear and self-determined motivation in these patients. Because feelings of athlete burnout may appear after experiencing chronic stress (Gustafsson et al., 2011), such as stress connected to injury, and because athlete burnout affects outcomes in other sport contexts (Gould & Whitley, 2009), athlete burnout was a relevant psychological factor to examine. The findings also provided insight for researchers and clinicians regarding psychological responses post-ACLR to help

improve the rehabilitation experience for individuals and increase their chances of returning to pre-injury levels of sport and physical activity. Therefore, the overarching purpose of this research was to explore how perceptions of self-determined motivation, athlete burnout, and injury-related fear affect individual psychological experiences at the 4- to 6-month time point following ACLR by investigating the relationship between these psychological variables.

1.2.1 Research Questions

As the overarching purpose of this study was to explore how perceptions of self-determined motivation, athlete burnout, and injury-related fear impact individual experiences following ACLR, the individual research questions were:

- Do self-reported levels of motivation and injury-related fear relate to self-reported levels of stress and athlete burnout in individuals post-ACLR?
- How do perceptions of motivation, athlete burnout, and injury-related fear affect individual psychological experiences throughout ACLR rehabilitation?

1.2.2 Hypothesis

Regarding the quantitative portion of this study exploring self-reported levels of motivation, injury-related fear, and athlete burnout measured 4- to 6-months post-ACLR, it was hypothesized that individuals with decreased levels of self-determined motivation and increased injury-related fear will also exhibit increased perceived stress and symptoms of athlete burnout.

1.3 Operational Definition of Terms

Anterior Cruciate Ligament Reconstruction (ACLR): restoring the function of the anterior cruciate ligament (ACL) after injury through a surgical tissue graft replacement

Athlete Burnout: psychosocial syndrome characterized by physical/emotional exhaustion; reduced sense of accomplishment; and sport devaluation

Injury-Related Fear: psychosocial impairment deterring individuals from returning to their pre-injury levels of sport and physical activity. Can take form of fear of movement and fear of reinjury, which can both impact functional outcomes after ACLR, and fear-avoidance beliefs, which can impact physical activity levels and quality of life following ACLR

Psychological Experiences: Psychological responses during rehabilitation process following ACLR before attempting to RTS

Return to Sport (RTS): an athlete's ability to fully participate in their sport following injury

Self-Determined Motivation: the degree to which internal sources drive an individual's behavior

Self-Determination Theory (SDT): a theory of human motivation used to understand how an individual's dispositional factors, as well as the social and environmental factors around them, affect motivation

CHAPTER 2

Review of Literature

2.1 Self-Determined Motivation

Self-determined motivation refers to the degree to which an individual's effort and behavior is driven by internal sources (Ryan & Deci, 2000). It is a beneficial aspect of sports participation and can positively influence athlete well-being (Gagné & Blanchard, 2007). It is associated with positive outcomes derived from sport and exercise, such as an increase in athlete interest and enjoyment and greater team cohesion (Gagné & Blanchard, 2007). Self-determined motivation also has a negative relationship with athlete burnout (Cresswell & Eklund, 2005; Lonsdale et al., 2009). It has been found that individuals who indicate greater self-determined motivation have improved psychological outcomes when returning to sport (Podlog & Eklund, 2010). Therefore, to improve outcomes related to sport and physical activity, it is important to understand the theoretical framework and underlying factors that can explain individual levels of motivation and why some individuals are more motivated during the rehabilitation process than others.

Self-determination theory (SDT) is one framework used to understand how an individual's dispositional factors, as well as social and environmental factors around them, affect motivation (Deci & Ryan, 1985). SDT theorizes that an individual's level of motivation to engage in a behavior is determined by the degree to which the behavior is consistent with an individual's self (Deci & Ryan, 1985). Based on SDT, an individual's motivational state falls along a self-determination continuum spanning from amotivation (i.e., absence of motivation or non-regulation) to intrinsic motivation (i.e., interest, curiosity, enjoyment, inherent satisfaction) (Pelletier et al., 2007). Between these two types of

motivation are different kinds of extrinsic motivations, including external regulation (e.g., external pressure and compliance), introjected regulation (e.g., self-control, ego-involvement, internal rewards and punishments), identified regulation (e.g., personal importance, choice and valuing), and integrated regulation (e.g., harmony with the self and activities in one's life) (Pelletier et al., 2007). As individuals move from external regulation to integrated regulation, they become more self-determined in their behaviors (Ryan & Deci, 2000).

To further characterize the different forms of motivation, SDT distinguishes between autonomous and controlled motivation (Deci & Ryan, 2008). Autonomous motivation refers to motivation stemming from internal sources, as well as extrinsic sources if they align with the individual's sense of self (Deci & Ryan, 2008). Intrinsic motivation, integrated regulation, and identified regulation would fit within autonomous motivation. Controlled motivation refers to external regulation, where the individual's behavior is because of a desire for external rewards or because of a fear of punishment (Deci & Ryan, 2008). Introjected regulation and external regulation would be considered forms of controlled motivation. The distinction between autonomous and controlled motivation is focused on the satisfaction or thwarting of the three basic psychological needs outlined in SDT: competence, autonomy, and relatedness.

These three psychological needs are derived from Basic Psychological Need Theory, a sub-theory of SDT that indicates how, for an individual to feel intrinsically motivated, their environment needs to satisfy each of the three needs (Ryan, 1995). Competence refers to the pursuit of mastery of a skill or set of knowledge. Autonomy refers to the perception of control over one's life direction. Relatedness refers to the feeling of being connected to others or to a specific group. Satisfaction of psychological needs promotes autonomous

motivation (Deci & Ryan, 2008), where individuals feel that behaviors are more in line with their goals and overall self. This can lead to positive outcomes, such as increased effort and well-being (Thogersen-Ntoumani & Ntoumanis, 2006). The thwarting of psychological needs, on the other hand, can lead to controlled motivation, where individuals engage in behavior because they feel they have to (Deci & Ryan, 2008). Negative outcomes from controlled motivation can include increased exhaustion and feelings of burnout (Lonsdale et al., 2009). Understanding how the satisfaction or thwarting of the basic psychological needs affects individuals can influence how individuals respond to their environments

Regarding sport and physical activity, these different perceptions of motivation can influence an individual's ability to return to sport after injury. For example, when returning from injury, an athlete may be motivated to return to sport because of an intrinsic pleasure related to sport (Podlog & Eklund, 2005); they may feel motivation to return to sport to regain their athletic identity after injury (Brewer et al., 1993); or they may experience extrinsic motivations when returning to sport such as monetary incentives (Bianco, 2001). The various ways that individuals perceive their motivation for the injury rehabilitation process and returning to sport can affect their appraisals and emotions regarding their ability to return (Podlog & Eklund, 2010). Different motivational regulations can affect an individual's cognitive appraisals and emotions when returning to sport after injury (Wiese-bjornstal et al., 1998). For example, when returning from injury, it has been found that external regulation is associated with concerns about returning to sport, while intrinsic motivation is associated with a positive sport perspective (Podlog & Eklund, 2005). Research has also found that promoting self-determined motivation can improve the quality of the exercise experience and foster positive exercise behavior for individuals (Thogersen-

Ntoumani & Ntoumanis, 2006). Individuals who demonstrated higher levels of self-efficacy and self-motivation are more compliant with rehabilitation and have a higher likelihood of returning to sport (Everhart et al., 2015). Overall, in reference to injury, self-determined motivation levels can affect an individual's willingness to engage in rehabilitation (Everhart et al., 2015; Podlog & Eklund, 2005), which can contribute to improved rehabilitation outcomes for patients post-ACLR.

2.2 Athlete Burnout

Athlete burnout is defined as a psychosocial syndrome characterized by three major symptoms: 1) physical and emotional exhaustion; 2) reduced sense of accomplishment; and 3) sport devaluation (Raedeke, 1997; Raedeke & Smith, 2001). Raedeke (1997) defines physical and emotional exhaustion as physical and emotional fatigue coming from the physical and psychosocial demands associated with training and competing in sport. Reduced sense of accomplishment is defined as the tendency to negatively evaluate performance and ability in sport, regardless of the actual outcome. Sport devaluation is defined as a negative and detached attitude toward sport, including a lack of interest in sport and a lack of concern for performance quality (Raedeke, 1997; Raedeke & Smith, 2001). As athletes experience these symptoms over time, they may notice declines in their physical performance and psychological well-being in regard to sport (Raedeke & Smith, 2001). This operational definition of athlete burnout is commonly used in the literature as a way to explain and understand the complex nature of athlete burnout in athletic populations. Understanding how and why athlete burnout develops is critical to identifying athletes at risk of burnout.

Several theoretical models have been created in order to explain the development of athlete burnout. Smith's (1986) cognitive-affective model focused on the role of stress in explaining burnout development in sport, indicating that stress alongside specific personality and motivational factors can lead to feelings of burnout. Coakley (1992) examined controlling behaviors and identity shifts, theorizing that the stress of the social organization of sport can cause unidimensional identities and perceived lack of control in athletes that may lead to burnout. Two different commitment models have also been developed (Raedeke, 1997; Schmidt & Stein, 1991) to offer an alternate perspective to stress-based models, suggesting that athletes whose sport commitment is based on feelings of entrapment may feel that they have no other option but to continue with their sport; over time, this can lead to burnout symptoms. With these models in mind, Gustafsson et al. (2011) created an integrated model of athlete burnout that incorporated aspects of the previous models, focusing on antecedents, early signs, and consequences. Overall, these models have contributed to greater understanding of the development of athlete burnout.

In order to understand how athlete burnout and injury may be related, it is beneficial to examine the role of stress in both the development of burnout and the experience of athletic injury, as it seems to be an important antecedent of both. In terms of athlete burnout and stress, Smith's (1986) cognitive-affective model explains how personal and situational factors can alter an athlete's perception of stress. These perceptions can lead to feelings of isolation from social support and a lack of control over the situation (Cresswell & Eklund, 2006b). Because stress is considered to be an antecedent of athlete burnout, it is important to consider the variety of ways in which stress can impact athletes. Athlete burnout has been found to have a positive relationship with perceived stress (Gould & Whitley, 2009). It has

been shown that, if high stress is maintained for extended periods of time, athletes may experience burnout (Goodger et al., 2007). Other behavioral responses connected to an athlete's perceived stress include physical withdrawal leading to possible sport dropout, decreased motivation and a decline in performance, and potentially athlete burnout (Cresswell & Eklund, 2006b; Smith, 1986).

Related to injury and stress, the stress and injury model is a framework designed to explain how psychosocial factors interact with an athlete's stress response to potentially influence athletic injury (Andersen & Williams, 1988). The specific psychosocial factors included in the model are personality, history of stressors, and coping resources. What the model suggests is that, when an athlete encounters a potentially stressful athletic situation, the situation can affect the athlete's stress response, which is influenced, either directly or indirectly, by each of the psychosocial factors. How the stress response affects the athlete through physiological or attentional changes can lead to the athlete potentially sustaining an injury (Andersen & Williams, 1988). This model is useful when considering how athlete burnout and injury may be related because several of the factors theorized to contribute to injury are outlined in the burnout models as well (e.g. Coakley, 1992; Smith, 1986; Wiese-Bjornstal et al., 1998). Dubuc et al. (2010) demonstrated these overlapping factors, finding that, as athletes began to experience symptoms of burnout, they also reported feelings of stress, irritability, and frustration with their sport, and struggles with injuries.

Although the stress and injury model indicates stress can affect risk of injury, it has been suggested that injury may also initiate stress (Grylls & Spittle, 2008; Udry et al., 1997). Athletes who have encountered injury can be affected psychologically, specifically in regard to their proneness to stress (Wiese-Bjornstal et al., 1998). Because of behavioral and

emotional responses that are associated with athletic injury, as well as personal and situational factors influenced by injury, injury may have some connection to athlete burnout (Cresswell & Eklund, 2005). However, there have been mixed results in the literature regarding this connection. For example, Cresswell & Eklund (2006b) found that individuals who reported more injuries also reported greater feelings of athlete burnout, supporting qualitative research by the same authors indicating that injury experience and burnout experience are related (Cresswell & Eklund, 2006a). On the contrary, Grylls & Spittle (2008) found that injured athletes experienced lower athlete burnout scores compared to uninjured athletes. These mixed results may be due to limitations such as not using a consistent burnout measure. Further limitations in athlete burnout research could include not consistently determining the severity of the injury, as well as not controlling for the point in time in which the athletes participated in the study. Although previous research has reported relationships between injury and burnout (e.g., Cresswell & Eklund, 2005, 2006b), more research should focus on specific injury experiences and how psychological factors may influence an injured athlete's experience of burnout, in order to help resolve these mixed results. Understanding whether there is an association between specific responses to injury, such as fear or stress (Wiese-Bjornstal et al., 1998), and athlete burnout can help determine which athletes may be more at risk of developing athlete burnout during the injury rehabilitation process.

2.3 Injury-Related Fear

Injury-related fear is a psychosocial impairment that encompasses aspects such as fear of movement, fear of reinjury, and fear-avoidance beliefs (Zale & Ditre, 2015). Due to the nature of the injury, injury-related fear is common in individuals after ACLR and can deter

return to preinjury levels of sport and physical activity (Meierbachtol et al., 2020). Specifically, it has been shown that fear of reinjury is a significant reason why individuals do not resume their preinjury levels of sport participation (Ardern et al., 2013; Kvist et al., 2005). Injury-related fear has been found to be associated with RTS, even when other psychological factors are controlled for (Baez et al., 2020). Additionally, injury-related fear is negatively associated with returning to pre-injury level of competitive sports in individuals post-ACLR (Kvist et al., 2005). These findings demonstrate the importance of addressing injury-related fear throughout the rehabilitation process, because, if not specifically addressed, injury-related fear can negatively impact rehabilitation outcomes (Ardern et al., 2013).

In order to understand the experiences of individuals who exhibit injury-related fear, it is important to outline how fear of movement, fear of reinjury, and fear-avoidance beliefs can affect the rehabilitation process. Fear of physical movement and fear of reinjury can affect functional outcomes following ACLR, specifically affecting knee-related quality of life and lessening chances of the individual returning to preinjury levels of sport participation (Kvist et al., 2005). Similarly, individuals with elevated levels of fear-avoidance beliefs engage in less physical activity and overall have a poorer quality of life following ACLR (Filbay et al., 2016). Elevated levels of fear-avoidance beliefs have also been found to increase the risk of reinjury in individuals with a history of ACLR (Hoch et al., 2019). Patients post-ACLR may be at risk of developing injury-related fear because of exposure to potentially fear-eliciting stimuli, which can lead to catastrophizing and avoidance behaviors (Baez et al., 2020). Avoidance behaviors may lead to lessened physical activity and a failure to return to preinjury levels of sport and physical activity (Baez et al., 2018).

Two models, the fear-avoidance model (Vlaeyen & Linton, 2000), and the Integrated Model of Response to Sport Injury, commonly known as the Cognitive Appraisal Model (Wiese-Bjornstal et al., 1998), can help to explain the development and effects of injury-related fear. The fear-avoidance model, originally developed to explain lower back pain, is a theoretical model regarding pain perception (Philips & Jahanshahi, 1986). It examines how pain-related fear can activate escape mechanisms leading to the avoidance of movement and activity (Zale & Ditre, 2015). This model can help to explain the failure to return to preinjury levels of sport and physical activity in patients post-ACLR. As the model indicates, in patients following ACLR, there is a continued cycle of pain, avoidance of physical activity due to fear, and disuse of the area where pain was felt. Because this fear persists, individuals may struggle to return to preinjury levels of sport and therefore have decreased levels of physical activity overall (Filbay et al., 2016).

The second model, the Integrated Model of Response to Sport Injury, depicts an athlete's psychological response to sport injury, encompassing personal and situational factors, cognitive appraisals, and behavioral and emotional responses (Wiese-Bjornstal et al., 1998). The specific factors and responses outlined in the model can also affect athlete perceptions of stress. Personal factors influence the actual cognitive appraisal of the athlete. Specific personal factors such as personality and coping skills can affect how the athlete perceives stressors within their situation. Situational factors influence cognitive appraisal processes as well as the athlete's overall perception of the situation. For example, social support and the rehabilitation environment can affect how injury stress impacts the athlete. These personal and situational factors thus alter an athlete's response to their appraisal of the situation, specifically emotional and behavioral responses. Emotional responses, such as injury-related

fear, can affect an athlete's appraisal of stress. Behavioral responses, like rehabilitation adherence, may stem from how an athlete reacts in response to their appraisal of stress. Overall, each of these factors outlined in the model affect recovery outcomes, both psychosocial and physical. For example, as observed in patients with elevated injury-related fear after ACLR, an individual experiencing fear may notice a shift in their cognitive appraisal concerning recovery outcomes, such as their belief in their ability to return to sport (Baez et al., 2020). Another example using this model is that athletes experiencing chronic stress due to injury and injury-related fear may experience feelings of athlete burnout, due to the theoretical connection between stress and athlete burnout (Smith, 1986). Ultimately, this model outlines how an athlete's cognitive appraisal of injury can impact outcome after injury, and which factors may be influencing these outcomes in athletes (Wiese-Bjornstal et al., 1998).

Because injury-related fear can affect outcomes after ACLR, like returning to pre-injury levels of sport and physical activity, it is beneficial to consider how the rehabilitation process can influence individual perceptions of injury-related fear. Meierbachtol et al. (2020) found variability between patients regarding fear-evoking tasks or situations. This finding suggests that, although addressing psychological factors is important following ACLR, rehabilitation and RTS training programs may not completely address fear of reinjury for all individuals. Individual responses seem to be critical to addressing fear of reinjury, which may not be available from standardized PROs (Meierbachtol et al., 2020). For example, if the source of fear is individual to each patient, then, if that specific source is not addressed during rehabilitation, fear of reinjury may persist (Meierbachtol et al., 2020). Injury-related fear can hinder an injured athlete's rehabilitation (Ardern et al., 2013) and functional progression,

leading to a delayed return-to-play time and an increased risk of reinjury upon return (Ardern et al., 2014; Kvist et al., 2005). When not fully addressed, psychosocial impairments related to fear of reinjury have been found to be present years after ACLR, thus affecting the individual's ability to RTS. These psychosocial impairments can also affect physical activity engagement in patients post-ACLR (Baez et al., 2020). Thus, addressing injury-related fear throughout the rehabilitation process is critical to improving outcomes following ACLR.

Overall, self-determined motivation and injury-related fear are two psychological constructs previously shown to impact patients during rehabilitation following ACLR. Specifically, individuals who exhibit greater levels of self-determined motivation during the rehabilitation process may have improved outcomes in sport and physical activity. In contrast, individuals exhibiting heightened levels of injury-related fear during the rehabilitation process may struggle to return to their pre-injury levels of sport and physical activity. Athlete burnout is a psychological construct that has not been examined extensively in patients in rehabilitation following ACLR. However, because of the stressful nature of ACL injuries and the lengthy rehabilitation process, and because of the theorized connection between stress and athlete burnout, it may be a relevant psychological outcome to explore. There is a gap in the literature regarding the examination of athlete burnout in relation to other relevant psychological constructs in individuals following ACLR. Therefore, this study has provided insight into how individual perceptions of self-determined motivation, athlete burnout, and injury-related fear affect psychological experiences during the lengthy and potentially stressful ACLR rehabilitation process.

CHAPTER 3

Method

3.1 Purpose

The purpose of this study was to explore how perceptions of self-determined motivation, athlete burnout, and injury-related fear affect individual psychological experiences during ACLR rehabilitation in patients between 4- and 6-months post-ACLR. For the quantitative component of the study, it was hypothesized that individuals with decreased levels of self-determined motivation and increased injury-related fear would also exhibit increased symptoms of athlete burnout. This chapter discusses the research design, sample population, instrumentation, data collection, and data analysis.

3.2 Research Design

A cross-sectional, explanatory sequential mixed methods study design was used to explore how psychological perceptions of self-determined motivation, athlete burnout, and injury-related fear impacted experiences during ACLR rehabilitation in patients between 4- and 6-months post-ACLR. This method involves the collection and analysis of both quantitative and qualitative data in response to research questions. For this study, quantitative data were collected first, followed by qualitative data. Phenomenology was the methodological orientation used to guide the qualitative aspect of the study (Lester, 1999). Use of a mixed methods design provides a deeper understanding of patient perspectives following ACLR that may be missed by collecting quantitative or qualitative data in isolation (Creswell, 2015).

Participants were recruited from the Michigan State University Sports Medicine Clinic. Study participants completed an online survey through Qualtrics that contained 5 questionnaires to complete. The primary variables of interest included 4 measures: (1) the Sport Motivation Scale-6 (SMS-6), (2) the Athlete Burnout Questionnaire (ABQ), (3) the Perceived Stress Scale 4 (PSS-4), and (4) the Tampa Scale for Kinesiophobia-11 (TSK-11). Participants also completed a demographic questionnaire. A sub-sample of 5 participants were selected to take part in an interview to further explain their experiences during ACLR rehabilitation and their responses on the questionnaires. Because of the nature of the study, the sample was a convenience sample of participants willing to be interviewed. This study was approved by the Michigan State University Institutional Review Board (IRB). Written informed consent from each participant or guardian and assent from each minor participant was obtained before beginning the study.

3.3 Quantitative Phase: Method

3.3.1 Sample Population and Participant Selection

A total of 13 participants with a history of unilateral, primary ACLR were included in the study. All participants were between 14-25 years old, between 4- and 6-months post-ACLR, and injured their knee playing or training for recreational or organized sports. Participants were recruited in-person through the Michigan State University Sports Medicine Clinic. Only participants who had not yet returned to sport were enrolled in the study, which was confirmed through the recruitment process. Furthermore, participants were excluded from the study if they had a history of bilateral ACLR, were less than 4 months or greater than 6 months post-surgery, or injured their knee in a non-sports related event. Data collection

occurred during the COVID-19 pandemic, which may have negatively impacted recruitment efforts.

3.3.2 Instrumentation

Motivation: The Sport Motivation Scale-6 (SMS-6; Mallett et al., 2007) is a revised version of the Sport Motivation Scale (SMS) based on SDT (Pelletier et al., 1995). It was used to determine sports participation motivation. The SMS-6 has 24 items assessing six constructs: intrinsic motivation, integrated regulation, identified regulation, introjected regulation, external regulation, and amotivation. Each subscale consists of four items. The items were scored on a 7-point Likert scale. The factorial structure of SMS-6 has been found to be in line with SDT (Kawabata & Mallett, 2013; Mallett et al., 2007). To synthesize and create an aggregate score, an overall self-determined motivation score was calculated, as described in DeFreese & Smith (2013). Possible scores ranged from -18 to 18, with higher scores indicating that an athlete's motivation for sport came from more self-determined reasons (DeFreese & Smith, 2013).

Athlete Burnout: The Athlete Burnout Questionnaire (ABQ; Raedeke & Smith, 2001) was used to measure athlete burnout. No adaptations were made from the original version of the scale. The 15-item ABQ has three 5-item subscales to match the three primary symptoms of athlete burnout: reduced sense of accomplishment, physical and emotional exhaustion, and devaluation. Each subscale was measured on a 5-point Likert scale. Based on DeFreese & Smith (2013), subscale scores were calculated by averaging scores on the five items responding to each burnout dimension. A global athlete burnout score was also created by

averaging the scores of each item, with scores ranging from 1 to 5 and higher scores indicating greater feelings of burnout (DeFreese & Smith, 2013). The ABQ is a widely-used measure of athlete burnout with demonstrated reliability and validity (Cresswell & Eklund, 2005; Raedeke & Smith, 2001).

Stress: The Perceived Stress Scale 4 (PSS-4) is a short form of the Perceived Stress Scale, a widely used measure of perceived stress (Cohen et al., 1983). The PSS-4 has four items that measure the degree to which situations occurring within the past month have been appraised as unpredictable or overwhelming. Each item was scored on a 5-point Likert scale. The total score sum was calculated, with scores ranging from 0 to 16 and higher scores indicating higher levels of stress (Cohen et al., 1983). The PSS-4 has been found to be a reliable measure of stress (Cohen & Williamson, 1988; Warttig et al., 2013).

Injury-Related Fear: The Tampa Scale for Kinesiophobia-11 (TSK-11; Woby et al, 2005) is a patient-reported outcome measure assessing pain-related fear of movement and reinjury. The TSK-11 has 11 items that examine fear in regard to injury. The response items on the TSK-11 are related to activity avoidance and somatic sensations. Each item was scored on a 4-point Likert scale. The total score sum was calculated for the TSK-11, and was scored from 11 to 44 points, with higher scores indicating greater feelings of pain-related fear. The TSK-11 is a validated measure of kinesiophobia in ACLR rehabilitation (George et al., 2012).

3.3.3 Data Collection and Management

All participants completed a demographic questionnaire, the SMS-6, the ABQ, the PSS-4, and the TSK-11. The demographic questionnaire gathered health information, including age, gender, race, ethnicity, and lower-extremity health history. Participants were also asked about sport history and current rehabilitation activities regarding their ACLR procedure. All participants then completed the SMS-6, the ABQ, the PSS-4, and the TSK-11 to assess their motivation, athlete burnout, stress levels, and injury-related fear symptoms related to their ACLR rehabilitation. Questionnaires were distributed to participants via the Qualtrics online platform.

3.3.4 Data Analysis

Descriptive statistics were calculated to summarize anthropometric measures (i.e., height, weight), the SMS-6, ABQ, PSS-4, and TSK-11 scores. Because the data were not normally distributed, Spearman rho correlation coefficients were used to examine the relationships between SMS-6, ABQ, PSS-4, and TSK-11 scores. Spearman rho values were interpreted as negligible (0.01 to 0.19), weak (0.2 to 0.29), moderate (0.3 to 0.39), strong (0.4 to 0.69), and very strong (≥ 0.70) (Dancey & Reidy, 2004). A Mann-Whitney U test was used to examine differences in scores on the questionnaires between those who agreed to be interviewed compared to those who did not agree to be interviewed. Hedges' g effect sizes with associated 95% confidence intervals (CIs) were calculated to determine the magnitude of difference between those who were interviewed versus those who were not interviewed. Effect sizes were interpreted as small (0.2 to 0.49), moderate (0.5 to 0.79), and large (≥ 0.8) (Cohen, 1977). A-priori alpha was set at $p < 0.05$.

3.4 Qualitative Phase: Method

3.4.1 Interview Measures

A semi-structured interview was used to guide the qualitative portion of the study. The interview guide contained open-ended questions regarding the participant's experience during ACLR rehabilitation and how the participant perceived their current levels of motivation, athlete burnout, and injury-related fear related to rehabilitation activities. Athlete burnout was defined for each participant. Questions regarding these variables were based on a review of each of the questionnaires prior to the interviews, with questions formulated based on individual responses, following the structure of an explanatory sequential mixed methods design (Creswell, 2015). The interviews lasted between 30 and 55 minutes and were conducted on a teleconferencing platform (i.e., Zoom). The interviews were recorded using the system's recording feature. Video and audio recordings were retained for transcription purposes until the study was completed. Data were kept in secure cloud-based storage and all data was de-identified to maximize data security and confidentiality precautions.

In conjunction with best recommendations, the primary investigator (MM) performed a pilot interview with an individual with a history of ACLR. This pilot interview participant offered feedback to the primary investigator that was used to revise any potentially leading or close-ended questions. Pilot interview data were not included in the current study analyses.

3.4.2 Data Collection and Management

A total of 9 participants were invited to be interviewed, with a sub-sample of 5 participants agreeing to participate in the interview. Therefore, this sample was a convenience sample based on participants who were willing to participate in the interview

process. The interview was a single, semi-structured interview taking place through a teleconferencing platform. The interview guide was based on previous qualitative work examining psychological responses to recovery after ACLR (Lisee et al., 2020) and the development of athlete burnout over time (Cresswell & Eklund, 2007). The interview was conducted by the primary investigator (MM), who was a female graduate student-member of the research team. The primary interviewer underwent a qualitative training protocol prior to this study, and was guided through the interview process by members of the research team who had studied qualitative methods extensively and published qualitative work (CK, DG, JD). The primary interviewer was interested in this topic because she was a former DI collegiate athlete with a history of injury. The participants had no prior relationship to the research team. Participants were aware that this project was completed as a thesis project for the primary investigator, and were informed of the research aim of the project. The goal of the interview was to allow participants to discuss their responses on the questionnaires, as well as to talk through their experiences with rehabilitation and ACLR.

3.4.3 Data Analysis

Data gathered from the interviews were interpreted through thematic analysis, as thematic analysis has been found to be an effective way of finding meaning in qualitative data (Guest et al., 2012). The interviews were transcribed verbatim to accurately interpret each participant's answers and allow for thematic coding. Within-interview participant-checking strategies (e.g., asking for clarification or for more information from participants) were used to allow participants to correct researcher interpretations, aiding in the validity of the results (Patton, 2015). Interview transcriptions were analyzed in a 6-stage process of thematic

analysis, as outlined in Braun & Clarke (2006): 1) becoming familiar with the data, 2) generating initial codes, 3) searching for themes, 4) reviewing themes, 5) defining and naming themes, and 6) producing the report. This study utilized line-by-line coding, which allowed for further immersion within the data to better formulate themes and subthemes.

Coded transcripts and thematic analysis were discussed between the primary investigator (MM) and one member of the research team with experience in qualitative analysis to verify the results and confirm the findings (MW). Coding discrepancies were resolved through meetings involving the primary investigator and one member of the research team, where code definitions were reviewed to determine the most accurate code assignment. Codes were organized into potential themes related to self-determined motivation, athlete burnout, and injury-related fear. Themes were checked to see if they worked in relation to the coded data, and were then refined to ensure clear definitions and names for each theme (Braun & Clarke, 2006). The purpose of the qualitative portion of the study was to explore how individuals perceived their experiences throughout ACLR rehabilitation in order to determine how their experiences affected their perception of motivation, athlete burnout, and injury-related fear. Following the qualitative analysis, inferences were drawn about how the qualitative findings helped to explain the quantitative results (Creswell, 2015).

CHAPTER 4

Results

4.1 Preliminary Quantitative Analysis

Overall, 13 participants completed the survey. Participant demographics and questionnaire scores are presented in Table 1. Participants averaged 20.85 on TSK-11, 10.16 on the SMS-6, 2.39 on the ABQ, and 4.54 on the PSS-4. With no established cutoff scores for the SMS-6, ABQ, or PSS-4, it is not possible to accurately characterize the results from those questionnaires. However, because a cut-off score of ≥ 17 on the TSK-11 has been established (Paterno et al., 2018), it can be stated that the participants did indicate elevated levels of fear of movement and reinjury.

Spearman rho correlation coefficients were used to examine the relationships between the variables. From these participants, a very strong, positive correlation between injury-related fear and perceived stress ($\rho = 0.70, p = 0.008$) was observed. While not statistically significant likely due to small sample size, a strong positive relationship between injury-related fear and global athlete burnout ($\rho = 0.53, p = 0.07$), and a strong negative relationship between self-determined motivation and global athlete burnout ($\rho = -0.43, p = 0.15$), were observed. Furthermore, although not statistically significant, a strong negative relationship between self-determined motivation and physical and emotional exhaustion ($\rho = -0.51, p = 0.08$) was observed. Correlations between all variables of interest are presented in Table 3.

When the questionnaire scores of participants who agreed to be interviewed were compared to those who were not interviewed, no statistically significant differences were observed for the TSK-11, PSS-4, or ABQ. However, a moderate effect size was observed for the SMS-4, with those willing to be interviewed exhibiting higher levels of self-determined

motivation when compared to those not willing to be interviewed. Between group comparisons are presented in Table 4.

4.2 Qualitative Analysis

Of the 13 participants included in the study, 5 of the participants completed the semi-structured interview. These participants included three females and two males. The average length of the interviews was 36 minutes, 55 seconds. Table 2 includes participant demographics and pseudonyms.

Thematic analysis procedures used within this study revealed the following five major themes relative to participants' perceptions of their rehabilitation experience following ACLR: 1) struggling with the recovery process, 2) acknowledging negative emotional states, 3) drive to return to sport and normal life, 4) understanding and finding purpose in rehabilitation, and 5) successfully navigating the recovery process. These five themes were further divided into 15 subthemes (see Table 5). The following section will provide a summary of the qualitative data, followed by analysis of the five themes. Quotes from the participants will be used to illustrate each theme and subtheme. A pseudonym will be attached to each quote to acknowledge the participant providing the quote while maintaining participant confidentiality.

4.2.1 Theme 1 – Struggling with the recovery process

To begin, participants discussed how the recovery process itself was challenging because of the uncertainty of the injury and the loss of their sport. Specifically, participants struggled with negative emotions surrounding motivation, as well as injury-related fear.

4.2.1.1 *Negative emotions surrounding injury and motivation*

The rehabilitation experience was described as challenging for many reasons. Nick described emotions stemming from the difficulty of navigating everyday activities:

I had to have help getting into the shower, and my dad would have to stand behind me when I jumped up the stairs... that's probably the most discouraging part, just because...that's such a low point.

Similarly, David mentioned his experience returning to college:

I didn't trust my knee at all, like the first few times I was walking. I had went back to school and I was walking all over the place. So... that was tough going up and down the stairs. Just walking to class, sitting in class, trying to bend my knees, do all that stuff.

Another issue brought up by participants was doubting their ability to recover. For example, at the beginning when he was on crutches, Nick stated:

“At first, [motivation levels] were low... I was like...there's just, there's no way... I just did not believe that there was any way I was going to be able to do anything in the next six months.”

David brought up a similar idea: “In the beginning, I had a lot of doubts about like, like just-not even just playing my sport but just like being able to walk normally again.”

Lack of motivation and frustration with the rehabilitation process was also discussed. Ashlyn mentioned: “When [motivation levels] are lower, I definitely dread going in [to

physical therapy]...it's like, 'do I have to go?,' that kind of feeling." Nick described mental and physical difficulties with rehabilitation: "Sometimes it's like, I can't squat with one leg, which I used to be able to do, so it's frustrating. And then it's also hard, because I can't squat with one leg because it hurts."

4.2.1.2 *Experiencing injury-related fear*

Another commonality among the participants was an experience of injury-related fear. When describing the beginning part of the rehabilitation process, Melissa stated: "So in the beginning...I was pretty fearful of doing a lot of things. Um, definitely minimized the things that could potentially go wrong a lot in the beginning." Lisa mentioned her experience when she was not able to walk at the beginning of her recovery:

It was still pretty rainy outside. And like, I would walk around and, when I started putting more weight on my foot, I almost slipped a lot and I would get super scared.

The participants then explained current feelings of injury-related fear, specifically fear of reinjury. Nick described performing ladder drills:

There are certain things where I get nervous about something, just kind of like, one in a million happening...like what if I find the one little piece of floor in the whole gym that's wet and I just like slip on my right leg...and re-tear.

David mentioned fearful thoughts he has while lifting:

There's that fear that it's just gonna like snap or something...Before that [injury], I would never think about that. But now that's like a thing in my head like, okay, I don't want my leg to go in some awkward position while I'm lifting and then I tear my ACL again.

4.2.2 Theme 2 – Acknowledging negative emotional states

As the participants talked through their rehabilitation experience, they began to acknowledge some of the negative emotional states they had experienced throughout the process. They discussed lessening fear levels, as well as contemplated their perception of athlete burnout.

4.2.2.1 *Transitioning to lower fear levels*

One way participants acknowledged their experience of negative emotional states was through the description of lowering fear levels as they got further into the recovery and rehabilitation process. For example, Lisa stated: “The fear has decreased since I’ve gone through rehab and have been strengthening my leg.” Melissa mentioned a similar experience in her current life: “Right now and a couple of weeks ago, I did not have much fear of everyday life and just of my leg being there.”

Participants provided examples regarding how they have seen this fear change through their experience. Melissa discussed her experience with trying new activities: “The first time, like I did stuff on one leg...The first time I did it, I was definitely a little bit nervous, but once I did it and realized that I was fine, all the fears went away.” David also described seeing his fear decrease as he did more repetitions of an exercise:

At the beginning, I'm like, 'Oh, I don't think I can do this.' But then I do it, and it was like, okay. But then I got to do another rep... Yeah, that's a good one. I'm still thinking about it...but the fear decreases after that.

4.2.2.2 *Contemplating feelings of athlete burnout*

Another negative emotional state discussed was athlete burnout. Participants were read a definition of athlete burnout, and then asked about each symptom individually. As a whole, athlete burnout did not emerge as a major experience during the recovery process. Nick discussed his limited experience of athlete burnout: "I've tried to just kind of separate sports and rehab. Just, I try to take rehab as it is and not... I try not to let sports get in the way of it or affect my thinking about it." Ashlyn did bring up what she thought on days where she felt unmotivated for rehabilitation exercises: "I think my mind is just thinking like, 'You have a long way to go.' Like, 'You're not gonna like- there's a rare chance you're going to play.' Like I was just thinking negative thoughts." However, Ashlyn also stated she has no experience athlete burnout because of motivation to RTS:

I feel like if I wasn't that motivated, then I feel like I definitely... would have doubt in myself. But like from the beginning...my first goal was to come back like better than before. So just to have that mindset throughout the whole like, experience definitely helped me not experience those feelings [of athlete burnout].

This idea of motivation came out in other participants' experiences as well. Melissa stated: "[Getting injured] just motivated me more to get back to where I wanted to be. I think that definitely helped [lessen athlete burnout]." She discussed a decision to change sports prior to her injury: "The past year doing things for myself and like realizing that to

choose softball...I really didn't enjoy basketball that much and I kinda just did it because I always did it. I think that helped [lessen athlete burnout] too.”

One symptom of athlete burnout, emotional and physical exhaustion, did seem to bring up some uncertain feelings in participants of how to conceptualize their experience with exhaustion. Thinking through her experience, Melissa discussed getting a break from sports: “I think in the beginning it was good to take a little break from it. Just to... like get everything situated back to normal.” Ashlyn stated that she does not feel exhaustion because she has not returned to sports yet: “I don't think I've felt anything like that, because I'm not in... Like I haven't really returned to it. So...I don't really feel any of that.” But Melissa also brought up the idea of having to RTS and change her schedule again:

After I've gotten comfortable like with my schedule now, thinking about going back to, um, like doing softball every single day, or working out every day, it definitely like got me a little bit, like thinking about how tired I could be.

Another symptom of athlete burnout that was evident in some participants was feeling a reduced sense of accomplishment because they were unable to play their sport. Ashlyn discussed not being at the level she was before in her sport: “A little bit [of reduced sense of accomplishment] because I can't really, I wasn't- I'm not like at the level I was before. So I feel like I'm definitely less successful.” However, despite seeing some evidence of this symptom, there was also indications of adaptation in terms of searching for ways to seek accomplishment in other areas. Melissa described accomplishments in her personal life:

I haven't been able to accomplish anything new within softball, but I have been accomplishing like personal things... in the weight room, I have accomplished

more than I had been before. So I think that kind of fills the void of my accomplishments that I usually had in softball.

4.2.3 Theme 3 – Drive to return to sport and normal life

As participants continued through the recovery process and processed some of their negative emotions, they mentioned feeling a type of inner drive pushing them to want to return to their sport and normal life. Specifically, this drive came from recognizing the value of recovering and returning to sport, finding motivation for their sport, and setting goals.

4.2.3.1 *Recognizing value in recovery for sport*

By recognizing the value of successful recovery for their sport, participants described finding the drive to return to sport and normal life. Specifically, participants were asked about the third symptom of athlete burnout, sport devaluation. David did not find that he had any experience of sport devaluation: “I’d say it’s the opposite [of sport devaluation]. Like getting hurt has like, I’ve never wanted to get back...so badly.” Ashlyn answered similarly, discussing how she wants to recover so she can get back to playing: “I’m actually the opposite [of sport devaluation]. I think I find it more...I want to get back and be better than I was. So I don’t think I’ve felt...‘I don’t want to play anymore,’ or anything like that.”

One participant did have a unique perspective regarding sport devaluation, as he is not planning on returning to his sport. Nick discussed how he still enjoys his sport, although he will not be planning it competitively again:

I obviously care about football less, but I wouldn’t say I have a negative perception of it. Like I still, I still like watching football and...I’ll probably play

football in the summer if I can, just with my friends in the backyard. But...I'm not going to do it competitively ever again.

4.2.3.2 Finding motivation for sport

As participants recognized the value in their recovery, they discussed finding motivation to RTS. One point of emphasis was using their athletic goals as motivation to recover. For example, Lisa said: “[Motivation] has pushed me to keep going even though sometimes I like, didn't want to have to keep working out and stuff. But my end goal to go and play in college has really pushed me to keep going.” Melissa also spoke about a similar type of motivation related to her future goals: “I want to play in college and junior year is like a really big recruiting year... So I definitely feel like being able to play in front of colleges at my best ability is very motivating to me.” Nick focused his attention toward more short-term motivation:

I use golf as like my short-term motivation, I guess... if I'm feeling tired of it or something, I can tell myself, okay, you're not going to be able to golf if you just give up or stop trying, like don't do your physical therapy at home.

4.2.3.3 Setting various types of goals

With a focus on motivation, goal-setting became a point of emphasis for the participants. The participants outlined two different types of goals that they tended to set as they worked through the recovery and rehabilitation process. The first type was individual-focused goals, which referred to their recovery as a person outside of their sport. Lisa stated her main goal was to get her legs back to the same strength: “I can still, like, see a major difference in the size of [my legs]. So, I just want to get them to like the same size and the same strength.”

David discussed wanting to feel confident: “I want to be 100 percent confident in my knee. I want it to feel normal...I know probably there's going to be like, a few minor tweaks with it. But...overall, I just want it to feel normal.”

The second type of goal outlined by participants were sport-specific goals. Ashlyn discussed: “We have our last tournament, my team does in May, and that's when my eight months will be. So my goal is to play in that tournament.” Melissa also had a specific time point for when she wanted to get back:

Best-case scenario is being able to play most of my high school season, which starts in March. So I know in the beginning I might not be able to like do everything. But I hope to play a lot of the high school season and then that, I hope will get me ready for summer, my travel season.

4.2.4 Theme 4 – Understanding and finding purpose in rehabilitation

Alongside having a drive to RTS, the ability to find purpose in the rehabilitation process was an important point brought up by the participants. They described recognizing the lengthy nature of recovery, trusting their medical staff, working hard in rehabilitation, and ultimately seeing the benefits of physical rehabilitation.

4.2.4.1 *Recognizing the lengthy recovery process*

To begin, participants discussed a realization that the recovery process was going to be long. Ashlyn talked through recognizing the lengthy process during rehabilitation: “The longer that like I kept going [to physical therapy], I like, realized more that it would be definitely a longer process.” Nick talked about seeing high-caliber athletes go through the process of recovering after ACLR:

I've watched some of these [professional] athletes have the same injury, and like...they've got professionals looking at them every day and I see a physical therapist twice a week, so I shouldn't expect to be back any sooner.

Not only did participants come to realize the length of the recovery process, but they gained perspective after acknowledging their abilities following surgery. Nick discussed the impact the recovery process had on his day-to-day life:

I feel like maybe one thing that people that I've talked to like don't understand is like, how much it initially affects your life, just at your house...After I had surgery and I was brought home in a wheelchair, I was like, this is really serious... So I was like, this is going to take a while and I had to accept that.

Melissa stated: "In the beginning I knew that I couldn't do a lot, which helped me. Like I knew that I wasn't gonna be able to run the next day after surgery...I prepared myself before a lot which I think helped."

4.2.4.2 *Trusting the medical staff*

An important component to making progress within the rehabilitation process was trusting the medical staff assisting with rehabilitation, such as the physical therapist or the athletic trainer. One way participants gained this trust was from navigating the overall rehabilitation experience. Nick mentioned: "I see two different people. And I like... I like both of the ladies I see. They're both good people that talk a lot, so it's never boring." Lisa discussed a similar positive experience with her physical therapists: "I've had two different

physical therapists...But they've both been really nice and like, they really like, push me to like, work more on like my legs and stuff.”

The participants also brought up trust they have with their individual medical staff. Melissa discussed feeling comfortable with her physical therapists: “Having someone there telling me that I'm going to be fine, definitely made me more comfortable doing it.” David talked about having conversations with his athletic trainer that helped him to shift his mindset: “I think like just talking with my [athletic] trainer and him being like, realistic with me, he’s like, ‘You have to- like you'll have to relax, like you can’t accelerate the process.’”

4.2.4.3 *Working hard in rehabilitation*

Participants also spoke about making the effort to work hard in physical rehabilitation. Melissa described having the ability to work hard because her fear levels were not as high: “Throughout [rehabilitation], I moved pretty quickly and got into more intense things because I wasn’t like, scared to do anything new or... and I wanted to do more as well.” Nick brought up the reality of the process: “There's nothing you're going to be able to do to speed that [recovery process] up really, unless you work your butt off and be patient.”

Participants then provided advice for other athletes going through the rehabilitation process. Ashlyn mentioned: “I would like, probably recommend them to push as hard as they can in [rehabilitation] because it, like, sucks. But that's overall going to help you get back to playing your sport.” Lisa reflected on her own experience:

I definitely would say like, tell them to like not cheat on their workouts...Because that really helps a lot, and I know like, sometimes I get really busy and I like,

forget. But like, in the long run, if you put in more work like, outside of [rehabilitation] and in [rehabilitation], it does really help in the long run.

4.2.4.4 *Seeing benefits of physical rehabilitation*

Finally, the participants discussed seeing the benefits of physical rehabilitation and how rehabilitation can help with recovery. For example, Lisa stated: “It's been a really good experience. Like, the workouts we do are hard, but I do really like going there.” Talking about the impact of rehabilitation, Ashlyn described:

Sometimes, like I wanna go because like I realize, like it'll make me better, and then some days, I'm like, ‘Do I have to go?’ But at the end of the day, I just- I go to like, just help me get to my goal.

Participants also focused on the progress they have made throughout their physical rehabilitation. Nick stated: “After a little bit of physical therapy, I started to see my leg working better and I was like, okay, you know, this is motivating to see.” Ashlyn also focused on progress: “I just try to look forward to like my next doctor's appointments... just finding out my progress, that has definitely helped.”

4.2.5 Theme 5 – Successfully navigating the recovery process

The final theme centered on how participants successfully navigated the recovery process.

Looking back at their experience, participants described staying motivated, using social support, reframing fear, and adopting a positive mindset.

4.2.5.1 *Staying motivated*

Getting through the process for each of the participants began with realizing the importance of staying motivated. Ashlyn talked about how her goals have positively impacted her motivation: “My motivation was to definitely get back to the level I was playing at...and to like even be better at the beginning.” Lisa focused on a similar sport-related point: “Knowing that I will be able to play in college still, and like at a higher level, has also been like a huge motivator.” Nick’s motivation came from a desire for long-term health:

I want to be healthy. So like if I can’t ever lift again, like once I turn 50 or something, pick up like running just to stay healthy... So I’d say it’s just kinda for my health, like...I don't want to let my leg make me be a couch potato.

4.2.5.2 *Using social support*

Participants also benefited from using different forms of social support. Melissa talked about having a large support system: “I have my parents and stuff. They helped me, all my siblings and my friends too, like I really have a great support system that definitely helped me through all of it.” Nick described specific ways his support system has celebrated his achievements: “Even just like my family, like I’ll come home, I’ll be like ‘I did heel taps on an eight inch box today’ and they’ll be like ‘Awesome!’” Lisa provided a similar sentiment for her friends: “Probably just like, all of my friends telling me that like, I’ll get better soon. And like, just having a support system around me has really helped.”

Another form of social support described by participants was talking to others who were also recovering from ACLR. Melissa mentioned: “I actually know a few people who

tore their ACL at the same time as me. So that kinda helped me too because we kind of like, went through it together.” Lisa also had this experience with someone who tore her ACL at a similar time: “I’ve been able to talk to her about our experience in rehab and how we feel about it and the different stuff we've done.”

4.2.5.3 *Reframing fear*

A third subtheme that came out was the reframing of the fear they experienced throughout the rehabilitation process. Lisa talked about the desire to get back to normal helping her to reframe her fear:

I don't feel like [fear] has impacted [rehabilitation] that much...because I've had so much motivation to just be at rehab, that I just like, forget about my fear for a little bit and I'm like... I have to, like, do all this stuff for- if I want my fear to go away and to be back to normal.

Nick brought up using rehabilitation to reframe his fear: “I don’t get as scared [during rehabilitation] because it's all structured exercises that I'm being walked through with by a professional that knows what they're doing.” Ashlyn mentioned using fear as motivation: “I think that, if anything, [fear] made me like, it drove me to do more at [rehabilitation] so that I could get rid of the fear.”

4.2.5.4 *Adopting a positive mindset*

Finally, a significant focus of the participants while reflecting on their experience was the impact of adopting a positive mindset. Lisa mentioned: “Since I do have such like, a positive state of mind, it made my experience with rehab a lot better because I like, like

going there and like, I know that I'm working toward something bigger.” Melissa stated:

“Through the whole process, I tried to stay positive, but it's obviously, like there were points where my mind went negative. But I think like overall I had a pretty positive mindset...which definitely helped me.”

The participants also provided advice for others on the importance of a positive mindset.

Nick discussed some thoughts from his own experience:

Being able to acknowledge the shortcomings you might have, without getting frustrated, you need to be able to do that or else it's going to make the whole experience a lot worse. Just being able to...look at the negative things or like the things that you find negative and turning them positive for yourself.

David provided a similar idea, saying:

I'm a real big believer in like perception of things... So if you are motivated and you're positive about getting better, your experience is going to be really good. And I think if you're negative about it, then it's not gonna go too well.

CHAPTER 5

Discussion

5.1 Overview

The purpose of the current study was to explore perceptions of self-determined motivation, athlete burnout, and injury-related fear and how these psychological outcomes affected individual psychological experiences following ACLR. For the quantitative part of the study, it was hypothesized that individuals with decreased levels of self-determined motivation and increased injury-related fear would also exhibit increased stress and symptoms of athlete burnout. The hypothesis was partially supported. A strong, positive relationship that was statistically significant between perceived stress and injury-related fear was observed. Although not statistically significant likely due to a small sample size, this study also found that injury-related fear and global athlete burnout had a strong positive relationship, and self-determined motivation and global athlete burnout had a strong negative relationship. These findings indicate that individuals with increased levels of stress may be experiencing injury-related fear as well. Additionally, increased injury-related fear may indicate increased feelings of athlete burnout, while increased self-determined motivation may indicate decreased feelings of athlete burnout, although a larger sample size needs to be examined to determine these correlations.

In the qualitative portion of the study, five higher-order themes emerged from the data: 1) struggling with the recovery process, 2) acknowledging negative emotional states, 3) drive to return to sport and normal life, 4) understanding and finding purpose in rehabilitation, and 5) successfully navigating the recovery process. These findings indicate that, at 4 to 6-months post-ACLR, individuals noticed a positive shift in their psychological perceptions and are able to articulate how these perceptions impact their recovery and rehabilitation experiences. Taken

together with the quantitative findings, it seems that increasing positive psychological perceptions may improve rehabilitation experiences in these individuals.

5.2 Psychological Perceptions During ACL Rehabilitation

The current study considered potential relationships between injury-related fear, self-determined motivation, perceived stress, and athlete burnout during the ACLR rehabilitation process. The only significant finding from the preliminary quantitative analysis was that there was a strong positive correlation between injury-related fear and perceived stress in individuals following ACLR. Similar findings regarding fear and stress have been reported in the literature. For example, specific responses to injury can include both fear and stress, and athletes who are actively dealing with an injury may have an increased proneness to stress (Wiese-Bjornstal et al., 1998). Additionally, Everhart et al. (2013) found that, after an individual goes through ACLR, their ability to cope with stress can impact sport and physical activity outcomes. The similarities in these findings may come from stress having the potential to negatively impact physical and psychological wellness in sport (Hardy, 1992), while injury-related fear can affect individuals' abilities to RTS (Baez et al., 2020). Taken together, when experiencing stress and fear related to injury, individuals may perceive general psychological responses that are more negative regarding the rehabilitation process and general outcomes.

Interestingly, the participants included in the interview part of the current study did not demonstrate significant stress concerning their rehabilitation experience, based on questions focusing on their rehabilitation experience. Gould et al. (1997) found that reducing stress in skiers recovering from season-ending injuries included keeping in touch and communicating with the athletes throughout the process. Because the individuals in the qualitative portion of this

study described positive experiences with their medical support staff, as well as using social support to help them get through rehabilitation, perhaps a lowering of injury-related fear and perceived stress levels had occurred by the time these participants were interviewed at the 4- to 6-month period following ACLR.

Individuals included in the interview also described seeing a positive shift in negative emotions, such as injury-related fear, from the beginning of the rehabilitation process to their current state. Specifically, they discussed how participating in rehabilitation helped these fear levels. However, these participants still indicated elevated levels of fear on the questionnaires, based on the average for the TSK-11 (20.85). Therefore, although participants may have perceived lessening fear levels throughout the process, more work needs to be done to improve injury-related fear over the course of rehabilitation. Mahood et al. (2020) outlined how graded exposure, social support, and self-motivation, among other things, helped individuals to manage and overcome fear of reinjury following ACLR. There may be benefit in using similar methods to help individuals continue to progress past feelings of fear following ACLR. Future research should also examine experiences of injury-related fear and perceived stress at different time points throughout rehabilitation to provide a more thorough understanding of what causes these positive shifts in fear and stress.

While participants discussed initial fear during the rehabilitation process in the interviews, the qualitative data demonstrated minimal experience of athlete burnout throughout the process. It should be noted that the participants were participating in competitive sport at the time of injury and overall did plan to RTS. This context is important, as the quantitative analysis indicated potential feelings of athlete burnout, with the subscale of reduced sense of accomplishment having the highest average (2.42). Interestingly, this symptom was the only one

that the interview participants discussed experiencing at length, specifically because they were not accomplishing anything in sport while injured. Previous literature shows mixed results regarding athlete burnout, with some research suggesting that individuals who have experienced more injuries indicate higher levels of burnout (Cresswell & Eklund, 2006b), and other research demonstrating that injured athletes had lower burnout scores than uninjured athletes (Grylls & Spittle, 2008). The participants in the current study did not have a history of bilateral ACL surgery, and also reported fairly high levels of self-determined motivation, which may explain the limited athlete burnout depicted in the study. However, because reduced sense of accomplishment was shown both quantitatively and qualitatively, helping athletes to fulfill this sense of accomplishment in other areas while recovering would be beneficial. It should be considered that the participants who were interviewed had higher levels of self-determined motivation compared to the participants who were not interviewed, which may have influenced perceptions of athlete burnout within the qualitative data. Overall, though, relationships between psychological outcomes should continue to be a focus, because ACLR recovery is a complex experience for individuals, and factors such as self-determined motivation may be what is helping to reduce feelings of athlete burnout in these patients (e.g., Lonsdale et al., 2009).

DeFreese et al. (2013) found that individual experiences tend to drive perceptions of psychological factors such as self-determined motivation and athlete burnout. In turn, increased self-determined motivation can lead to greater positive perceptions regarding ability to RTS (Podlog & Eklund, 2010). In the current study, individuals discussed positive rehabilitation experiences and an ability to find purpose in recovery, thus driving their self-determined motivation to get back to sport and physical activity. Similarities among these experiences can be explored through the basic psychological needs outlined in SDT (Ryan & Deci, 2000).

Specifically, in the current study, qualitative data demonstrated satisfaction of the participants' basic psychological needs. Although the SMS-6 does not have an established cutoff score, the average self-determined motivation score for the interviewed participants was 12.18, indicating that the quantitative findings likely support this viewpoint. Regarding competence, participants described progress in rehabilitation and gaining back their ability to do normal activities. Regarding autonomy, they discussed setting goals based on what they wanted out of the recovery process. Regarding relatedness, they perceived positive social support from several different avenues. The indication of basic psychological need satisfaction matches previous literature, where the satisfaction of basic psychological needs in injury rehabilitation led to increased motivation and a greater belief that the medical support staff cared for the individuals (Bejar et al., 2019). It is known that basic psychological need satisfaction can impact an individual's level of self-determined motivation (Bejar et al., 2019), and that individuals with greater self-determined motivation have improved psychological outcomes when RTS (Podlog & Eklund, 2010). Therefore, future research should assess psychological need satisfaction in patients as well as examine how to further incorporate need satisfaction into the rehabilitation process.

Additionally, in the qualitative interviews, when participants described higher levels of motivation, they also seemed to perceive a greater belief in their ability to achieve their goals and RTS. Similar perceptions have been outlined in the literature, with multiple sources finding that motivation does affect an individual's appraisal of their injury and can improve rehabilitation outcomes in patients post-ACLR (e.g., Pizzari et al., 2002; Sonesson et al., 2017; Wiese-Bjornstal et al., 1998). Because the participants in the current study exhibited high motivation for rehabilitation and RTS in both the quantitative and qualitative components of the study, it

supports the previous literature in terms of the positive impact that self-determined motivation has on rehabilitation.

Overall, knowing that individual psychological perceptions can impact the rehabilitation process (Baez et al., 2020), it is worth considering how these psychological states may affect the ability of individuals to cope in various situations as they recover from their injury. Participants discussed the significant impact that injury had on their life outside of sport, showing how the injury experience cannot be separated from day-to-day living. This idea that psychological responses to injury will both impact, and be impacted by, experiences outside of sport has been explored in the literature. For example, Wiese-Bjornstal et al. (1998) outlined athlete psychological responses to injury within the Integrated Model of Response to Sport Injury, which can be used to examine potential behavioral and emotional responses to injury and how an individual may respond in negative non-sport situations. From this model, Wadey et al. (2019) found that individuals with high pre-injury adversities felt overwhelmed and unable to cope once the injury occurred, whereas individuals with low pre-injury adversities never developed the coping abilities needed to help them cope with the injury. Additionally, Albinson & Petrie (2003) found that individuals who perceived high negative life-event stress prior to their injury struggled more with coping once their injury occurred. These studies support the importance of examining the relationship between psychological stressors within sport as well as outside of sport. Further examination into how the injury experience changed individual perceptions of daily life could allow for greater understanding of how these psychological states integrate and affect the individual.

5.3 Clinical Implications of Findings

Overall, the findings from this study indicate potential implications for clinicians, specifically physical therapists and athletic trainers who are working with these athletes throughout the rehabilitation process. To begin, as previous literature has shown (e.g., Ardern et al., 2013; Baez et al., 2020; Filbay et al., 2016), the psychological components of recovery and rehabilitation following ACLR play a significant role in the perceived experience of the athlete. Although physical recovery is certainly important, psychological outcomes need to also be prioritized in rehabilitation. The current study showed a positive relationship between injury-related fear and perceived stress levels. Interviewed participants also highlighted that their fear levels seemed to improve when they were actively working with a clinician, such as a physical therapist, at rehabilitation. Therefore, it may be beneficial to include a psychological component to rehabilitation. Addressing feelings of fear and lack of motivation as part of the rehabilitation process may improve outcomes as individuals begin the process to RTS and physical activity. For example, Baez et al. (2018) suggests that certain methods clinicians could consider using in rehabilitation are cognitive-behavioral treatment strategies like positive self-talk and imagery. Additionally, graded exposure throughout rehabilitation could help to address feelings of fear in patients (Mahood et al., 2020).

These findings also illustrate that it is beneficial to actively help athletes find what drives them to get back to sport and physical activity. The participants interviewed in the current study discussed setting goals that focused on both individual health and desire to RTS. This seemed to help the participants begin to see value in the recovery process, thus increasing motivation for rehabilitation. Providing patients the space to talk through their goals could have a positive effect on their self-determined motivation, because they may perceive increased social support, helping

to facilitate their RTS process (Mahood et al., 2020). In addition, facilitating motivation may improve patients' abilities to achieve their sport-related goals (Sonesson et al., 2016).

Finally, clinicians should focus on what can help athletes successfully navigate the recovery process. The participants interviewed in this study discussed finding sources of self-determined motivation, using their social support adequately, reframing their feelings of fear, and adopting a positive mindset. Using this information, we encourage clinicians to communicate with their patients about what they are feeling, both physically and psychologically, to better address feelings of fear, as well as to help them increase self-determined motivation. Specifically, satisfying the psychological needs outlined in SDT (Ryan & Deci, 2000), can encourage higher levels of self-determined motivation and increase compliance with rehabilitation (Everhart et al., 2015). Because a positive mindset was particularly emphasized in the interviews, creating a supportive environment where individuals are encouraged to focus on their progress could allow for a greater emphasis of positive psychological factors over negative ones (e.g., Mahood et al., 2020; Paterno et al., 2019; Sonesson et al., 2016). Establishing an environment that prioritizes positive support and the satisfaction of each psychological need could help to improve rehabilitation outcomes and increase chances of returning to previous levels of sport and physical activity.

5.4 Limitations

This study is not without limitations. Firstly, there was convenience bias in terms of who was selected to participate in the interviews. As individuals with higher motivation and greater well-being may be more likely to participate in research, the 'healthy-worker effect' (Schaufeli & Enzmann, 1998) could impact interpretation of the results, as those with decreased well-being

may not be included within the sample. It was found that the interviewed participants in this study had significantly higher self-determined motivation scores than the non-interviewed participants, which further underlines this limitation in research.

Secondly, this study had a small sample size that was underpowered; therefore, a type 2 error could have occurred. Data saturation was also not able to be reached for the qualitative component of this study, due to the convenience sample of participants who agreed to complete the interview. Because data saturation is an important part of qualitative research (Fusch & Ness, 2015), this limitation affects the validity of the study's findings.

A third limitation is that these results were solely from participants in the mid-Michigan region of the United States. Psychological perceptions of rehabilitation experience may vary in other areas of the country, which can affect the generalizability of the study. Additionally, previous research has explored motivation and athlete burnout, and outlined sampling limitations within this area of research (e.g., DeFreese & Smith, 2013; Smith et al., 2010). Diversifying the sample by including participants from a variety of backgrounds and experiences would improve generalizability and provide a more comprehensive understanding of how individuals interpret their rehabilitation experiences.

Lastly, the cross-sectional nature of this study limits our understanding of cause and effect between the variables of interest. It is certainly possible that the 4- to 6-month time point may not be the peak for some of these psychological outcomes. Future research should explore these variables in a prospective study to identify the cause-and-effect nature of injury-related fear and self-determined motivation on perceived stress and athlete burnout.

5.5 Conclusion

The purpose of this study was to better understand patient experiences following ACLR, and how self-determined motivation and injury-related fear may relate to perceived stress and athlete burnout. The participants within this study provided insight into their experiences following ACLR and how their perceptions of self-determined motivation, injury-related fear, and athlete burnout impacted their recovery process. Injury-related fear and self-determined motivation seem to play an important role in the recovery and rehabilitation experience at 4- to 6-months post-ACLR, whereas athlete burnout does not seem to be as prominent. Future research should therefore continue to examine perceptions of psychological responses at different time points to gain a better understanding of how these responses change throughout recovery. With a better understanding of psychological variables, researchers and clinicians may be able to improve rehabilitation outcomes and RTS rates for patients following ACLR.

APPENDICES

APPENDIX A

Demographic Survey

What is your age in years?

What is your gender identity?

- Male
- Female
- Nonbinary/third gender
- Prefer to self-describe _____

What is your race?

- American Indian or Alaskan Native
- Asian
- Black or African American
- Native Hawaiian or Other Pacific Islander
- White
- Prefer not to say
- Prefer to self-describe _____

Are you of Hispanic, Latino/a/x, or of Spanish origin? (one or more categories may be selected)

- No, not of Hispanic, Latino/a/x, or Spanish Origin
- Yes, Mexican, Mexican American, Chicano/a/x
- Yes, Puerto Rican
- Yes, Cuban
- Yes, Another Hispanic, Latino/a/x or Spanish Origin
- Some other race, ethnicity, or origin
- Prefer not to say
- Prefer to self-describe _____

What sport do you play?

What is the highest level of sport you've played?

- High school
- AAU
- Junior College
- NAIA
- NCAA Division III
- NCAA Division II
- NCAA Division I
- Semi-professional
- Professional

Please describe any other lower-extremity injuries you have experienced.

How long has it been since your current injury?

How long has it been since your reconstructive surgery?

Please describe current rehabilitation activities related to your reconstructive surgery.

APPENDIX B

Sport Motivation Scale-6 (SMS-6)

WHY DO YOU PRACTICE YOUR SPORT?

Using the scale below, please indicate to what extent each of the following items corresponds to one of the reasons for which you are presently practicing your sport.

Does not correspond at all	Corresponds a little	Corresponds moderately	Corresponds a lot	Corresponds exactly
1	2	3	4	5

WHY DO YOU PRACTICE YOUR SPORT?

- | | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. For the excitement I feel when I am really involved in the activity | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2. Because it's part of the way in which I've chosen to live my life | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3. Because it is a good way to learn lots of things which could be useful to me in other areas of my life | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4. Because it allows me to be well regarded by people that I know | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 5. I don't know anymore; I have the impression of being incapable of succeeding in this sport | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 6. Because I feel a lot of personal satisfaction while mastering certain difficult training techniques | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 7. Because it is absolutely necessary to do sports if one wants to be in shape | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8. Because it is one of the best ways I have chosen to develop other aspects of myself | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 9. Because it is an extension of me | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 10. Because I must do sports to feel good myself | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 11. For the prestige of being an athlete | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 12. I don't know if I want to continue to invest my time and effort as much in my sport anymore | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 13. Because participation in my sport is consistent with my deepest principles | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 14. For the satisfaction I experience while I am perfecting my abilities | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 15. Because it is one of the best ways to maintain good relationships | | | | | | | |

with my friends	1	2	3	4	5	6	7
16. Because I would feel bad if I was not taking time to do it	1	2	3	4	5	6	7
17. It is not clear to me anymore; I don't really think my place is in sport	1	2	3	4	5	6	7
18. For the pleasure of discovering new performance strategies	1	2	3	4	5	6	7
19. For the material and/or social benefits of being an athlete	1	2	3	4	5	6	7
20. Because training hard will improve my performance	1	2	3	4	5	6	7
21. Because participation in my sport is an integral part of my life	1	2	3	4	5	6	7
22. I don't seem to be enjoying my sport as much as I previously did	1	2	3	4	5	6	7
23. Because I must do sports regularly	1	2	3	4	5	6	7
24. To show others how good I am at my sport	1	2	3	4	5	6	7

APPENDIX C

Athlete Burnout Questionnaire (ABQ)

Using the scale below, please indicate to what extent each of the following items corresponds to how you are feeling.

Never	Almost never	Sometimes	Frequently	Almost always
1	2	3	4	5
1. I'm accomplishing many worthwhile things in sport			1 2 3 4 5	
2. I feel so tired from my training that I have trouble finding energy to do other things			1 2 3 4 5	
3. The effort I spend in my sport would be better spent doing other things			1 2 3 4 5	
4. I feel overly tired from my sport participation			1 2 3 4 5	
5. I am not achieving much in my sport			1 2 3 4 5	
6. I don't care as much about my sport performance as I used to			1 2 3 4 5	
7. I am not performing up to my ability in sport			1 2 3 4 5	
8. I feel "wiped out" from my sport			1 2 3 4 5	
9. I'm not into my sport like I used to be			1 2 3 4 5	
10. I feel physically worn out from my sport			1 2 3 4 5	
11. I feel less concerned about being successful in my sport than I used to			1 2 3 4 5	
12. I am exhausted by the mental and physical demands of my sport			1 2 3 4 5	
13. It seems that no matter what I do, I don't perform as well as I should			1 2 3 4 5	
14. I feel successful at my sport			1 2 3 4 5	
15. I have negative feelings toward my sport			1 2 3 4 5	

APPENDIX D

Perceived Stress Scale 4 (PSS-4)

The questions in this scale ask you about your feelings and thoughts during THE LAST MONTH. In each case, please indicated your response by placing an "X" over the square representing HOW OFTEN you felt or thought a certain way.

Never	Almost never	Sometimes	Fairly Often	Very Often			
0	1	2	3	4			
			1	2	3	4	5
			1	2	3	4	5
			1	2	3	4	5
			1	2	3	4	5

APPENDIX E

Tampa Scale of Kinesiophobia-11 (TSK-11)

This is a list of phrases which other patients have used to express how they view their condition. Please circle the number that best describes how you feel about each statement.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree			
1	2	3	4			
1. I'm afraid I might injure myself if I exercise			1	2	3	4
2. If I were to try to overcome it, my pain would increase			1	2	3	4
3. My body is telling me I have something dangerously wrong			1	2	3	4
4. People aren't taking my medical condition serious enough			1	2	3	4
5. My accident/problem has put my body at risk for the rest of my life			1	2	3	4
6. Pain always means I have injured my body			1	2	3	4
7. Simply being careful that I do not make any unnecessary movements is the safest thing I can do to prevent my pain from worsening			1	2	3	4
8. I wouldn't have this much pain if there wasn't something potentially dangerous going on in my body			1	2	3	4
9. Pain lets me know when to stop exercising so that I don't injure myself			1	2	3	4
10. I can't do all the things normal people do because it's too easy for me to get injured			1	2	3	4
11. No one should have to exercise when he/she is in pain			1	2	3	4

APPENDIX F

Semi-Structured Interview Guide

Welcome Script

- Thank you so much for agreeing to speak with me today. (*Confirm/resolve any technical issues. Get recorder ready.*)
- Our conversation should take about 30-45 minutes. I am sure you are a busy person, so I appreciate you taking this time.
- Because specific rehabilitation experiences following ACL reconstruction surgery may affect individual perceptions of various psychological constructs, the purpose of this interview is to better understand how your experiences during rehabilitation following your ACL surgery may have affected different psychological perceptions for you throughout the process. There are no right or wrong answers.
- Your responses will help me learn more about the ACL rehabilitation process and how the rehabilitation process and return-to-sport outcomes following rehabilitation can be improved.
- This interview is completely voluntary. If any question makes you uncomfortable or you don't want to answer it, please let me know and we can skip it. If at any point you no longer want to participate, just let me know.
- May I record our discussion? The recording can help me later to fill in anything I might have missed. The only other people who might listen to this tape would be research assistants working on this study. Once the study is complete, the recording will be destroyed.
- Everything we discuss today is private and confidential—your name will not be connected to anything you say. Your name is not on this interview or the recording.
- Do you have any questions for me before we get started?
- Great, thank you! (*Or resolve any questions/issues.*)

Introduction (***Develop rapport and help participant feel comfortable talking***)

- Tell me about the role that sport and physical activity have played in your life.
- Tell me more about your sport career so far.
 - How much playing time did you have before injury?
 - How successful were you?
- Is this your first knee injury?
 - Do you mind sharing how you injured your knee?
 - Have you experienced any other major injuries?
- Can you describe your rehabilitation process so far?

Future Intentions

- Do you have any specific goals for the rehabilitation process?
 - If so, can you tell me about your goals?
 - Do you plan to return to your sport/previous levels of physical activity?
- What would be the ideal, “best-case-scenario” outcome of this rehabilitation process for you?

Rehabilitation Experience (***Look over questionnaire responses before the interview***)

- Overall, what has the rehabilitation process been like for you?

- Can you describe what your motivation has been like going through the rehabilitation process? (***Motivation questionnaire responses***)
 - Can you elaborate on your motivation for going through ACL rehabilitation?
 - *Ask about questionnaire responses:* Can you elaborate on your responses to the motivation questionnaire?
 - How would you describe your motivation levels during the rehab process?
 - How do you feel your motivation levels have impacted your experience going through the rehabilitation process?
- Can you describe your levels of fear related to your injury right now? (***Injury-related fear questionnaire responses***)
 - *Ask about questionnaire responses:* Can you elaborate on your responses to the injury-related fear questionnaire?
 - How have these fear levels changed throughout the rehabilitation process?
 - Did your fear levels impact your experience going through rehabilitation?
- Athlete burnout is a psychological outcome characterized by a reduced sense of accomplishment, sport devaluation, and physical and emotional exhaustion related to your sport.
 - Have you found yourself experiencing any feelings of emotional or physical exhaustion related to returning to your sport?
 - Operational definition: Exhaustion from continual stressors related to sport, demands for time related to sport, high training loads
 - Have you felt any sort of reduced sense of accomplishment related to your sport?
 - Operational definition: Questioning/doubting sport skills and ability to be successful
 - Have you experienced any sense of sport devaluation throughout the rehabilitation process?
 - Operational definition: Finding yourself caring less about sport and performance to the point where you have a negative perception of your sport
 - *Ask about questionnaire responses:* Can you elaborate on your responses to the athlete burnout questionnaire? (***Ask about specific responses on questionnaire***)
 - If experiencing symptoms: how are you feeling at your current point in the rehabilitation process compared to when you first started following your surgery?
 - If not experiencing symptoms: So you said you haven't experienced these symptoms. Why do you think that is?
 - What would you say has contributed to you not experiencing any of these symptoms?
 - Do you feel that how you've felt (in regard to emotional/physical exhaustion, reduced sense of accomplishment, or sport devaluation) has had any effect on your rehabilitation?
- Overall, thinking about where you feel you are mentally right now, how do you think your current state-of-mind has impacted your rehabilitation experience?

Open Ending

- If another athlete were to experience this injury and rehabilitation process, what recommendations would you give them?
- Is there anything more that you would like to add that you think would be beneficial for understanding your rehabilitation experience?

Thank you and good-bye!

Thank you for participating in this interview! I really appreciate your time and expertise. If you have any questions later or think of something to add, please send me an email.

APPENDIX G

COREQ Checklist

COREQ (Consolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Domain 1: Research team and reflexivity			
<i>Personal characteristics</i>			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	25
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	25
Occupation	3	What was their occupation at the time of the study?	25
Gender	4	Was the researcher male or female?	25
Experience and training	5	What experience or training did the researcher have?	25
<i>Relationship with participants</i>			
Relationship established	6	Was a relationship established prior to study commencement?	25
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	25
Interviewer characteristics	8	What characteristics were reported about the interviewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	25
Domain 2: Study design			
<i>Theoretical framework</i>			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	19
<i>Participant selection</i>			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	24
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	20
Sample size	12	How many participants were in the study?	20
Non-participation	13	How many people refused to participate or dropped out? Reasons?	24
<i>Setting</i>			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	24
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	N/A
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	28, 64
<i>Data collection</i>			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	24, 60
Repeat interviews	18	Were repeat interviews carried out? If yes, how many?	N/A
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	24
Field notes	20	Were field notes made during and/or after the interview or focus group?	N/A
Duration	21	What was the duration of the interviews or focus group?	28, 64
Data saturation	22	Was data saturation discussed?	N/A
Transcripts returned	23	Were transcripts returned to participants for comment and/or	25

Topic	Item No.	Guide Questions/Description	Reported on Page No.
		correction?	
Domain 3: analysis and findings			
<i>Data analysis</i>			
Number of data coders	24	How many data coders coded the data?	26
Description of the coding tree	25	Did authors provide a description of the coding tree?	N/A
Derivation of themes	26	Were themes identified in advance or derived from the data?	26
Software	27	What software, if applicable, was used to manage the data?	N/A
Participant checking	28	Did participants provide feedback on the findings?	N/A
<i>Reporting</i>			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	29-42
Data and findings consistent	30	Was there consistency between the data presented and the findings?	29-42
Clarity of major themes	31	Were major themes clearly presented in the findings?	29-42
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	29-42

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

Once you have completed this checklist, please save a copy and upload it as part of your submission. DO NOT include this checklist as part of the main manuscript document. It must be uploaded as a separate file.

APPENDIX H

Demographic Tables

Table 1. *Questionnaire Participant Demographics and Questionnaire Scores*

Participant	Age	Biological Sex	Time Since Surgery (months)	Interviewed (Y/N)	TSK-11 Score	PSS-4 Score	SMS-6 Score	ABQ Score
1	16	Male	6	N	15	0	10.63	2.8
2	17	Female	5.5	N	16	0	13.13	1.6
3	21	Female	6	N	20	6	8.38	1.8
4	16	Female	5	Y	17	2	13.34	2.07
5	18	Male	4	Y	27	6	13.13	3.07
6	14	Female	4	Y	19	5	14.88	1.73
7	17	Female	6	N	27	7	11	2.93
8	17	Female	4	Y	28	7	12.25	2.47
9	19	Male	4	Y	15	2	7.25	2.20
10	14	Male	4.5	N	26	9	12.13	2.33
11	18	Male	5	N	12	5	9.5	2.07
12	16	Female	5	N	25	2	-0.5	3.20
13	17	Female	5	N	24	8	7	2.80

Notes. TSK-11 = Tampa Scale of Kinesiophobia-11, PSS-4 = Perceived Stress Scale 4, SMS-6 = Sport Motivation Scale 6, ABQ = Athlete Burnout Questionnaire

Table 2. *Interview Participant Demographics*

Participant	Pseudonym	Age	Biological Sex	Sport	Time Since Surgery (months)	Length of Interview (minutes)
4	Melissa	16	Female	Softball	5	28:41
5	Nick	18	Male	American Football/Golf	4	52:32
6	Ashlyn	14	Female	Volleyball	4	31:38
8	Lisa	17	Female	Basketball/Volleyball	4	27:08
9	David	19	Male	American Football	4	44:39

APPENDIX I

Quantitative and Qualitative Results Tables

Table 3. *Descriptive Statistics and Correlation Matrix for Study Variables (N=13)*

	1.	2.	3.	4.	5.	6.	7.
1. TSK-11	1.0						
2. PSS-4	0.70	1.0					
		0.008					
3. Self-determined motivation	0.12	-0.07	1.0				
	0.70	0.83					
4. Global athlete burnout	0.53	0.27	-0.43	1.0			
	0.07	0.38	0.15				
5. Physical/emotional exhaustion	0.35	0.23	-0.51	0.73	1.0		
	0.24	0.44	0.08	0.005			
6. Reduced sense of accomplishment	0.39	0.15	-0.38	0.91	0.57	1.0	
	0.18	0.62	0.20	0.00	0.04		
7. Sport devaluation	0.30	0.26	0.09	0.32	0.25	0.11	1.0
	0.31	0.39	0.77	0.28	0.41	0.72	
<i>M</i>	20.85	4.54	10.16	2.39	2.28	2.42	2.05
<i>SD</i>	5.55	3.02	4.03	0.53	0.77	0.87	0.90

Notes. * $p < 0.05$; TSK-11 = Tampa Scale of Kinesiophobia-11, PSS-4 = Perceived Stress Scale 4, *M* = Mean, *SD* = Standard Deviation

Table 4. *Between Group Comparisons of Interviewees and Non-Interviewees (N=13)*

	Interviewed (N=5) Median (IQR)	Not Interviewed (N=8) Median (IQR)	Total (N=13) Median (IQR)	P-value	Hedges g Effect Size (95% CI)
TSK-11	19 (10)	22 (10)	20 (10)	0.66	-0.09 (-1.13 to 0.95)
PSS-4	5 (4)	5.5 (6.5)	5 (5)	0.80	0.07 (-0.98 to 1.10)
SMS-6	13.13 (1.13)	10.06 (3.88)	11 (4.75)	0.07* [^]	-0.79 (-1.86 to 0.3)
ABQ	2.2 (0.40)	2.57 (0.93)	2.33 (0.73)	0.66	0.23 (-0.82 to 1.27)

Notes. TSK-11 = Tampa Scale of Kinesiophobia-11, PSS-4 = Perceived Stress Scale 4, SMS-6 = Sport Motivation Scale 6, ABQ = Athlete Burnout Questionnaire, IQR = Interquartile Range; * denotes statistical significance, [^] denotes a moderate effect size

Table 5. *Themes and Subthemes Generated From Participants' Interviews (N=5)*

Theme	Subtheme
Struggling with the recovery process	Negative emotions surrounding injury and motivation
	Experiencing injury-related fear
Acknowledging negative emotional states	Transitioning to lower fear levels
	Contemplating feelings of athlete burnout
Drive to return to sport and normal life	Recognizing value in recovery for sport
	Finding motivation for sport
	Setting various types of goals
Understanding and finding purpose in rehabilitation	Recognizing the lengthy recovery process
	Trusting the medical staff
	Working hard in rehabilitation
	Seeing benefits of physical rehabilitation
Successfully navigating the recovery process	Staying motivated
	Using social support
	Reframing fear
	Adopting a positive mindset

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