

Factors Influencing Recovery from Anterior Cruciate
Ligament Reconstruction (ACLR) in High-Performance
Athletes.

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Abstract

Anterior cruciate ligament reconstruction (ACLR) is a common occurrence in sport, with high-performance athletes at particular risk. Current research in this area has focused mainly on the outcomes of ACLR, with little apparent research into the actual recovery experience of individuals, especially for high-performance athletes. To investigate this apparent gap, the current study explored elite and semi-elite athletes experienced recovery following ACLR and the factors influencing this experience. Semi-structured interviews were completed with eight athletes involved in various sports including football, hockey, indoor cricket, netball and futsal. An interpretive description methodology was used to explore and analyse the data. Results highlighted that recovery from ACLR is a long, multifactorial process. Four main themes were identified from the data. (1) "As a mental battle, it's a bit of a rollercoaster" relating to the psychological aspect to recovery. (2) "Oh ACL's, I know a bit about this " relating to the importance of education, perceived professional competency and the therapeutic relationship. (3) "It's not going to stop me from playing ever" relating to the cognitive aspects of mindset, motivation and goal-orientated focus. (4) "Rehab is just one side of it" relating to the broader life aspects of occupational demands, social aspects and re-emergence in sport. Collectively, these themes illustrate that the psychological aspects of recovery are important to ACLR recovery in high-performance athletes. As a result, it is important that professionals facilitating ACLR recovery need to be attentive to individual experience and the potential factors that might need addressing prior to surgery and throughout rehabilitation. Further research is required to explore the recovery experience in more depth, especially in relation to contact time with health professionals and athletes' re-emergence into sport participation during rehabilitation.

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Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

Signature

08 November 2019

Date

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Ethics Approval

Ethics Application: 19/118 Factors influencing recovery from Anterior Cruciate
Ligament (ACL) reconstruction within a New Zealand Context

The evidence provided, satisfied the points raised by the Auckland University of
Technology Ethics Committee (AUTEC) and the ethics application has been approved
for three years until 6 June 2022.

Chapter One: Thesis Outline

The current thesis will be presented in four main chapters. The literature review will provide an overview of the background of ACL injury and treatment. Various factors potentially influencing recovery highlighted in previous research and the limited research on the recovery experience will be discussed. The methods chapter will highlight the background of the primary researcher, a description of the methodology approach used and what was involved in the data analysis. The results chapter will illustrate the participant characteristics and the four main themes and sub-themes that were established. Lastly, the discussion chapter will explain the four themes in more depth, relating this back to previous research. It will also highlight clinical implications, strengths and limitations of the study, future research recommendations and the conclusions made on the recovery experience of ACLR.

Chapter Two: Literature Review

2.1 Anterior Cruciate Ligament Injury

The anterior cruciate ligament (ACL) is a key structure of the knee that helps with stabilisation (Mendonza, Patel, & Bassett, 2007). Its main function is preventing the tibia (shin bone) from rotation and gliding underneath the femur (thigh bone) in an anterior position, thus providing strength to the knee (Mendonza et al., 2007). It contains mechanoreceptors that influence the neuromuscular functions of the knee joint, which in turn aids with knee control (van Melick et al., 2016). If this ligament is put under increased stress or load, individuals can experience a partial or full ACL rupture, often resulting in immediate loss of knee function (Burland, Toonstra, et al., 2018).

ACL rupture can occur through both contact or non-contact actions and is one of the most common knee injuries reported (Majewski, Susanne, & Klaus, 2006; Salem et al., 2018). ACL injury mainly occurs in elite and recreational athletes (Ardern, Webster, Taylor, & Feller, 2011b; Griffin et al., 2000; Rosso et al., 2018). This is due to an increase in physical demand, resulting from change of direction, change in speed, sudden stoppage, landing patterns or overextension of the knee that are specific to sport movement, particularly in jumping or pivoting sports (Mendonza et al., 2007; te Wierike, van der Sluis, van den Akker-Scheek, Elferink-Gemser, & Visscher, 2013).

The severity of injury can be long-lasting and can vary from person to person (Filbay, Crossley, & Ackerman, 2016). The immediate short-term impact is not being able to participate in sport during rehabilitation, while the long-term impact could result in the injury being season or career ending, along with continual knee impairments experienced throughout life (Ardern, Taylor, Feller, & Webster, 2014). These outcomes can have a significant impact on an individual (such as reduced quality of life or psychological distress) and could mean the end to sporting or career goals that have been worked toward for a number of years (Mendonza et al., 2007). It may also mean a loss of athletic identity and financial security for those who play at a high level (Ardern, Taylor, et al., 2014).

2.2 Treatment

Following an ACL injury, the likelihood of the ligament repairing itself with no intervention is little to none (Bauer, Feeley, Wawrzyniak, Pinkowsky, & Gallo, 2014). Because of this, there are two suggested treatment options that can help re-stabilise the knee (Bauer et al., 2014). The first is a non-surgical option, where strength training

is performed to increase muscle function and stability around where the ACL ligament should be (Grindem, Wellsandt, Failla, Snyder-Mackler, & Risberg, 2018). This option favours athletes who are older, female, not involved in high-intensity sport or occupational demands, or those who show good functional ability early on after ACL injury (Grindem et al., 2018). Grindem et al. (2018) showed a 50% success rate with non-surgical treatment of active rehabilitation alone, two years following ACL injury. This demonstrates that athletes can sustain knee function without the need for the invasion of surgery. Although these outcomes are possible, the findings from Grindem et al. (2018) suggest that non-surgical treatment success is limited to certain demographic and contextual factors. Males, younger individuals, high-performance athletes and those who experience less knee function immediately following injury are less likely to have positive results with this approach. These factors will therefore need to be considered during the decision-making process to treatment options. Further to this, of those who did experience non-surgical treatment, 33% of these participants were then required to undergo a later surgical procedure, in order to address functional limitations that were not corrected with active rehabilitation alone. This raises the question of how this experience might impact on the psychological aspects to recovery, given this time frame might have been reduced if surgical intervention was completed at an earlier date. Additionally, a critique to this study is around the definition of successful outcome, which was defined as having experienced 2 years post-injury without needing surgery and showing adequate functional capacity (as measured by a physical testing battery). As a result, generalisations from this study will need to be made in comparison to this specific interpretation.

The second approach, and the one which is commonly used and viewed as the standard treatment method, is a surgical ACL reconstruction (ACLR) (Shea et al., 2015). This procedure involves the replacement of an ACL using either a hamstring or patella tendon graft, which helps to stabilise the knee (Zaffagnini et al., 2011). Most professionals advise this course of treatment, especially if an individual has high aspirations of returning to sport (RTS) (Ardern, Taylor, Feller, & Webster, 2013; Ardern et al., 2011b; Feller & Webster, 2013; McPherson, Feller, Hewett, & Webster, 2019a). Following surgery, there is an extensive rehabilitation process that aims to restore pre-injury function using strategies targeted at range of movement and strength (Kruse et al., 2012; Wilk, Macrina, Cain, Dugas, & Andrews, 2012). This process has been said to last between 6-12 months, with some individuals needing longer than this (Ardern et al., 2011b). More specifically, Grindem, Snyder-Mackler, Moksnes, Engebretsen, and Risberg (2016) suggest that individuals should wait at least nine months to RTS, as this can mean a 51% increased chance of successful recovery for each month that an athlete delays RTS (up until the nine month mark). As a result, individuals often

experience feelings of uncertainty or frustration about their injury and can find the rehabilitation phase to be rather long and tedious (te Wierike et al., 2013). Because of the commonality of ACLR and purpose of the study, the following literature review will focus on this treatment approach rather than the non-surgical option.

2.3 Return to sports participation after ACLR success rates

RTS is one of the main outcome measures after ACLR (Ardern, Taylor, et al., 2014; Lynch et al., 2015). This is said to be influenced by the sporting population that tend to experience higher rates of ACL injuries in comparison to the general public (Gianotti, Marshall, Hume, & Bunt, 2009). Given that RTS is one of the most common reasons for ACLR, it would be assumed that most individuals would achieve this. Although this is plausible, research illustrates that RTS rates are less than desirable. Most athletes aspire to resume sport participation at or above pre-injury level but research indicates this is not always possible (Ardern, Taylor, Feller, Whitehead, & Webster, 2013; Gignac et al., 2015). One of the most cited RTS rates is from a systematic review and meta-analysis by Ardern, Webster, Taylor, and Feller (2011a) and its follow up systematic review and meta-analysis by Ardern, Taylor, et al. (2014). Results from these papers suggest that four in five athletes return to some capacity of sport participation, two in three athletes return to their pre-injury level of sport, while only 55% of athletes were able to return to a competitive level of sport. This indicates there is a significant number of individuals who do not meet desired RTS outcomes, with other studies also supporting this (Ardern, Taylor, Feller, & Webster, 2012; Gignac et al., 2015). Further to this, of those that do achieve RTS at pre-injury level, some report less than desirable performance levels which can be of concern to those players who were striving to recover to be the player they were pre-injury (Harris et al., 2013; McCullough et al., 2012). In sum, the research suggests that most athletes struggle to achieve desired outcomes following ACLR.

2.4 Incidence of second ACL injury post reconstruction

Although the main objective of ACLR is to stabilise the knee and RTS, incidence rates of sustaining an additional ACL injury is high (Paterno, Rauh, Schmitt, Ford, & Hewett, 2014; Zbrojkiewicz, Vertullo, & Grayson, 2018). On review of the literature, the chance of sustaining a secondary injury to the ipsilateral (graft) or contralateral knee is between 3-30%, with the incidence of contralateral injury appearing to be slightly higher overall (Paterno et al., 2014; Wright et al., 2007). Research suggests that younger individuals are at an increased risk of this occurrence, with a 23% chance that those under the age of 25 will experience a secondary injury, especially with early RTS

(Wiggins et al., 2016). This probability further increases with those individuals under the age of 20, with research indicating that individuals within this population are three to six times more likely to experience re-injury than those older than this (Webster, Nagelli, Hewett, & Feller, 2018).

Paterno et al. (2014) showed that of all types of secondary injury, contralateral injury in females was the most common occurrence. They also highlight that all individuals who had received an ACLR were nearly six times more likely to acquire a second ACL injury within two years post reconstruction than other athletes competing within the same sporting environment. In addition to this, Zbrojkiewicz et al. (2018) conducted a 15 year comparison study that reported re-vision ACL surgeries had increased by 123%, illustrating the rise in secondary injury in this population. Collectively, these findings demonstrate the importance of quality recovery from ACLR, especially given the statistics of secondary injury.

2.5 Expectations of ACLR

Despite the severity and longevity of an ACLR injury, research suggests that most individuals expect their knee will return to normal or near normal function following adequate rehabilitation (Burland, Toonstra, et al., 2018; Feucht et al., 2016). Literature highlights that 91% of individuals who undergo surgery anticipate a full RTS, regardless of robust research suggesting this may not be the case (Feucht et al., 2016). Feucht et al. (2016) found that individuals who are younger in age, highly active or have no operational knee history are particularly positive about their surgical outcomes. In addition to this, results further illustrated that those who underwent revision surgery for an ACL also had relatively high RTS and functional expectations - albeit lower than those experiencing a primary ACLR. Matava, Howard, Polakof, and Brophy (2014) suggests that high expectations may be driven by the increase in surgical and rehabilitation advances, along with the apparent media coverage and electronic information that is available on ACL injury. As a result of the mismatch between patient expectation and RTS and functional outcomes, individuals may become disheartened throughout rehabilitation and experience feelings of struggle and frustration if their expectations are not met (Heijne, Axelsson, Werner, & Biguet, 2008; Scott, Perry, & Sole, 2018; te Wierike et al., 2013). This emphasises the need for realistic expectations to be established prior to surgery, allowing individuals the time to process and plan accordingly.

2.6 Factors influencing recovery

When exploring the factors associated with recovery, it is evident that this area is multifaceted, dynamic and ever-changing. Aspects such as demographics, physical characteristics, psychological considerations, social support, contextual factors, and a professional's knowledge and influence have all been found to have a significant effect on the outcomes from ACLR. These will be discussed in more depth below.

2.7 Demographic Factors

When searching through literature, age and gender are consistently mentioned as influencing factors to ACL recovery and desired outcomes.

2.7.1 Age

There is a vast amount of evidence that younger individuals are more likely to RTS than older individuals (Ardern et al., 2012; Ardern et al., 2011b; Bauer et al., 2014; Webster et al., 2018). Ardern et al. (2012) completed a study on the medium-term outcomes of ACLR, with results emphasising that RTS was significantly influenced by age. Those who were 25 years or older reported significantly less involvement in sport participation at pre-injury level when compared with those under the age of 25 years. Additional studies have also demonstrated this finding, especially when investigating RTS at either pre-injury or elite level sports (Ardern, Taylor, Webster, Feller, & Whitehead, 2015; Brophy et al., 2012; McVeigh & Pack, 2015).

Potential reasons for this finding are that older individuals may have more competing factors in their life that may contest with their desire to RTS at pre-injury level (Ardern et al., 2012). Possible factors that have been proposed are generally related to either employment or family commitments, as younger athletes tend not to place as much importance on these considerations given their age and lifestyle (Ardern et al., 2012; Ardern et al., 2015; McVeigh & Pack, 2015). Younger athletes are said to have a significant pull toward the social engagement of sport and may experience a greater sense of athletic identity than older individuals. Additionally, research suggests that younger athletes can become consumed within their sporting life, which may act as a significant motivator to achieve RTS at or above pre-injury level (Ardern, Taylor, et al., 2014). Therefore, it appears that younger individuals have fewer competing factors to consider than older individuals, along with a greater pull towards their athletic identity.

In contrast to the above, a study by Ardern, Österberg, et al. (2014) indicated no significant difference when looking at age. Conclusions made advised that this may be

due to Swedish practice when treating acute ACL injuries, as there is a three to six-month period where all individuals are required to complete rehabilitation prior to any decision being reached on whether to undergo surgery or not. Thus, Ardern, Österberg, et al. (2014) advocate that older individuals who choose to proceed with ACLR at their own discretion, are likely to display similar motivation levels to RTS than those younger than them. Further, those who prioritise their competing lifestyle factors, may opt for the non-surgical option and be satisfied with the results from active rehabilitation alone. This finding contradicts studies mentioned above, suggesting further research into the influence of age on ACLR recovery is required, specifically in relation to high-performance athletes given the level of investment in sport participation.

2.7.2 Gender

Gender differences were also apparent when looking at outcomes following ACLR, with qualitative research completed by Thing (2006) suggesting that females may take longer to RTS than males. Since this study, a vast amount of literature has reinforced this finding mainly through quantitative research (Ardern et al., 2011b; Bauer et al., 2014; Brophy et al., 2012; Webster et al., 2018). Two studies that looked at the same cohort of 503 patients one year apart, concluded that men were more likely to RTS within 12 months, while women took slightly longer than this. Interestingly, this noticeable gender difference was less apparent two to seven years post reconstruction, illustrating that females are just as likely to RTS but may need an extended period of rehabilitation to achieve this (Ardern et al., 2012; Ardern et al., 2011b). Webster et al. (2018) recently supported these studies by showing that, of a cohort of 563 elite athletes, 30% of males and 17% of females attempted their RTS within 11-24 months post ACLR, thus favouring males for quicker RTS. Additional literature has also found similar results, further supporting the prior claims made by Thing (2006) (Bauer et al., 2014; Brophy et al., 2012; de Valk et al., 2013). Given gender difference was initially found through qualitative methodology, this highlights that further studies using this approach may be beneficial. This is a clear example of where qualitative research has revealed complexities in relation to ACLR outcomes, augmenting quantitative findings.

2.8 Physical Factors

Although it is apparent in the literature that muscle function alone cannot predict RTS and positive outcomes from ACLR (Ardern, Taylor, et al., 2014), it is still essential that individuals regain the physical capacity to be able to deal with day-to-day living and the demands of sport participation, especially if they are to achieve desired results (Ericsson, Roos, & Frobell, 2013). Functional capacity, quadricep strength, limb

symmetry, pain and weight gain have all been recognised to impact ACLR outcomes and will be discussed below.

2.8.1 Functional capacity

Studies demonstrate that individuals who report higher levels of functional capacity after ACLR, tend to experience better RTS and recovery outcomes (Ardern, Österberg, et al., 2014; Ardern, Taylor, et al., 2014; Fältström, Hägglund, & Kvist, 2016; Senorski et al., 2017). Burland, Kostyun, et al. (2018) found that those individuals who showed greater functional strength at three- and six-month follow ups presented with better self-reported knee function and readiness to RTS. This outcome measure also predicted a greater likelihood that individuals would have a successful RTS, and this would be at an earlier rate than those presenting with functional impairments (Burland, Kostyun, et al., 2018). Beischer, Senorski, Thomeé, Samuelsson, and Thomeé (2019) found similar results illustrating that those who had gained muscle function by eight- and 12-month follow up periods reported greater confidence in their knee function and more successful outcomes in relation to RTS. In addition to these studies, various research has indicated that those individuals who report higher levels of satisfaction with knee function generally had more confidence in their physical capacity and were able to RTS with fewer complications (Ardern, Österberg, et al., 2016). Raoul et al. (2019) provided evidence for this by suggesting that individuals who are experiencing satisfactory objective functional outcomes at six months are more likely to RTS at or above their pre-injury level of sport participation. While Nawasreh et al. (2017) added to this by demonstrating that a higher level of functional ability at six months post ACLR tends to be maintained 24 months post-surgery and has a positive influence on levels of satisfaction reported. Collectively, these findings provide evidence that functional capacity has a significant influence on recovery and generates awareness to the importance of achieving quality functional outcomes post ACLR.

In comparison to positive outcome studies, research has also found that a number of individuals do not RTS at either pre-injury or any participation level because of knee instability and poor function (Ardern et al., 2012; te Wierike et al., 2013). Nawasreh et al. (2017) reported that of those who failed functional tests at six months post ACLR, more than half of these individuals experienced residual functional deficits that influenced an outcome of not being able to RTS at their pre-injury level. Additionally, Ardern et al. (2012) reported poor functional ability of the operated knee was associated with not reaching RTS at pre-injury level. These findings are also supported by te Wierike et al. (2013), where it was suggested that an unstable knee resulted in lower reports of RTS. A worrying theme in the literature is that individuals have the

tendency to RTS even in the absence of being cleared physically by their surgeon, physiotherapist, or other health professional (Nawasreh et al., 2017; Raoul et al., 2019). Raoul et al. (2019) reported that 32% of his participants RTS without having achieved the necessary functional ability or getting medical clearance from a surgeon. This outcome is quite alarming given that research calls attention to the association between patients presenting with poor functional ability and an increased risk of re-injury (Kyritsis, Bahr, Landreau, Miladi, & Witvrouw, 2016; Raoul et al., 2019). Accordingly, providing extensive physical testing and information regarding secondary risk of early RTS appears to be of noteworthy importance to the overall health of individuals recovering from ACLR (Gokeler, Dingenen, Mouton, & Seil, 2017; Nawasreh et al., 2017). It would further be beneficial to identify what factors influence the decision to RTS without medical clearance, in order to gain a deeper understanding to this. Future qualitative studies may provide the methodology to achieve this.

Although physical function is evidently important for recovery, it is important to be aware that numerous studies have found that desired functional outcomes may not be reached within the first 12 months of rehabilitation (Arden, Taylor, Feller, Whitehead, et al., 2013; Arden et al., 2011b). Raoul et al. (2019) and Beischer et al. (2019) both found that one in five athletes did not regain satisfactory muscle function within six and 12 months respectively, thus showing that the majority do not gain satisfactory outcomes early on in recovery. This illustrates that extensive physical rehabilitation programs are essential for desired outcomes, with further studies highlighting that those with poor physical impairments within the first 12 months of ACLR can improve their functional capacity by increasing their level of rehabilitation adherence (Arden et al., 2012; Nawasreh et al., 2017). Furthermore, increased participation in sport specific activities, such as jumping, running, change of direction or pivoting—which are experienced later in the rehabilitation phase—are said to increase an individual's physical capacity, bettering the chance of a successful RTS (Arden, Taylor, et al., 2014; Nawasreh et al., 2017). This indicates that individuals may experience greater results in the latter phase of the recovery, resulting in an increase in physical capacity. In addition to the idea of an extensive physical rehabilitation period, Rosso et al. (2018) suggest that positive results after ACLR are heavily reliant on an individual being supervised throughout rehabilitation sessions. If individuals are left to their own experience and knowledge, then the purpose of rehabilitation exercises may not be achieved, because of poor technique or execution (Rosso et al., 2018). Looking at this literature collectively, it appears that functional recovery from ACLR differs from person to person, with some needing longer periods of extensive rehabilitation to reach favoured outcomes, while others are able to achieve desired results within one-year post-surgery. Future research may be beneficial in this area to determine how this

evident disparity between RTS periods is experienced by individuals and what factors may influence this. Along with research targeted at identifying if supervised rehabilitation sessions are taking place within ACLR recovery populations, given the potential barriers of cost associated with this.

Recent literature recommends that physical rehabilitation after ACLR should begin within the week following the operation, owing to the association between early intervention and long-term outcomes (Ebert et al., 2019; van Melick et al., 2016). Such intervention is said to help control swelling, increase patella mobility, start to activate the quadricep muscle, initiate walking patterns, and increase the range of motion of the knee joint, allowing for better functional movement (Adams, Logerstedt, Hunter-Giordano, Axe, & Snyder-Mackler, 2012; Wilk & Arrigo, 2017). In turn, this is said to improve the probability of favoured long-term outcomes being achieved, by increasing the likelihood that individuals will feel less hesitant toward physical rehabilitation exercises and greater levels of adherence (Ross, Clifford, & Louw, 2017). Further to this, Ross et al. (2017) advocate that pre-operative physical rehabilitation is just as important as post-operative exercises because of the added benefits this has on ACLR outcomes. Those who enter ACLR with a higher level of physical conditioning have shown better outcomes post-surgery and take less time to regain the functional capacity needed for RTS (Failla et al., 2016; Gokeler et al., 2017; Grindem et al., 2015). Thus, a combination of pre-operative and early post-operative rehabilitation appears to benefit the overall outcomes of ACLR recovery. Although results for pre-operative and early intervention show positive outcomes, an apparent gap in this literature is in relation to the actual experience of this. Research in this area may help to highlight the accessibility and adherence factors for individuals, potentially identifying any barriers or enablers that influence pre-operative and early intervention.

2.8.2 Quadricep strength and limb symmetry

Quadriceps strength and limb symmetry are two significant areas of muscle function that are important when recovering from an ACLR (Arder, Taylor, et al., 2014; Hartigan, Axe, & Snyder-Mackler, 2010; Lepley, Pietrosimone, & Cormier, 2018). Various research has indicated that functional strength or deficits in these areas can have a significant impact on RTS and desired post-surgical outcomes (Grindem et al., 2016; Kyritsis et al., 2016; Lepley et al., 2018). A literature review revealed that a difference of greater than 10% between the surgical and non-surgical limb indicates a higher risk of re-injury and inferior muscle function (Beischer et al., 2019; Grindem et al., 2016; Kyritsis et al., 2016). These findings further support the idea that quality functional capacity is required if desired physical outcomes and RTS are to be attained.

2.8.3 Pain

Further to muscle function and strength, pain is also thought to be a predictor of recovery outcomes following ACLR. A qualitative study completed by Ross et al. (2017) suggested that experiencing a painful surgical procedure may influence physical restriction and impede muscle strength in the early stages of rehabilitation. Lepley et al. (2018) added to this finding, putting forward the idea that lower levels of pre-surgical pain has an effect on how ready individuals felt to return to functional movement, therefore influencing muscle strength and functional capacity early on. Additionally, it was found that less pain was related to increased quadricep strength and knee joint function, providing a greater chance of exercise completion. Similar results have been found in other studies, suggesting this is an important factor when looking at ACLR outcomes (Chmielewski & George, 2019; Senorski et al., 2017).

2.8.4 Weight gain

When looking at the recovery of ACLR and the influence of physical factors, weight gain may have a considerable impact on outcomes experienced for a number of individuals. In a qualitative study completed by Filbay et al. (2016), 65% of participants mentioned a decrease in physical activity during rehabilitation, which also resulted in weight gain. This consequently led to an increase in knee symptoms and low motivation for physical exercise, creating a cycle that many participants found hard to break. Filbay, Ackerman, Russell, and Crossley (2017) supported this finding through a cross-sectional study using questionnaires, with results indicating a negative effect that weight gain can have when recovering from ACLR. Although research in this area appears to be somewhat scarce, the recent findings above give support to the idea that individuals who experience weight gain after ACLR could be subjected to negative long-term consequences for rehabilitation, given the effect increased weight has on symptoms and motivation. However, additional research into this aspect to recovery would be advised, especially in relation to high-performance athletes. In the studies mentioned above, this population was not the target participant group therefore results may differ. In addition to this, a critique of the studies mentioned above is the time between injury and interview. This was said to be between five to 20 years, which may mean that other factors or recall bias may come into question.

2.9 Psychological factors

Over the last decade research has shown that psychological factors play a significant role in recovery after ACLR, potentially more than physical capacity (Ardern, Taylor, et al., 2014; Ardern, Taylor, Feller, Whitehead, et al., 2013; Everhart, Best, & Flanigan,

2015; McVeigh & Pack, 2015). Many studies have concluded that psychological responses to ACLR and rehabilitation are predictive of long-term outcomes and RTS (Ardern et al., 2015; Beischer et al., 2019; Everhart et al., 2015; McPherson et al., 2019a; Senorski et al., 2017). Rodriguez, Marroquin, and Cosby (2019) found that many individuals recovering from ACLR experience psychological factors that can obstruct their ability to RTS at or above pre-injury level. In fact, Ardern et al. (2011a) found that 28% of those who did not RTS, did so because of limited confidence in their knee. Additional studies have likewise indicated areas of psychological aspects, such as motivation and self-efficacy, as influential factors to ACLR outcomes (Ardern, Kvist, & Webster, 2016; Burland, Toonstra, et al., 2018).

Although there is evidence to suggest that psychological factors can impede desired outcomes, a vast amount of research indicates that these areas of recovery are modifiable and can change over time (Burland, Toonstra, et al., 2018; Ebert et al., 2019; McPherson, Feller, Hewett, & Webster, 2019b). Chmielewski and George (2019) provided evidence that psychological measures can improve significantly in both the short and long-term, which is also consistent with earlier findings from Chmielewski et al. (2011). Further to this, Ardern et al. (2015) completed a study on individuals who were able to RTS at 24 months post ACLR, after having not RTS at a 12-month follow up. Results revealed that psychological factors were an evident predictor of those who could RTS in comparison to those failed to do so 24 months post-surgery. This study shows that psychological factors can change over time and may strengthen the likelihood that an individual will be able to achieve desired outcomes.

One of the few qualitative studies conducted, completed by McVeigh and Pack (2015), looked at the experience of athletic rehabilitators when working with individuals recovering from ACLR. Findings concluded that psychological aspects of recovery were reported as an important aspect to recovery by all therapists, but concern was communicated over their lack of ability to provide adequate professional help to those experiencing psychological discomfort. Interestingly, it was noted that despite this finding, there were limited referrals to qualified psychologists reported, even though some individuals may have required this input. Furthermore, Scott et al. (2018) completed a qualitative study on the individual perspective of recovery from patients following ACLR, with results highlighting that there was an evident lack of psychological input provided by health professionals. This study focused on individuals in sport or recreational activity, and it remains unclear to the extent these findings can be applied to high-performance athletes. Collectively, these studies draw attention to the need for a multidisciplinary team approach, especially given that those working with individuals post ACLR report psychological factors as an important aspect to recovery (McVeigh &

Pack, 2015). However, the recovery experience of ACLR for high-performance athletes remains unknown, their experience is likely to be different given the level of support that elite athletes are suggested to receive in comparison to the general public (Arden, Taylor, et al., 2014).

Psychological readiness, emotions, self-efficacy, health locus of control (HLOC), motivation and fear of movement (kinesiophobia) are all areas of psychological influence that have been recognised to have an effect on ACLR recovery. These will be discussed in more depth below.

2.9.1 Psychological readiness

A term mostly used to describe psychological factors relating to ACLR is psychological readiness. This is defined as “an athletes perceived likelihood of a successful RTS following injury” and is said to be a “dynamic and psychosocial process” influenced by three key attributes: confidence, realistic expectations and motivation (Podlog, Hannon, Banham, & Wadey, 2015, p. 10). Research provides evidence that an individual who reports with higher levels of psychological readiness—as demonstrated through an objective measure—tend to experience more positive outcomes from ACLR than those who present with low psychological readiness (Arden, Österberg, et al., 2014; Beischer et al., 2019; Fältström et al., 2016; Webster et al., 2018). Arden, Taylor, Feller, Whitehead, et al. (2013) completed a study that demonstrated that not only did psychological readiness act as a predictor for RTS by 12 months post ACLR, pre-surgery levels of psychological readiness were also associated with RTS at or above pre-injury level. Fältström et al. (2016) provided further evidence, with a cohort of current players reporting higher levels of psychological readiness in comparison to athletes who had not yet RTS. These findings are also apparent in a systematic review and meta-analysis completed by Arden, Taylor, et al. (2014), collectively demonstrating the impact psychological readiness has on ACLR outcomes.

Of concern is the apparent association between psychological readiness and reports of secondary ACL injuries, either to the surgical graft or contralateral knee (McPherson et al., 2019a). Studies have found that lower levels of psychological readiness at 12-months post ACLR has been linked with higher levels of re-injury, with those under the age of 20 years being most at risk (McPherson et al., 2019a, 2019b). McPherson et al. (2019b) demonstrated that individuals who experienced a secondary ACL injury presented with a significantly smaller change in psychological readiness within the first-year post-surgery. This indicates that monitoring psychological readiness throughout rehabilitation can help to identify those individuals who may suffer a secondary injury,

with support and rehabilitation advice given to hopefully prevent this occurrence from happening.

2.9.2 Emotions

Research has described the rehabilitation journey of ACLR as a long and arduous one (Scott et al., 2018). As a result, the emotional response to injury can have an effect on the experience one has and the outcomes associated with this journey (McPherson et al., 2019b; te Wierike et al., 2013). Morrey, Stuart, Smith, and Wiese-Bjornstal (1999) referenced a “U-shape” response when looking at how individuals experience ACL injury. This model suggests that individuals are likely to experience peaks in negative emotions soon after injury and then again at the time of RTS (Morrey et al., 1999). A more recent study has also referred to this approach when trying to encapsulate the emotional journey that individuals experience following ACLR (McPherson et al., 2019b). In contrast to this view, Langford, Webster, and Feller (2009) found that participants emotional response tended to improve linearly throughout the rehabilitation phase, which then had a positive effect on RTS at or above pre-injury level. Studies on the emotional changes throughout ACLR recovery in addition to those above appear to be limited. Therefore, it would be beneficial to complete further research into the emotional experience over the recovery period, with the aim to provide supplementary support for the findings above or alternative explanation that illustrate what the emotional response may present like over time.

An important concept relating to emotional response and ACLR recovery is the idea that preparation for surgery and rehabilitation is a key driver in how individuals cope with their situation, along with developing realistic expectations of recovery (Filbay et al., 2017; Sonesson et al., 2017). Heijne et al. (2008) suggest that feelings of frustration were stimulated based on individuals reporting that rehabilitation lasted longer than anticipated. This may have been influenced by a lack of information obtained prior to ACLR or the experience of unforeseen setbacks (Scott et al., 2018). Consequently, this report of frustration often led to a decrease in confidence and self-esteem, which are both factors that can influence undesired outcomes (Ardern, Österberg, et al., 2016). Further to this finding, Brewer et al. (2000) reported that lower levels of stress were found to be associated with less knee laxity, indicating that emotions can have an influence on functional capacity. Burland, Toonstra, et al. (2018) described that, irrespective of RTS, participants recounted feelings of hesitation through recovery, resulting in outcomes such as restricting the intensity of sport played or choosing to participate in alternative activities that required less proficiency. Collectively, these studies indicate that multiple emotions are experienced throughout

recovery, with varying effects on ACLR outcomes. However, limited research has been completed on emotional changes throughout recovery.

2.9.3 Self-efficacy

A recurring theme in ACLR research is the idea of self-efficacy and its effect on recovery (Ardern, Österberg, et al., 2016; Beischer et al., 2019; Chmielewski & George, 2019; Senorski et al., 2017). In a wider sense, self-efficacy relates to how an individual perceives their own capability to achieve a particular goal, with emotions and experiences influencing this perception (Bandura, 1977). A review of the literature, specifically relating to ACLR, highlights that individuals who exhibit higher levels of self-efficacy tend to have better outcomes as a result of increased levels of confidence and motivation (Ardern, Österberg, et al., 2016; Everhart et al., 2015). Numerous studies have provided evidence for this, suggesting it is a pivotal factor for predicting positive outcomes and RTS at or above pre-injury level (Beischer et al., 2019; Chmielewski & George, 2019; Senorski et al., 2017). Further to this, a greater level of self-efficacy has been associated with increased levels of muscle function, optimism, satisfaction and perseverance following ACLR, thus increasing an individual's chance to achieve positive outcomes (Beischer et al., 2019; Everhart et al., 2015; P. Thomeé et al., 2008).

In addition to these findings, Bandura (1977) proposed the idea that individuals with elevated levels of self-efficacy tend to display an increase in motivation and effort following setbacks from ACLR, indicating a higher desire to RTS regardless of the circumstances. This is essential for outcomes following surgery, given that setbacks are likely to occur (Scott et al., 2018). If individuals do not have the mental capacity to deal with complications throughout rehabilitation, positive outcomes or goals are less likely to be reached (P. Thomeé et al., 2008). Individuals may lack the motivation to continue rehabilitation adherence or struggle to visualise the possibility of overcoming setbacks (Sonesson et al., 2017; P. Thomeé et al., 2008; R. Thomeé et al., 2011).

Lastly, Ardern, Österberg, et al. (2016) concluded that self-efficacy might be the most influential psychological factor when accessing an individual's knee-related satisfaction, indicating that self-efficacy has an important role in the recovery of ACLR. When viewing these studies together, it appears to be imperative to identify those with low levels of self-efficacy, as they may require more support and reassurance throughout rehabilitation if desired results are to be reached.

2.9.4 Health locus of control

Following on from self-efficacy, a factor that relates highly to this attribute is an individual's health locus of control (HLOC) (te Wierike et al., 2013). This contributes to an individual perceiving that outcomes are shaped by personal behaviour rather than external influence (P. Thomeé et al., 2007). Studies have demonstrated that having a high HLOC is associated with better recovery outcomes (Kaplan & Witvrouw, 2019; te Wierike et al., 2013). A systematic review completed by te Wierike et al. (2013) found that pre-operative scores of HLOC could be predictive of outcomes following rehabilitation, while a descriptive review completed by Kaplan and Witvrouw (2019) found that increased levels of HLOC were associated with improved chances of RTS. These studies provide evidence that those who view recovering from injury as an internal responsibility tend to achieve desired results in comparison to those who view external factors as highly influential, such as blaming the rehabilitation plan or physiotherapist. However, more research is required to better understand the influence that HLOC has on ACLR recovery, as research in this area appears to be relatively uncommon.

2.9.5 Motivation

In addition to self-efficacy and HLOC, motivation is also a key contributor ACLR outcomes. It appears to be intuitive to relate levels of motivation with ACLR outcomes, with previous literature evidently supporting this existence (Bauer et al., 2014; Beischer et al., 2019; Burland, Toonstra, et al., 2018; Fältström et al., 2016; Pizzari, McBurney, Taylor, & Feller, 2002; Sonesson et al., 2017). Given the length of time it takes to recover from an ACL injury, individuals need to be able to maintain high levels of motivation in order to complete the rehabilitation necessary to regain adequate functional capacity (Burland, Toonstra, et al., 2018). Intrinsic motivation is said to be associated with positive outcomes following surgery and is defined as “the natural tendency to seek out challenges with the intent of further development/enhancement and mastery of skills” (Burland, Toonstra, et al., 2018, p. 460; Ryan & Deci, 2000). Burland, Toonstra, et al. (2018) illustrated that participants who displayed intrinsic motivation characteristics throughout recovery, demonstrated a higher level of commitment to rehabilitation, tended to display a more competitive nature that influenced a drive for improvement, and presented with a willingness to succeed without the reliance on external influence or encouragement. These findings are similar to those of Eastlack, Axe, and Snyder-Mackler (1999) who presented evidence to show that those individuals with higher levels of intrinsic motivation had greater RTS success

following ACLR. Thus, those who do not rely on external motivators, tend to report greater outcomes and a better experience of recovery overall.

In addition to intrinsic motivation, further studies have been completed on a broader sense of motivation influence. Fältström et al. (2016) observed that players who were able to RTS showed greater levels of motivation throughout recovery. Gobbi and Francisco (2006) reported higher scores of psychovitality—which included aspects of motivation—in those players who achieved RTS in comparison to those who did not. While, Everhart et al. (2015) demonstrated that higher levels of motivation had an association with an increase in confidence experienced and therefore resulted in a greater chance of RTS outcomes being achieved. A study completed by Beischer et al. (2019) on muscle function following ACLR, also support higher levels of motivation and RTS outcomes. Results indicated that this was more prominent in adolescent athletes, with no relationship found for the adult subgroup. This suggests that younger individuals may require significant levels of motivation to regain muscle function during rehabilitation, while motivation appeared to be inconsequential to the muscle function acquisition in older individuals.

Although these findings in relation to motivation are apparent, the actual experience of motivation is less understood. This highlights a gap for future research looking into how motivation levels might change throughout recovery and what factors outside RTS might be influential to high-performance athletes.

2.9.6 Fear and kinesiophobia

When evaluating the literature, one of the main contributors to a lack of RTS is a fear of re-injury or kinesiophobia reported. Kinesiophobia has been describe as “an excessive, irrational and debilitating fear of physical movement and activity resulting from a feeling of vulnerability to painful injury or re-injury” (Huang et al., 2019, p. 2). This fear typically occurs because of a lack of confidence in the knee, increased awareness of knee symptoms or functional restrictions, or the recurrent thought of having to re-experience the injury and rehabilitation phase (Burland, Toonstra, et al., 2018; Filbay et al., 2016). McVeigh and Pack (2015) advocate the natural experience of fear in response to ACL injury and surgery, with this being a common emotion early on in the recovery phase. In order to overcome this, individuals need to be willing to move past these initial fears so that they can experience successful outcomes during rehabilitation (Everhart et al., 2015). The term kinesiophobia is typically used to explain fear related to ACLR and is described as the worry experienced in relation to movement and subsequent damage, specifically in relation to movements or activities that were experienced at the time of injury (Hartigan, Lynch, Logerstedt, Chmielewski, & Snyder-Mackler, 2013). A study

completed by Chmielewski and George (2019) found that increased levels of kinesiophobia four weeks post ACLR could identify those individuals who may not meet necessary rehabilitation criteria at a 12-week assessment post-surgery. This suggests that kinesiophobia is likely to slow down progress throughout rehabilitation and could result in negative outcomes if an individual is not equipped to overcome this.

Filbay et al. (2016) describes three types of fear-related responses to ACL injury. These were developed following a qualitative study using semi-structured questionnaires on the outcomes of ACLR five to 20 years post-surgery. The first is fear accommodation where individuals learn to adapt or modify movement in order to maintain desired outcomes, such as functional daily living and RTS; the second is fear suppression, where athletes choose to actively overcome or suppress thoughts relating to fear, regardless of any functional impairment they may be experiencing; and the third is fear avoidance, where athletes choose not to RTS due to a fear of reinjury. Other research adds to the idea of each of these fear-related responses, which are discussed in more detail below.

Fear accommodation is said to be beneficial for athletes if they wish to maintain sport participation, along with a high level of knee related satisfaction and greater levels of knee related quality of life (Filbay et al., 2016). Individuals who seek this type of behaviour tend to acknowledge any limitations they may be experiencing and find ways to modify their movement patterns accordingly (Filbay et al., 2016). As a result, they can strengthen their functional capacity, which in turn increases the likelihood of RTS at or above pre-injury level (Filbay et al., 2016). Fear accommodation could be reached shortly into rehabilitation or it may take a few months or years to develop (Filbay et al., 2016). Ardern et al. (2015) completed a study looking at RTS outcomes two years post injury and concluded that no relationship was apparent between return to pre-injury level sport and fear of re-injury (Ardern et al., 2015). Gignac et al. (2015) advocate that fear of re-injury can lessen over time and that this decrease is also a predictive factor in athletes increasing their participation in higher risk knee-related activities. A study completed by Tjong, Murnaghan, Nyhof-Young, and Ogilvie-Harris (2014) revealed that a sub-group of individuals presenting with fear of re-injury were able to overcome this initial emotional response to facilitate a RTS. Looking at these findings together, there is evidence to support that for some individuals, fear of re-injury can act as a protective mechanism and allow athletes to adjust their functional movement to optimise future performance. This is in alignment with conclusions made by Filbay et al. (2016).

Fear suppression, the second type of fear response, is potentially the most concerning given its association with a greater chance of additional knee trauma in the form of

elevated knee symptoms or re-injury to either the surgical graft or contralateral ACL (Filbay et al., 2016). This outcome is explained by athletes ignoring evident functional limitations and participating in unrestricted sporting activities that compromise successful ACLR outcome (Filbay et al., 2016). McPherson et al. (2019b) provide evidence for this, illustrating that individuals who had experienced a re-injury 12 months post ACLR reported greater levels of fear in comparison to those who were in the non-injured group. This finding suggests that individuals may have had functional limitations present or were not psychologically ready but choose to RTS in spite of this (Raoul et al., 2019). These discoveries are alarming given the research on secondary ACL injury risk (Paterno et al., 2014; Zbrojkiewicz et al., 2018). Thus, it may be important that behaviours demonstrating fear suppression are recognised at different stages of recovery and adjusted accordingly.

The last fear response, fear avoidance, is seemingly the most researched within ACLR literature (Fältström et al., 2016; Flanigan, Everhart, Pedroza, Smith, & Kaeding, 2013; McPherson et al., 2019b; te Wierike et al., 2013). This reaction usually results in undesired outcomes from ACLR, although some research has indicated that individuals may learn to accept current circumstances and still have a satisfactory quality of life, irrespective of not returning to sport participation as a result of fear (Ardern, Taylor, et al., 2014). For the majority however, research indicates that a decrease in sport participation or not returning to sport can have a negative impact on an individual, with fear of re-injury said to be the most common factor associated with this outcome (Ardern, Österberg, et al., 2014; Fältström et al., 2016; McPherson et al., 2019b; te Wierike et al., 2013). Many studies have indicated that individuals have not resumed sports participation because of their fears, highlighting how prominent this response is within the ACLR population (Ardern, Österberg, et al., 2014; Burland, Toonstra, et al., 2018; Fältström et al., 2016; te Wierike et al., 2013). Interestingly, in their prospective studies, both Ardern, Österberg, et al. (2014) and Kaplan and Witvrouw (2019) suggested that 24% of individuals who did not RTS, did so because of fear of reinjury. Furthermore, evidence for fear avoidance behaviour is explained by the recurrent idea that athletes who undergo ACLR often struggle or do not return to sport despite satisfactory functional capacity (Ardern, Taylor, et al., 2014; Ardern et al., 2011a). This shows support towards the idea that psychological factors, such as fear, inhibit an individual's ability to achieve desired ACLR outcomes, even if they may be functionally capable to do so (Flanigan et al., 2013).

In alignment with Filbay et al. (2016), the fear-avoidance model of pain has commonly been discussed when looking at ACLR outcomes (Chmielewski & George, 2019; Flanigan, Everhart, & Glassman, 2015; Tichonova, Rimdeikienė, Petruševičienė, &

Lendraitiené, 2016). This theory was established by Lethem, Slade, Troup, and Bentley (1983) and has been comprehensively validated in a number of research studies over the years (Flanigan et al., 2015). The fear-avoidance model suggests that when individuals experience recurrent pain with certain movements or activities, a heightened negative psychological response can be present at either pain or the anticipation of pain, referred to as pain catastrophising (Flanigan et al., 2015). This negative psychological response often results in an active avoidance of specific movement, which can impact an individual's recovery from ACLR especially if rehabilitation exercises are compromised or not adhered too (Flanigan et al., 2015; Pizzari et al., 2002). Chmielewski and George (2019) provide results that align with the fear-avoidance model, with an association established between pain catastrophising at one- and four-week post-ACLR follow up periods, and pain intensity experienced 12-weeks post-surgery. This demonstrates an example of pain catastrophising behaviour, with results illustrating that higher pain catastrophising led to increased struggles with knee-related pain during activities of daily living and rehabilitation, which in turn can elicit fear-avoidant behaviours (Filbay et al., 2016; Tichonova et al., 2016). This may have an impact on exercise adherence, especially for meaningful exercises related to specific fear-related movements (Chmielewski & George, 2019; Flanigan et al., 2015). Furthermore, Tichonova et al. (2016) suggests that those individuals who report less fear-avoidant beliefs, tend to be able to view pain as a non-threatening occurrence, which is important given that pain is usually associated with the initial phase of recovery. These individuals tend to be able to push through pain experienced with levels of pain generally dissipating over time (Tichonova et al., 2016). These studies show the importance of pain related information being provided to individuals recovering from ACLR, given the effects that pain-avoidance can have on favoured outcomes and rehabilitation completion.

An interesting concept from the literature in relation to fear of re-injury is the suggestion that fear might not be the most appropriate terminology to describe individuals who choose not to RTS because of the risk of additional damage (Webster et al., 2018). Walker, Thatcher, and Lavalley (2010) put forward the idea that re-injury anxiety may explain this outcome more clearly, given that fear is associated to a 'stimulus-specific biological mechanism', in contrast to anxiety which is related to an 'anticipation or uncertainty' about a future event. Given these definitions, it appears that experience of ceasing sport participation because of the anticipation or uncertainty of re-injury, might be best described by the term fear-anxiety. Regardless of the terminology however, Walker et al. (2010) suggest that both definitions have strong associations with RTS following ACLR. Although, further research exploring the effectiveness of terminology may be beneficial to capture the true essence of this experience.

Reviewing the studies above, it appears that fear of re-injury through movement (kinesiophobia) can impact individuals in a variety of ways. Some use it as an adjustment factor while others are significantly impacted in a negative way. Although the findings from Filbay et al. (2016) add valued knowledge to the fear-response of ACLR, the use of semi-structured telephone interviews in the study may be a limitation, as the time between injury and the interview (which varied from five years to 20 years) may influence recall bias, along with the absence of being able to make non-verbal observations and influencing perceived rapport and ability to speak openly. Although these limitations are apparent, strengths for this study approach allowed for great complexities to be established in relation to fear of re-injury, adding depth to the current knowledge in this area. Additional qualitative findings are required to complement the current understanding of ACLR experience and fear of re-injury, especially with a reduced time period between surgery and interview to lessen the effect of recall bias.

2.10 Social support

One area that seems to have limited research when looking at ACLR recovery is the impact that social support may have on reported outcomes and RTS. This is interesting considering the context of a biopsychosocial model that appears to have high relevance with ACL injuries and rehabilitation (Burland, Toonstra, et al., 2018; Webster et al., 2018). Of the few studies that have mentioned social support as a factor, most highlight that having a positive and supportive social network can enhance the confidence individuals experience when navigating ACLR rehabilitation (Burland, Toonstra, et al., 2018; Filbay et al., 2016; Scott et al., 2018). Some researchers advocate that positive social systems can act as a facilitator throughout recovery, potentially influencing better outcomes following a number of different injuries (Johnston & Carroll, 1998; Yang, Peek-Asa, Lowe, Heiden, & Foster, 2010). When looking at ACLR specifically, there are only a limited number of studies that appear to mention social support networks throughout a vast range of literature. Of the few, there are mixed opinions on whether social influence can increase RTS possibilities; however, most agree that confidence and coping strategies can be significantly influenced throughout the recovery period (Burland, Toonstra, et al., 2018; Scott et al., 2018). Burland, Toonstra, et al. (2018) conducted semi-structured interviews that resulted in social support being identified as a coping strategy but not necessarily a factor that predicted RTS. It was apparent that one individual was negatively affected by the lack of social support received from a coach. However, the researchers made note that this was not the only reason this individual decided not to RTS. Scott et al. (2018) were able to highlight a more substantial finding of the influence of social support on ACLR outcomes, illustrating that participants identified their social support

as being a significant contributor to a reduction in stress and an increase in motivation during recovery. Similar findings were reported by Brewer et al. (2003), where conclusions were made that greater levels of positive social support were associated with increased reports of home exercise rehabilitation adherence. Thus, it appears social support could influence rehabilitation in a number of different ways.

A thought-provoking study completed by Rock and Jones (2002) explored the influence of rehabilitation specialists on outcomes following ACLR. Findings advised that the use of counselling skills from a professional could be viewed as an important source of social support, with results suggesting that this leads to an increase in rehabilitation adherence and overall outcomes from surgery. Such a finding is interesting, given the professional working relationship between therapist and client. It is important to consider the idea that individuals experience desired social support outside of this relationship, due to the results of the studies mentioned above.

When viewing literature on social support, it appears that social interaction and experience of care are fundamental aspects of ACLR recovery, although these may be less impactful on outcomes reported in comparison to other factors. Research indicates that social support can influence rehabilitation in a number of ways, especially the effect it has on confidence and rehabilitation adherence, which are two aspects of recovery that do have reported influence on ACLR outcomes (Arden, Österberg, et al., 2014; Brewer et al., 2000; Burland, Toonstra, et al., 2018). Thus, positive social support appears to be beneficial to ACLR recovery overall. However, more research is needed to determine how social support influences recovery from ACLR, to augment the limited studies currently available.

2.11 Contextual factors

Along with physical, psychological and social aspects to recovery, many individuals are additionally influenced by contextual factors. Specific to ACLR, nature of sport, level of sport played, time between injury and surgery, and lifestyle factors can all have a significant impact on recovery outcomes and RTS rates.

2.11.1 Nature of sport

Throughout the literature, it is evident that the type of sport played has a big influence on the incidence of ACL injury and ACLR recovery (Arden et al., 2015; Ross et al., 2017; Warner, Smith, Wright, Matava, & Brophy, 2011). Arden et al. (2015) found that those athletes who reported greater RTS at or above pre-injury level were those involved in the category 'other sports', which included badminton, cycling and tennis.

Results showed this sub-group reported a RTS rate well above 50%, which was significantly less than RTS for other sporting types. Conclusions made from this finding suggest that sports with lower levels of demand—either through physical or time factors—increase the likelihood that athletes could resume their pre-injury level of sport involvement (Arderm et al., 2015). A second finding from the same study was the low RTS rates among those athletes who were involved in pivoting sports (Arderm et al., 2015). Aside from RTS rates below 50%, results found that one in four participants had changed sport or the level they participated in, while one in three individuals had ceased playing sport all together at a two-year follow up. This appears to show support that the type of sport played has a significant impact on ACLR outcomes experienced. Furthermore, Warner et al. (2011) put forward the idea that sports with increased physical demands on the operated knee could impose a greater challenge to RTS than those that are defined as low impact, such as cycling. In a recent qualitative study completed by Ross et al. (2017), findings further support this idea by demonstrating that pivoting and extreme sports at a competitive level are perceived to be a higher risk to re-injury, which may influence decisions around RTS for a number of individuals. Thus, type of sport appears to be a key determinant in whether an individual is successful in RTS outcomes or not.

2.11.2 Elite versus recreational athletes

In addition to the type of sport played, there is also evidence to suggest that there are significant differences to RTS rates between elite and recreational athletes. Significant findings from the literature suggest that elite athletes have superior access to medical, professional and facility support during ACLR recovery, along with an increased level of investment and motivation to RTS (Arderm, Taylor, et al., 2014). Arderm, Taylor, et al. (2014) put forward the idea that elite athletes who have access to greater resources throughout rehabilitation tend to have double the chances of RTS at pre-injury level and six times the probability of RTS at a competitive level. This is in comparison to non-elite or recreational athletes that experience significantly less support in these areas. Motivation is also a driving factor, with Czuppon, Racette, Klein, and Harris-Hayes (2014) identifying that elite athletes tend to experience a greater level of RTS motivation, which has been shown to have a positive effect on ACLR outcomes. In contrast, greater motivation can also mean higher levels of emotional investment towards recovery, which may elicit a negative psychological response if rehabilitation outcomes are not met (Czuppon et al., 2014). This can have a detrimental effect on the outcome of ACLR in elite athletes, along with a decrease in quality of life reported (Czuppon et al., 2014). Lastly, research completed on the level of sport played and ACLR outcomes illustrate that those in elite sports tend to have a higher frequency of

sport involvement, which can be beneficial to RTS outcomes, psychological readiness and functional recovery (Webster et al., 2018). Thus, although there may be greater stressors for those playing at an elite level, the support and motivation provided to RTS in comparison to non-elite athletes tends to be a positive factor for achieving desired results (Ekstrand, 2011). Nevertheless, monitoring elite athletes throughout rehabilitation appears to be highly important, especially if an athlete presents with emotional distress towards undesired outcomes.

2.11.3 Time between injury and surgery

Time between injury and surgery has also been found to have a significant impact on ACLR outcomes and RTS. Although only a few studies have reported on this area, it appears to be that a shorter time frame may be beneficial when accessing ACLR outcomes (de Valk et al., 2013; Fältström et al., 2016; Webster et al., 2018). Ardern, Österberg, et al. (2014) found that the chances of RTS were significantly lower as time between injury and surgery increased, while Webster et al. (2018) found that shorter time frames between injury and surgery were associated with higher levels of psychological readiness. In addition to these findings, the most notable study in this area was completed by Fältström et al. (2016), who investigated factors associated with RTS in female football players after ACL injury. A key finding was that athletes who had an ACLR within one-year post-injury were more likely to RTS than those who had a greater time delay between injury and surgery. This finding is similar to a study completed by de Valk et al. (2013), which suggested that surgery should be completed within three months post ACL injury, as this resulted in higher activity levels post ACLR. Although these findings are apparent, Fältström et al. (2016) noted uncertainty around whether conclusions from the results meant that early ACLR after injury increased the possibility of successful RTS or if those who were more motivated or played at a higher level underwent earlier ACLR out of choice. Thus, this area of recovery still needs to be explored in more depth in order to make stronger definitive conclusions.

2.11.4 Lifestyle factors

Lifestyle factors are known to influence ACLR outcomes and RTS, with occupational and family commitments being the main determinants. Tjong et al. (2014) advocate that lifestyle considerations are one of the more overlooked contributors to individuals not returning to pre-injury level sport. Following a significant injury such as an ACL, some individuals have reported that a reprioritisation of lifestyle factors occurs, especially if a substantial life change coincides at the time of injury or during rehabilitation (Burland, Toonstra, et al., 2018; Tjong et al., 2014). Given the lengthy recovery phase, Scott et

al. (2018) highlight that these changes in circumstances and priorities are a great possibility. Furthermore, a change in priority has also been associated with having to accept the reality of ACL injury and what is involved (Ardern, Österberg, et al., 2014; Burland, Toonstra, et al., 2018). This may mean that RTS is no longer a goal following ACLR, even if individuals still experience a strong association with their sport (Burland, Toonstra, et al., 2018).

Gignac et al. (2015) proposed that findings found in a longitudinal mixed-model study may suggest that apparent age differences in RTS could be the result of those aged 18-40 years being in a life phase of considerable transition and that role responsibilities were significantly important. Conclusions suggested that full-time occupational demands, family commitments and household responsibilities were all factors associated within those aged 18-40 years, thus having an influence on RTS outcomes. Ardern, Österberg, et al. (2014) illustrated that one in 10 study participants who did not RTS, conveyed occupational or family commitments as the most important reason for non-return. Similar findings were reported by Nawasreh et al. (2017), with 20% and 15% of athletes choosing not to RTS at 12- and 24-month follow up periods, respectively, despite having demonstrated satisfactory functional measures on a physical test battery. In addition to these findings, Burland, Toonstra, et al. (2018) drew attention to the fact that all participants who did not RTS in their qualitative study, did so because of lifestyle consideration. A qualitative study by Ross et al. (2017) illustrated that social priorities and responsibilities can induce fear of re-injury, which can also influence undesired results following ACLR. Collectively, these findings support the idea that many lifestyle factors influence RTS and ACLR recovery, with individuals choosing to participate or cease participation in sport for various reasons unrelated to their knee (Ardern, Österberg, et al., 2014). To strengthen understanding around lifestyle influence and ACLR, additional research may be needed to explore how lifestyle influence impacts on the actual recovery experience, not just the outcomes reported.

2.12 Education, knowledge and professional influence

Finally, education and knowledge acquisition, along with the therapeutic relationship have been identified as having a significant influence on ACLR outcomes.

2.12.1 Knowledge and education

McVeigh and Pack (2015) advocate the importance of education throughout rehabilitation, suggesting that it is often underestimated when accessing outcomes following ACLR. This education can be formal through the knowledge required of

professionals and informal through the learnings that clients need to acquire throughout the rehabilitation journey (McVeigh & Pack, 2015).

Formal education of professionals is paramount to gain trust from clients, which can determine outcomes following ACLR, especially when looking at rehabilitation adherence (McVeigh & Pack, 2015; Scott et al., 2018). Ebert et al. (2019) advocate that educating clients on the importance of rehabilitation and following an evidence based RTS plan is significantly important, so that individuals can avoid re-injury or undesired outcomes. It is proposed, however, that educating individuals recovering from ACLR can be one of the greatest challenges for professionals, given the eagerness of clients to resume pre-injury activity as soon as possible (Ebert et al., 2019). In addition to this, research suggests that if individuals trust professional recommendations, they may opt to change their sports participation—either through the level or type of sport played—which may influence better outcomes following ACLR (Arden, Österberg, et al., 2016). These outcomes may relate to better functional capacity or a decreased risk of re-injury, even if returning to pre-injury level sport is not possible (Arden, Österberg, et al., 2016). This demonstrates that professional input can have a significant influence on the decisions made throughout the recovery process, specifically in light of the trust individuals place in their education, knowledge, experience and expertise.

When looking at informal education, both Filbay et al. (2017) and Sonesson et al. (2017) recently found that pre-operative education provides clients with the necessary information to feel prepared for the surgical process and rehabilitation phase. Research highlights that those who felt prepared by pre-operative information often had a better experience throughout recovery (Filbay et al., 2017; McVeigh & Pack, 2015; Sonesson et al., 2017). This is mainly due to having the ability to form realistic expectations regarding potential outcomes of ACLR, along with clarity around the commitment and perseverance that is needed in order to achieve desired results (Filbay et al., 2017; Sonesson et al., 2017). Further to this, Sonesson et al. (2017) suggest that those who do not receive this pre-operative education may require more support during rehabilitation in order to maintain adequate levels of motivation and understanding of experience.

2.12.2 Therapeutic relationship

In addition to formal education of professionals, research demonstrates there are further attributes that are key to the therapeutic relationship, especially in relation to interactions experienced between therapist-client and surgeon-client (McVeigh & Pack, 2015; Scott et al., 2018).

McVeigh and Pack (2015) emphasise the importance of communication throughout rehabilitation, as this has an influence on how individuals experience the therapeutic relationship, plan for recovery and the ability to deal with any issues that may arise. This skill further relates to information provided around pre-operative education, as discussed previously, as individuals who feel less prepared because of limited discussions tend to have a poor experience of recovery. Scott et al. (2018) provides evidence for this, suggesting that most of the participants in a qualitative study, recounted little pre-operative communication around the commitment and persistence needed for desired ACLR outcomes. This led to feelings of frustration, anger and depression as they struggled to come to terms with the disparity between personal expectations and what they actually experienced through recovery, especially in relation to restrictions placed on their independence. Thus, an increase in pre-operative communication could have enabled participants to establish realistic expectations and coping strategies in order to deal with their situation (Heijne et al., 2008; Scott et al., 2018). In addition, Scott et al. (2018) further suggested that individuals respond more positively throughout recovery with health professionals who they view as 'effective', with attributes such as having a good education, being dedicated, easily approachable, a good communicator and being encouraging of a positive relationship as the key factors to this perception. Consequently, professionals should be aware of their influence on ACLR outcomes and work to develop a good therapeutic relationship for the entirety of the recovery period. Although the results from Scott et al. (2018) provide information around the key attributes that influence effectiveness of the therapeutic relationship for recreational athletes, further qualitative studies may be necessary to gain deeper insight into the apparent differences and similarities of these findings to that of high-performance athletes.

2.13 Gaps identified in the current literature

When reviewing the literature in its entirety, ACLR appears to be a complex phenomenon, with many factors impacting recovery from ACL injury. Most studies within the current review are aligned to quantitative research that mainly focus on the outcomes following ACLR. The few qualitative studies that have been completed provide greater depth and exploration around ACLR, however the population of high-performance athletes using this methodology seems evidently scarce. Further to this, understanding the lived experience of ACLR recovery and what factors influence this seems less investigated, with the main outcome of current literature being focused on outcomes rather than the recovery process.

2.14 Purpose of the current study

As the rehabilitation phase is a significant part of recovery from ACLR, it is important to know what factors to be aware of and potential interventions that may be useful to promote a positive outcome. The purpose of the current study is to supplement the knowledge attained by Scott et al. (2018) and other qualitative researchers, looking at how high-performance (elite and semi-elite) athletes experience the recovery process from ACLR. It will look to further investigate the factors that influence recovery, with particular emphasis on how the rehabilitation process is experienced—highlighted by Scott et al. (2018) as a topic for further exploration. As a result, the current study will look to widen the qualitative understanding of ACLR experience, with the aim to provide clinical implications for professionals and identify areas of future research that may not be apparent within existing quantitative literature.

2.14.1 Research question

How do high-performance athletes experience recovery from ACL reconstruction and what are potential factors for recovery?

Chapter Three: Methodology

3.1 Personal reflective statement

It is imperative that when conducting qualitative research, the researcher is transparent regarding the assumptions and experience they bring into a study so that the reader can determine any bias that may be present in the findings (Thorne, Kirkham & MacDonald-Emes, 1997). In this regard, I illustrate my background in ACLR and the thoughts or beliefs I had when starting this project.

3.1.1 Background

I was an elite athlete who ruptured my ACL during a non-competition match in 2016 and underwent an ACLR in the same year. I experienced 14 months of rehabilitation to get back to playing sport (at a semi-elite level). However, I still have ongoing issues present to this day. This injury, along with my passion for psychology, influenced my decision to study the factors relating to ACLR recovery, owing to the common occurrence of this injury and the long-term impact it has had on my own life. I hope to add to the current knowledge of best practice when facilitating ACLR recovery and what can be implemented to help individuals who sustain this type of injury in the future.

3.1.2 Assumptions

Prior to commencing the current study, it was my belief that many individuals suffered from the pain and psychological challenges that accompanied this long-term injury. Through hearing other athletes' stories over my playing career, I was aware of the different journeys that each individual can experience. For some it can be relatively straight forward, but for others it can be a maze of frustration and confusion. My view on recovery practice aligned with the physical aspects of rehabilitation being evidently offered to individuals; however, the psychological aspect of recovery was often overlooked. It was important to separate my own assumptions from the participants descriptions of recovery in order to get true reflections on the recovery experience from the participants. Thorne (2008) advises this is a key component to be aware of when navigating interpretive description, as it will allow important credibility and meaningfulness to the study design. Thorne (2008, p. 108) highlights recommendations of how to ensure assumptions are less influential by providing guidelines on how to achieve "situating self within the research role". Due to this, the following steps were conducted in order to separate my assumptions with the current study.

1. My own assumptions were individually explored, explicitly stated and discussed with the research team at the start of the project. This allowed a collective awareness prior to data collection and analysis and was continued throughout the study in order to identify if these assumptions were apparent within the interviews and analytical process.
2. Reflective notes were kept with the purpose to identify and discuss with the research team any potential influence my assumptions might have had on the study design.
3. An awareness was placed on allowing the research participants to lead the interviews by having an open mindset and one that situated myself by learning through participant experience, not allowing my background to shape the conversation in an influential manner. It was also essential to only ask questions that were relevant to the research question to maintain integrity throughout the study.
4. A discussion was had prior to data collection around how to manage situations where personal experience might need to be communicated to participants. It was agreed by the research team that my ACL injury and reconstruction information would not be explicitly provided to research participants unless they initiated this occurrence. If this situation was encountered, especially during or prior to an interview, then limited information around personal experience would be given in order to avoid the influence of shared experience from guiding the conversation. This was done in a respectful manner, deflecting the conversation back to the experience of the participant.

3.2 Methodology

Based on the nature of the research question, interpretive description was used as the qualitative research approach for the current study. Interpretive description was formally recognised by Thorne, Kirkham, and MacDonald-Emes (1997) as a valuable addition to qualitative research, after identifying that grounded theory, phenomenology and ethnography methods did not quite match up to the experienced-based knowledge that was required in the nursing field (Thorne, Kirkham, & O'Flynn-Magee, 2004). Thorne et al. (1997) stated that various researchers were conducting qualitative research that deviated slightly from the methods mentioned above but were doing so without giving their approach a specific name. This insight led to the development of interpretive description and provided health-care researchers with a valid foundation to explore much needed phenomena and research questions with an applied purpose (Thorne, 2008). As a result, relevant understanding could be generated and provide

informed guidance to those in the clinical field, along with conducting research that was based on quality and integrity (Thorne et al., 1997; Thorne et al., 2004).

Interpretive description aligns with the philosophical nature of interpretive naturalistic enquiry (Thorne, 2008). This suggests that for some phenomena: research design needs to take a holistic stance in order to determine the complexity of constructed realities; the researcher and participant are inseparable and interact with one another to explore the meaning behind experience; and that theory emerges through naturalistic observation and/or interpretation and it is present in the data gathered (Thorne et al., 2004). A strength of this approach is its ability to explore clinically relevant questions, that is data-driven (led by the participants) and allows a degree of induction to the data to enable comparison and contrast and identify common experience between participants and ensure clinical relevance of the findings (Thorne et al., 2004). This methodology allowed the study to evolve over time using semi-structured interviews, where key themes were identified and then further explored with subsequent participants.

As discussed in the literature review, research available for the experience of ACLR in high-performance athletes is fairly scarce. Interpretive description can therefore help to enhance this knowledge and inform clinical practice and future research that is required. Thorne (2008) also emphasises that interpretive description is based around subjective and experiential knowledge being of key significance, and this can help when informing clinical practice. Thus, this methodology was appropriate for the purpose of the current study.

3.2.1 Recruitment strategy

This study adopted a purposive sampling method to recruit participants with lived experience of at least one ACL reconstruction. The aim of the study was to capture a range of experiences of ACLR in order to produce findings that are factual to the intended audience (Thorne, 2008). Due to this, purposive sampling based on age, sex and multidirectional team sport was the best approach in relation to the study objectives.

Sporting organisations emailed their members living within Auckland, Northland and Waikato regions an advertisement about the study (see appendix B). These regions were selected due to the accessibility for the primary researcher, and the time and funding limitations of the study. Participants were asked to register their interest with the primary researcher if they were interested in taking part. After talking with the researcher about the study and having the opportunity to ask questions, if the

participant was keen to participate, they were asked a series of demographic questions to determine their eligibility against the inclusion or exclusion criteria (see table 1.0). There was a total of 17 participants that expressed interest. Eleven participants (65%) met all inclusion criteria. Six (35%) participants were excluded due to; the level of sport they were involved in (n=4) and the time of their injury/reconstruction (n=2). Of the 11 participants who met inclusion criteria, eight participants were selected to participate in the study to capture diversity in terms of age (19 to 38 years), level of sport (elite and semi-elite) and sport category. The three participants not selected were thanked for their interest in the study.

3.2.2 Selection process

The selection process involved thorough discussions within the research team aligning those who expressed interest with the objectives and inclusion criteria of the current study. Those participants who did not meet criteria were excluded, while those who did meet the inclusion criteria were compared against the other potential participants to determine who should be asked to participate to ensure diversity of experience was captured. The intended purpose of these discussions was to identify the mix of participants that would produce results with the greatest range of characteristics, while still staying true to the study objectives.

3.2.3 Data collection

Once participants were selected into the study, an email was sent out to confirm availability and arrange a time and venue for the interview to take place. Once these details were confirmed, participants were provided the opportunity to withdraw or ask questions via email or over the phone at any point prior to meeting. At the time of the interview, participants were given the opportunity to ask any further questions about the study, take a break or stop the interview for any given reason. Participants were then asked to read through the informed consent form and sign this prior to the start of the interview. Following this, participants were asked questions about their recovery from ACL injury through a semi-structured interview. The interviews ranged from 25-70 minutes depending on the participants experience and willingness to share. Data were collected via an electronic recording and transcribed verbatim. Interviews were completed at the Auckland University of Technology (n=5), a participant's home (n=1) or a participant's workplace (n=2). They were done in a quiet and private space to facilitate quality recording, privacy and confidentiality.

During data collection, questions were reviewed, revised or added in order to generate more depth in the interviews. Thorne (2008) states this is a key strength of interpretive description due to the flexible nature of the methodology.

Table 1

Inclusion and exclusion criteria for the study along with justification

Inclusion Criteria	Justification
Sixteen years of age or older	Because of consent constrictions only those 16 years or older were included in this study.
Have had an ACL reconstruction within the last 5 years	This will allow accurate reporting of current factors that influence ACLR recovery, rather than identifying those that may have already been rectified.
Have completed the first 9 months of rehabilitation	This will allow a participant to have experienced most or all stages of the rehabilitation process, allowing them to articulate the total recovery phase from an ACLR.
Live in Northland, Auckland or Waikato region	Because of travel and cost restrictions of the researcher, those who live in these regions will be included in this study.
National level (semi-elite) or International level (elite) athlete.*	This will allow the data to be compared and contrasted on the basis of sporting association. If it was open to a wider range of participants, the data collection may be too big to analyse effectively using qualitative methods.
Exclusion Criteria	Justification
If participants have not completed at least 9 months of rehabilitation or are more than 5 years post-surgery.	Research suggests that 9 months is the adequate time required to recover from an ACLR (insert REF). This exclusion criterion will allow the study to truly capture the entire rehabilitation experience rather than just the early stages. Providing a 5-year cut-off date for injury/reconstruction is also important to ensure the study is focusing on present factors when accessing ACLR recovery, rather than accessing factors that may have already been rectified.
If the researcher is familiar with the participant because of their involvement in elite and semi-elite sport, along with their own ACLR experience.	This is to prevent conflict of interest in the interviewing process, allowing all interviews to be completed in that same manner and not one participant to be treated differently from the next. This will also ensure participants feel able to speak openly.
If the participant is under 16 years old	Due to consent constrictions those under 16 years will be excluded.
If the participant is not fluent in English	Due to language barriers in the interviewing process.

*Elite Athlete refers to those athletes who compete at the International level in the open age group competitions and semi-elite athlete refers to those athletes who compete at the National level in the open age group competitions.

3.3 Data analysis

Because of the nature of the research question, interpretive description was employed to analysis the data. Through this method, much like that of most qualitative research, specific situations are explored before moving toward more comprehensive generalisations. Thorne refers to this process as inductive reasoning and highlights the importance of this methodology being data-driven (Thorne, 2008). This allowed the dataset to guide the overall narrative of the research question and fit with the exploratory nature of the study. Due to this, interpretive description and inductive

reasoning were considered a relevant data analysis approach that aligns with the purpose of the current study.

Throughout the study, data collection and analysis were completed simultaneously, as Thorne (2008) suggests that one helps to inform the other. In addition, it was also essential that a thorough data analysis was completed, without rushing through the process to avoid making pre-mature assumptions. Thorne (2008) states this is essential to a rigorous thematic analysis, ensuring inductive knowledge development occurs and the study design is truly data-driven. It is therefore important to stay deep within the data set before moving toward the more comprehensive generalisations. The following stages were completed in order to ensure rigor within the current study.

3.3.1 Stage 1: Familiarisation with the data

The first step was familiarisation of the dataset. Interviews were transcribed verbatim and read multiple times prior to structured analysis. During this stage, transcripts and recordings were listened to in detail and notes were made to help establish codes later in the analysis. These notes were related to both the individual data items (individual transcripts) and the dataset as a whole. Before moving to the next stage, notes were checked through to determine if what was written was an accurate reflection on what the participants described.

3.3.2 Stage 2: Coding

After familiarisation was complete and a list was generated of possible ideas for coding, formal coding was able to take place. This involved the creation of initial codes, which included a mixture of codes at the semantic level, relating to a description of what the participant has actually said, and the latent level, relating to the interpretation of what meanings may lie beneath the content of the data. At this stage, it was important that repeated patterns were starting to form, which meant that each data item needed to be given equal attention in order to ensure no interesting aspects of the data were overlooked. Codes were revised to ensure they captured variation in experience. At the end of this stage, a list of codes was generated that highlighted both the diversity and similarities of the dataset, and a list of collated data was established for each individual code.

3.3.3 Stage 3: Theme development

Moving into the more analytical stage of the analysis, the codes were then transformed into potential themes. These themes were actively developed by determining where there was possible overlap or similarity in the coded data. This was an active process

where themes were explored, altered and at times dismissed, which Thorne (2008) states is an important part of the analytical process. Once a list of possible themes and sub-themes were collected, along with the data extracts that related to each theme, these were then reviewed thoroughly. This stage involved accessing whether the coded extracts of each theme illustrated a coherent pattern or not and if the themes related to the dataset as a whole. It was important in this stage to re-read all the research data to determine whether the themes identified were coherent, told the entirety of the dataset, highlighted the important themes present in the data, and related to the research question of the study (Thorne, 2008). Data were also re-coded based on the outcomes of this stage and actively transformed throughout the process. At the end of this stage, a list of themes and sub-themes that answered the research question were then established and defined, along with the data extracts in each theme being organised into a coherent manner.

3.3.4 Checking interpretation

Throughout the data analysis the primary researcher conducted most of the process however, this was done under close supervision of the research supervisors. Data transcripts were checked by supervisors, along with discussions had between the research team around apparent codes and themes. As a result, ideas were actively refined throughout the process, before agreeing on the final themes and sub-themes to be presented. Further to this, assumptions of the primary researcher were continually checked within the research team to avoid bias in the interpretations (as previously mentioned).

3.4 Ethical approval

Ethical approval for the current study was sought and obtained through the Auckland University of Technology Ethics Committee on 07 June 2019 AUTEK Reference number 19/118. All data and analysis were conducted after approval was granted.

Chapter Four: Results

4.1 Participant Characteristics

A total of eight participants were included in the study who were either elite or semi-elite athletes located in Auckland, New Zealand. This singular location was the result of participant response to the research advertisement, as no athletes outside of this location were suited to the inclusion criteria of the study. The demographics of the participants are shown in Table 2.0. Participants are numbered to maintain anonymity.

Elite Athlete refers to individuals who compete at the international level in the open age group competitions and semi-elite athlete refers to individuals who compete at the national level in the open age group competitions.

Table 2 _
Participant Characteristics

Participant	Gender	Age	Ethnicity	Sport	Level*	ACLR 1*	ACLR 2 **
P1	F	19	European/Jamaican	Football	SE	4.9	0.6
P2	F	25	NZ European	Hockey	SE	4.2	0.7
P3	F	22	NZ European	Hockey	SE	4.2	3.2
P4	F	38	European/Asian	Football/ Indoor Cricket	E	1.11	-
P5	F	23	NZ European	Netball	SE	5.5	3.11
P6	M	24	NZ European	Football	SE	2.2	
P7	M	24	NZ European	Football	SE	2.2	***
P8	F	23	NZ European	Futsal	E	23	1.2

* Level relates to the level of sport played. E = Elite, SE= Semi-elite

**ACLR 1 states the time since first ACLR, displayed in years.months

*** ACLR 2 states the time since secondary ACLR, if applicable, displayed in years.months

**** P7 has recently experienced a second ACL injury but has yet to received surgery

4.2 Main Themes

It became clear from the data, that experience of ACLR recovery is multifactorial and one that is very much an individual journey. Due to this, the results will be presented based on common themes established across the data set but will be explained based on the various experiences described. In most cases, the commonality was evident however, the description of this was at times similar between participants and at times significantly different. Overall, it was apparent that experience of ACLR recovery is described as a long and committed journey.

Four main themes were identified from the data: (1) “As a mental battle, it’s a bit of a rollercoaster”, (2) “Oh ACL’s, I know a bit about this ”, (3) “It’s not going to stop me from playing ever”, (4) “Rehab is just one side of it”. The themes and related subthemes are described below, along with supporting quotations. Figure 1.0 also provides an illustration of the themes and subthemes.

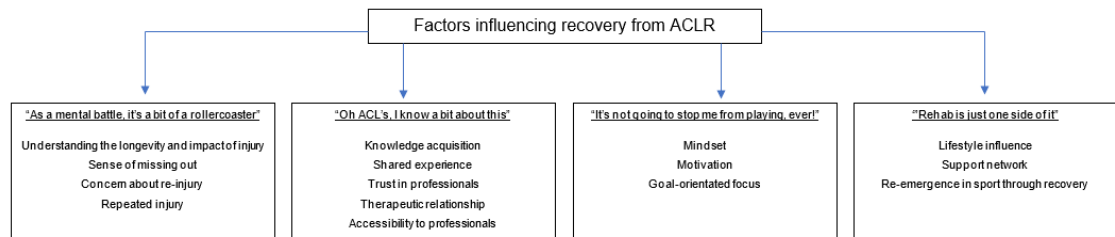


Figure 1. Themes and Subthemes illustrating the factors influencing recovery from ACLR

4.2.1 “As a mental battle, it’s a bit of a rollercoaster”

It was evident that the mental side of recovery was a challenge for all participants, with many factors identified that relate to the mental toughness that was required to overcome ACLR. It was mentioned by some participants that the mental side of recovery was often the hardest part, even more so than the physical.

You’ve got the whole muscular side of things, but they don’t tell you about the whole mental side of things that you sign up for, well you don’t sign up for coz you just get delivered it you know. Here’s your ACL reconstruction, go away and do it. (P2).

The mental side for me is way more important than the physical side of things. Accepting it and moving on from it... without the mental acceptance you won’t be able to do anything. (P7).

Four sub-themes were identified that describe this mental aspect to recovery in more detail.

4.2.1.1 Understanding the longevity and impact of the injury

During the initial phase of injury, participants reported a significant amount of uncertainty around what an ACL rupture was and what the recovery process might encompass.

Because I was only 18 at the time, I didn’t have that, I was quite naïve to the, to the ACLs and stuff like that? Like we didn’t really know that much about it. (P5).

It was 2 weeks of me sitting there thinking like you know I’ve done something, but I don’t know what. So, I think that was the hardest thing as well. Was just sitting there thinking oh, am I gonna like, is it, or is it just a bone bruise or is it

something else? You know. Hoping that it's, you know, but at the same time thinking oh, no. I don't really know what to make of it. (P6).

As the weeks and months progressed, it was evident that participants experienced frustration and realisation over how long the injury took to recover from, the impact this had on certain restrictions they encountered in sport and life, and the commitment that was needed in order to complete rehabilitation requirements. The experience was often described as repetitive and provoked a vast range of emotions throughout different stages of recovery.

I like to exercise quite a lot so being restricted to even walking was even such a pain and I felt so upset like every day I'd wake up and be like, I can't do anything. And so, I'd like, it was, I was always bored ... I'd wake up, like I'd look at my knee and I was just bored ... I just felt bored all the time. I was like I can't move, you know, I want to get back into what I can do as soon as possible. And I just thought that was the biggest struggle (P1).

The majority of participants also described the frustration of additional injuries during recovery, which impacted on the time it took to complete rehabilitation.

I probably started running a month later than the actual programme would say and that was based solely on the um, tibia and it was also to give the meniscus time to heal. (P4).

So, I had a bit of a rough start to my rehab. My Baker's cyst burst ... But once that was recognised it was smooth sailing from there but it was just yeah rough week or two. (P7).

Some participants described an internal conflict that was experienced between feeling ready to RTS and being held back by professionals. This was due to the mandatory nine-month time frame that most participants had to adhere too, often resulting in feelings of frustration by the evident restriction placed on them, even though they felt ready to RTS. This was associated with reports of tension experienced in the therapeutic relationship. However, participants did report an awareness that it was in their best interest to wait.

I know that I was pushing to get out quicker coz I genuinely felt I was ready. I had passed all the return to sports tests. So I started getting a bit antsy coz I was like, I've done all this, I've passed my tests so I want to go play sort of thing. (P3).

End of month 7 I was like get me on pitch, I feel great. Get me on pitch, don't make me wait for 9 months ... They just told me, I can't remember exactly, but they just told me the statistics of people that go back to sport too early and it was something like you have a 50% chance, it increases, you have a 50% better chance per month that you wait or something like that. So just hearing those kind of things terrified me coz 9 months is long enough to wait. (P7).

In contrast to this, some participants experienced a longer recovery period to RTS where mixed emotions were described. Often there was disappointment or frustration experienced at the time. However, most participants then reported the importance of quality rehabilitation versus rushing back to sport.

Yeah not passing [initial RTS test] was pretty disappointing but I think it, it just showed that you needed a little bit more time to get things right. (P7).

Just how important it is to not rush through everything especially with like, um, getting back. Like everyone's like 'oh, 7 – 8 months' like if you can take 9 – 10 months, it's gonna make it all worth it for your like, for your long term playing. Coz I just thought, like, oh 7 – 8 months, I'll be back into it but taking that 9 – 10 months of actually just getting myself fit and getting myself right before actually playing was really important. (P5).

In addition to a lengthier RTS, it was also reported by some participants that performance satisfaction took between one to three years to recover post-injury, even though they were able to RTS earlier than this.

I think I thought even when I came back from the 2nd one it would only take me about a year to get back to where I was, but now looking back on it, it took closer to two. (P3).

My first season was pretty average, it's just like, I, you know, you'd be thinking about your knee the whole time in games and stuff you'd be like 'oh can I actually, should I reach for that ball or should I like go that way?' and then in the second season, like I was coming back like not thinking about my knee as much and it was only actually in my [third] season that ... I was like oh I'm actually feeling like so much more like myself and my speed was coming back. (P2).

What appeared to help participants through the long timeframe was the sense of achievement they felt when progressions were made throughout different stages of recovery. In particular, overcoming the initial stages of rehabilitation, being able to run

again, and achieving an RTS appeared to be significant milestones related to positive recollections of experience.

But I think the longer you go and then when you start running like with the spin-biking and then when you're running it just gets easier. It's just that first block that's so hard. Especially straight after surgery that's the first block is hard. (P1).

There's little wins along the way, you know. They, they come few and far between but when you do get them you're like, okay I'm getting better and you know, you like might squat heavier or you might, um, I don't know, be able to do something that you couldn't do last week or it's not painful this week. (P2).

4.2.1.2 Sense of missing out

Throughout the longevity of the recovery process, participants described the sense of missing out on things which negatively impacted their experience. This related to a number of areas, with the main aspects being within the sporting context and social interactions. Due to the physical restrictions placed on the participants for a number of months, it was apparent that a number of 'events' were missed throughout recovery but sport and non-sport related.

Oh it's hard like the main thing I think was just like the competitions I had been missing. It's like the main thing that comes to mind. (P8).

Missing out on a social life, just coz I was constantly worried that, you know, I wouldn't go out on Saturday night coz I was worried that someone would bump into me and I would just re-rupture my ligament, that kind of, that was a bit of a drag. (P7).

4.2.1.3 Concern about re-injury

It was apparent that a concern for re-injury was evident for some participants and not for others. Those who experienced concern reported uncertainty around future participation in sport, fear around the specific movement that was experienced at the time of injury and being hesitant throughout rehabilitation. This experience was described as a challenge throughout recovery and one that had affected both sport participation and life considerations.

The hardest thing is like doing the full turn and like I have nightmares about how I did it like, I dream about me rolling the ball back and putting my foot down and like doing my ACL again so that's not fun. Um. So I think that mentally, that

that's going to be the scariest thing for me is going to be able to take players on one on one and just change of direction. (P8).

The real, like motivation to get back to hockey is just not there because I'm scared I'll do it again if I go back and just like the thought of doing a third one, I'm just like no, but then if I don't do all these things that I could pot- like if I stop doing things, in general life, that I could potentially do my ACL again I'm going to live a very boring life, so it's kinda like trying to find that balance. (P2).

Those who reported less concern for re-injury appeared to recall a more positive experience throughout recovery and felt more confident to RTS. For most, this was associated with the trust they had in their knee and the rehabilitation programme they had completed. In contrast to this, those who reported higher levels of concern generally experienced a lack of confidence, which affected RTS readiness.

I knew I had rehabbed properly. I knew I had worked my ass off to get everything back into shape and I just knew when I was getting back into training that I was competing with everyone else again. (P7).

I want to say full confidence isn't there coz like even when I've been in training, like I am cautious like if I'm, so if I'm doing some sprints or whatever just like my myself to the side, when I go to change direction I slow down quite a lot before I do that like in a game, I can't do that. Like if I want to get back to like that high level so that's yeah, so confidence isn't quite there yet. (P8).

An interesting aspect when looking at concern regarding re-injury was the idea of participants experiencing 'distractions', which helped to direct attention away from their knee and towards the task at hand. This appeared to allow participants to feel less fear towards re-injury and more confidence in what their knee was capable of.

We just talked the whole time so while I was, he'd say do this and we were just having a conversation so there was no even thought about what I was doing while I was doing it because yeah, I was literally just, yeah, just casual conversation with him. (P4).

I think my first game was when I gained the confidence coz as soon as like you're back on the field, like, when you're actually concentrating on your sport like you don't really think about your knees. (P1).

4.2.1.4 Repeated injury

The majority of participants described experiencing a secondary ACL injury, either to the contralateral knee or the ipsilateral graft. This experience was often experienced with disbelief at the time of re-injury and what that meant in terms of re-experiencing surgery and rehabilitation, even if they had been made aware it was a possibility?

My New Zealand doctor did say that your right knee is stronger than your left so if you're ever gonna tear an ACL it's gonna be your left one. And so I was told that, I was aware but I never thought it would happen I guess. (P1).

I didn't think I'd done it again. Um. So... I kind of had the mindset that once it was fixed there was no chance of me doing it again. Like I was like I've done all the rehab properly, everything's great, there's no ways I can do it again and then I did. (P3).

An interesting commonality among those who experienced re-injury, however, was that the familiarity of the injury and rehabilitation influenced participants to feel more prepared for recovery once the initial shock of the occurrence wore off. This was associated with the knowledge and experience they had acquired through the first injury, giving them more certainty around what to expect. Further to this, participants also reported that re-injury influenced confidence around the knee's capability early on after surgery, often resulting in 'pushing' the knee to a greater extent during rehabilitation.

I wasn't too phased the second time. Coz I kinda knew already what I was getting myself into. (P7).

The second one was probably, like I knew what to do so that was kind of good and mentally I was like, okay I know what the recovery is, what I need to be doing this time round ... I think what I didn't realise was on my first rehab I was like oh, I need to be on crutches for a while and I, you, I really didn't. So for my second one, I was probably off crutches within 2 – 3 weeks, you know, I was ready to go. (P5).

4.2.2 “Oh ACL's, I know a bit about this”

The uncertainty that individuals felt at the beginning of the ACLR journey was evident. Most participants reported a lack of awareness around what an ACL rupture was at the time of injury, while those who reported some awareness, often mentioned that the journey was significantly different to what they had anticipated.

I had no idea what, like I just felt pain, because I had no idea what an ACL was. (P1).

I was a little bit naïve in terms of like, I know, coz you know, we learnt about it at uni, I kind of knew what was to be expected um, like in terms of the rehab and stuff but I guess I didn't expect it to be that full on, I joked to people that it's kind of a part time job you like, involuntary sign yourself up for. (P2).

This uncertainty was apparent from the time of injury and continued into the different stages of recovery. It often led to feelings of anticipation around what rehabilitation may entail, along with what participation in sport may look like in the future. Particularly evident was the experience of uncertainty around what was normal discomfort expected in the recovery process and what discomfort may be worth concern. Those who reported a lack of understanding throughout rehabilitation, appeared to relate this to a negative aspect of their recovery experience.

It was kind of like not helpful when you kind of don't know where you should be. (P5).

For the majority, learning through the process appeared to be beneficial to participants recovery experience, with many expressing their confidence to ask a number of questions when they required clarity. Unfortunately for others, asking questions appeared to be a daunting task, and this led to a feeling of wasted time or uncertainty around if they were on the right path to desired outcomes.

I ask a lot of questions to my physios and I was like what if this happens, what if like, they would always give me a straight answer so I think the more kind of support and like, the more I felt better with asking the questions to the physio, like, I felt more ready to, like to play. (P1).

Maybe I should've just called up or whatever. I just felt like they were kind of stupid questions. (8).

Along with asking questions, some participants reported conducting personal research, which helped with understanding their injury and what they might expect to experience.

I did a lot of research about the knee and what you can do to prevent it from happening again and so I did a lot of research regarding all of that stuff. (P1).

This sense of comprehension was evidently important to most participants and appeared to influence the experience of ACLR in a number of ways. These will be explained using the five subthemes below.

4.2.2.1 Knowledge acquisition

Knowledge acquisition was a key aspect to understanding ACLR for many participants, with some suggesting they enjoyed the process of learning new information. This appeared to influence a more positive experience during rehabilitation, mainly through the attainment of clarity around what to expect and/or having confidence in the process they were undertaking in order to achieve desired outcomes.

So I really enjoyed um, learning all about it and understanding and watching videos and stuff. (P5).

You kind of learn to understand the limitations of what you can and can't do. (P7).

A specific area of clarity that appeared to be of great importance was the certainty acquired around what pain was normal versus what pain might be of concern. This allowed participants to push through any normal pain they were experiencing, with reports that this facilitated their recovery in a positive way.

When I had started getting, you know, pain when I was coming back I was like, fuck, does this mean that you know, like my cartilage isn't fixed, you know, is it something like that but I just had the reassurance like you know, everything's good like my scans are fine, he was happy with my scans, he was like, you know, everything's looking good so I, and I had the reassurance. (P6).

In addition to gaining information, it was apparent that being around others that were knowledgeable in relation to ACLR was beneficial in comparison to those who lacked this understanding.

I was into a bigger facility like more, being around more people with more knowledge and so like I'd be able to talk to some of the people and they'd be like 'oh ACLs I know a bit about this!'. (P1).

I think someone with the knowledge of like what it is and what to expect um, is a lot better for me, personally. (P2).

What was also apparent was the pride and comfort participants experienced in passing on their knowledge to others. This appeared to give some purpose to their experience, as they were able to help others as a result.

I'm making sure that I like let people know, especially about warming up and stuff, about how important it is about landing properly because I don't want people to obviously go through, you know? (P5).

I like talking about it more coz I want people to be aware of how serious it is and like, especially, like working in football and like youth girls, like in our under 16 age group, we've had a handful of ACLs recently, and like it's really concerning and I know a lot of them as well so it's like just upsetting to see like all these young girls like going through it so I don't mind talking about it now. (P8).

4.2.2.2 Shared experience

Similar to those with knowledge, participants reported that others who had been through ACLR or hearing of others who had been through the recovery influenced their own experience in number of different ways. Some participants were positively influenced hearing stories of success,

I had seen other people do them and I was like well, they've done them and they're back playing, you know? So I could draw on those people as well. (P2).

My roommate had done his so we were on the same page, we were both on crutches, we were both going to rehab together, we both knew how bad it was, he had already done his so he knew, you know, his other knee was doing just fine so it was, it was good in that terms as well. (P6).

Others experienced a level of concern hearing or witnessing that individuals went through the injury multiple times and/or were not able to get back to their pre-injury level of sport participation or performance. Either viewpoint influenced the level of confidence or anticipation that was experienced, especially at the beginning stages of the rehabilitation. It also gave individuals a chance to compare and contrast their experience with others, affecting how they perceived and understood their own journey.

It's hard because I know of people who have done it twice, I know people who've done it three times, like that kind of thing and now they don't even play so that's like I don't want that to be me. (P8).

Did his ACL and you see it happening around you and they're gone for the season and then they, most of them don't come back the same kind of player that they used to be, because of the lack of mobility after that and yeah, um. So that was why I was super nervous. (P7).

Further to this, the idea of famous persons influencing how participants viewed and experienced the injury was another significant factor to individuals' own perceptions. This was mainly through social media, where participants were able to see professional athletes overcoming the injury. However, this was experienced in both a negative and positive way:

Like all my role models and they've done it and they've come back and they're still playing a league. Like that gave me that reassurance, like it's not the end of the world, like I can come back from it. (P5).

Especially with social media I find as well. Like for example, now I'm following like Damien McKenzie and um, like Phoebe Steel and Kelsey Smith who are all like, been in like, either like the All Blacks or the Black Sticks and I got a high up like hockey person as well and like, you know, they say 'oh they're back running' and I'm here going oh, I'm a month down the track and I'm still not running so like yep, I'm not doing well. (P2).

4.2.2.3 Trust in professionals

All participants mentioned trust in professionals as a key factor when describing ACLR recovery. Those who experienced professionals who appeared to be knowledgeable, had experience, and could reassure participants that they were on the right track to successful outcome, appeared to make the recovery process more straightforward. It was also apparent that trust was essential between surgeon and the participant, with multiple accounts of agreeing to what the surgeon suggested, along with open communication prior to the surgical process. This trust was also essential in the physiotherapist and participant relationship.

So he recommended patella um and like explained why and stuff like that and I was happy to go with his recommendations because he actually did ask what level I wanted to go back at. He didn't just recommend like whatever, yeah. I think that was good. (P8).

An area of interest where trust was established was an immediate start to the rehabilitation process. This was experienced both pre-surgery and post-surgery, with participants indicating that being able to start the rehabilitation process early allowed them to observe what their knee was capable of and increase their confidence to complete rehabilitation exercises earlier. It further increased their trust and confidence in professionals, due to associating this with the idea that they knew what they were doing.

Basically, rehab started from day 1, um, [name of surgeon]'s pretty clear, he gives you a rehab programme pretty much when you have your meeting with him? So you have your 6 week plan and then you have, like, basically a 3 or 4 stage phase plan which he gives to you and outlines to you and that's basically broken down to days and um, yeah weeks. Yeah. Where you should be at in terms of your rehab yeah. (P4).

I mean the day after my surgery, they were wanting me to bend my knee straight away like that was obviously really painful, but it showed me straight away that I was like, okay, these physios know what they're doing. Like they know, they gave me like, um, an actual thing of like all the phases and what they want, what I should be doing so I'd be like okay right here, on paper, I know exactly where I should be. And I thought that was quite cool. (P1).

In addition, it appeared that reputation and education history was an important aspect to the perception of professional competency, with some participants making explicit reports of how this influenced their trust towards their surgeon or physiotherapist.

He'd [the surgeon] had a really good education, I knew he came from a university that was quite good. (P6).

I know [name of surgeon] s one of the best Orthopaedic Surgeons in the country. He did my ankle um, I don't know, fractured the base of my tibia, yeah, ankle probably about 5 years ago now? 4 years ago? And he did that surgery. I was back playing within 4 weeks of doing, having that. So yeah, I trust him so. (P4).

In contrast to this, there were also reports of participants not trusting in their professionals, and this was associated with a more negative recall of experience. This recall was associated with factors such as limited information being received, less familiarity or connectedness in the therapeutic relationship, a lack of reassurance received, insufficiency of goal understanding, limited clarity around the plan for recovery, or feeling like a number rather than being cared for.

I went from physio to physio coz I just couldn't find the right physio that was there to support me and it wasn't until I found [name of physiotherapist] in [name of area] who's like, actual [name of physiotherapist], so the guy, the actual guy, he was the one that boosted me and actually finished off my rehab like the way it should've been from the start. (P1).

I didn't get the sense of I'd be able to get back. He [the surgeon] said I could definitely get back to netball, but I don't think he got that in the sense of like you'll get back to where, to I guess like elite netball but I don't know if that's because he didn't really understand where I was at with netball? ... So I think he was kind of like that oh, okay. I didn't realise you were going to go back into it. I was like oh, isn't this the point of me getting the surgery?

4.2.2.4 Therapeutic relationship

In addition to trust, participants placed importance on the therapeutic relationship experienced throughout recovery, with most reporting a good relationship was established during recovery or existed prior to the injury. This was linked to increased motivation and enjoyment during rehabilitation, along with feeling supported and cared for.

He's basically our team physio so always really accessible. I had known him before that anyway, um, so you know I had a good relationship with him too and I knew that he was someone who was passionate about physiotherapy, like you know, he's always interested in studies and he's always interested in trying to, you know, get the best and, and have the best exercises and stuff and you know, not like, revolutionise but he, he's ready to really look into those different aspects instead of just doing whatever else. So yeah, I knew that I was going to be getting, you know, a good plan and a good physio which was really, really helpful. (P6).

They're all just real positive and they actually care for you [physiotherapists at clinic], like they want you to get back so I would say they, like having a, having a physio that you can bond with one on one it does help coz they're like okay I do actually really care about this person, I want them to get back to be happy again. (P1).

With [name of physiotherapist] I just found that he was not, he had a lot more knowledge but also just personality-wise, we just had that, I liked him because he was just straight up, told me how it was, what you need to do. Whereas my other physio, he was lovely and did everything but I just feel like with [name of physiotherapist] he had that extra, like, extra knowledge about what you should be doing and he rehabbed a lot of other netballers with ACLs and stuff that I knew so I kind of had that 'okay, he knows, he knows what he's doing'. (P5).

In contrast to this, some participants experienced negative therapeutic relationships during recovery, which was associated with less motivation or clarity around the injury.

Well, I had a great experience in my first meeting with my surgeon. He kind of sat me down and said 'you'll never be as fast as you were, like before, you'll never be back to same level of hockey you were before, you'll never be able to do the same things' like he kind of was just like, boom. Straight to the point. Like. Pretty rough. Like I left just like crying, like I was just 'oh my gosh'. (P2).

It was just like, it was kinda being let down so I was like, I would get my hopes up to see this new physio so I was like okay hopefully this guy's better and then I'd just feel let down again because, like, I just felt like, it was the same thing. Like I was kinda just like a number and they weren't actually caring about like me. That's what I felt like. (P1).

4.2.2.5 Accessibility to professionals

Another fundamental part to the recovery experience was participants' accessibility to professional support. This was apparent as those participants who appeared to have a more positive experience recalled having significantly more support than those who appeared to struggle to a greater extent throughout rehabilitation. Increased contact time with professionals was also significant, especially in relation to physiotherapist support.

I think physio is huge, so I think pretty much for the 9 months I was having physio three times a week. Um. And I think it just kind of helps with having no other new niggles developing or anything like that. And you're always being checked on like making sure that alignment's going well, muscle growth is going well, all those kinds of things, um. So I think that was a huge help as well. (P3).

I was pretty lucky that I had a lot of support at the beginning and throughout the process and if I wasn't sure or comfortable with something I'd generally ask and probably get a bit more support so like the strength and conditioning stuff, being able to see [name of physiotherapist], um, so [name of physiotherapist] still did the, like, the massage and the movement and all that stuff and then I had [name of strength trainer] which was solely just strength-based which was good. (P4).

There was an interesting contrast evident between two participants, which demonstrated the differences experienced in relation to contact time and support:

I would go in everyday basically for 8 months, or the physio would be like oh, we've done some good stuff, have tomorrow off like don't worry about it and then just come in like, don't do anything over the, like you don't have to come in over the weekend and stuff so yeah. (P6)

I was only seeing physio once a month at this point so it's like, I can't, I can't remember like I'll try my best but like I don't, you know, I don't have someone with me once a week to correct my technique or to push me.(P8).

What was significantly apparent about this difference was the level of physiotherapy involvement during rehabilitation and the disparity between having a physiotherapist present at rehabilitation sessions in comparison to having to experience this process on your own.

So the physio would always be there and he'd be like, you know, you're running quite on your toes, you're not having that heel plant, um, he's like, you're doing it fine on your left foot obviously but I can tell that, you know, on your right foot, you're a little bit hesitant. (P6).

I just had to do all the rehab by myself. Which, I, yeah, I wish there was someone that, like even once a week, like one out of the three or four times I was in the gym like I had someone with me. To either like just push me to have a good session or to um, or just to like help me with technique and stuff like that then I might not have hurt my back if I was yeah. (P8).

Additionally, most participants reported the benefits of having a physiotherapist present during rehabilitation sessions, which helped with reports of confidence and dealing with any hesitation that might be present.

Aside from the physical input from professionals, it was apparent that psychological aspects were less supported, with some participants suggesting that they struggled mentally throughout the recovery process but were given little in the way of professional support for this.

I guess there would be? But I don't really know who I would go to and like... I mean, I don't really like whinging. I only whinge to this one person coz he'll tell me to pull my head in and be like 'you're doing fine, get on with it' kind of thing um yeah. I guess there definitely would be but I just haven't really looked or yeah. I don't know where to look. (P2).

4.2.3 “It’s not going to stop me from playing, ever!”

In addition to the mental battle throughout recovery, the third theme illustrates the mental resilience and strength that participants drew upon as an important part of recovery.

I think it was just mainly trying to stay mentally strong for it. (P6).

I think I kinda, I always give myself a time block to be upset and then got on, gotta move on. Like start dealing with the rest of it. (P3).

Three key sub-themes were apparent within this commonality: mindset, motivation, and goal-oriented focus.

4.2.3.1 Mindset

Mindset was discussed by the majority of participants, with importance placed on a positive mindset being a key aspect to overcoming ACLR. Acceptance of the injury and being future orientated seemed to be two key drivers to maintaining an optimistic perspective.

‘Well it’s done, so there’s nothing you can do, so you’ve just kind of like, every next day is a better place than the one the day before.’ Um. Some people thought it was a blasé attitude, but I just don’t see the point in dwelling over something that’s happened. (P3).

If you don’t wake up in the morning and want to go to the gym to fix your knee mentally, then you’re never going to do it. You’re always going to put it off and go nah she’ll be right. So mentally, you have to, you have to be willing to sacrifice however long it takes to, to get yourself better. Coz you can’t do anything, physically you can’t go to the gym unless mentally you’re like, great, let’s get there, let’s do it. And that would apply with all kinds, all factors to do with the knee rehab because you have to mentally accept if you want to push yourself to see the limitations of your knee again. (P7).

This contrasted with those who identified that mindset was a hindrance at times throughout their recovery, experiencing a more negative perception of the injury and rehabilitation, which often lead to unhelpful behaviours.

I’m like, I think I need to change my mindset about it because I’m just like a bit meh at the moment. (P2).

It was definitely like the mindset is like everything towards like how I felt about my first one. It's coz like, if I was like doing well with my rehab and I was happy it was good but if something sad happened I got, something hindered it, it would just not be good. (P1).

4.2.3.2 Motivation

Motivation was a second driving factor that influenced mental strength and resilience throughout recovery, with participants reporting a variety of different aspects to motivation experienced. RTS was particularly evident as a main driving factor; however, all participants mentioned motivational aspects in addition to this.

Wanting to get pain-free, you know, I, I wanted to make sure that when I was going to be running and later on in life that I wasn't going to have extra problems so I wanted to make sure that, you know, I wasn't waking up after a training and the next day being stiff, like I didn't want that anymore so that's why it was motivation for me to go to the gym and do it coz I'm like this sucks, I don't want my knee to be sore all the time so yeah, that was always a big motivation. (P6).

They told me to stop ... Everyone's telling me to stop and I'm like, well...there's only a few things I really, really, really, really like doing and playing football is one of them. (P7).

I think that also motivated me like being at a like pretty good gym with good facilities. (P1).

It was evident that those who reported higher levels of motivation appeared to have a more positive experience during recovery. Other participants reported that motivation levels fluctuated significantly throughout rehabilitation, suggesting it was viewed as more of a chore, therefore influencing a lack of adherence at times.

I'd get bored and doing the same exercises and stuff and I knew I had to do them but I was like, it gets quite boring and I just had like motivation like fluctuates a lot. (P8).

It felt like more of a chore to go to rehab so I was just like, oh I've gotta go up – like it was after school as well, and I was just like, oh I don't want to. (P5).

4.2.3.3 Goal-orientated focus

An aspect that appeared to help motivation was being goal orientated. Most participants suggested that having a clear goal that they were striving to achieve, influenced greater motivation and focus on moving forward in their rehabilitation. Whether this goal was related to RTS, getting physically strong, being pain free, occupational demands, or a mixture of different factors, it was evident that this helped to drive motivation levels and adherence to rehabilitation.

I had a goal in mind for what I wanted so yeah, it was kind of getting back on the street as quickly as I could for work and then being ready for a tournament kind of at the end of July/beginning of August so that was my kind of goal to get back so yeah those were my outside driving motivations. (P4).

Yeah I think if you just have a goal and things like that it makes the rehab a whole lot easier, you know, like I say when I got back to New Zealand and I realised that I wanted to play, taking that month or two of no playing and just going to the gym like 3 or 4 times a week, I knew that it was going to be good because, then later on and I joined trainings I noticed my knee wasn't as sore and stuff I realised it was all worth something, so I think that's always important to have as well. (P6).

In comparison to this, an individual who experienced a re-injury reported a change in motivation from RTS—which was a key driving factor in her first experience—to being uncertain as to what her sporting involvement would be in the future. This influenced her experience of recovery as her motivation levels were altered based on not having a clear goal to work towards. This was evident throughout the interview, with the topic being brought up on multiple occasions.

The motivation's not as high in this one but yeah, I'm still unsure whether I will go back and play hockey just coz like the thought of doing a third one I'm like (laughing) I don't really want to ... But then, like, I just can't really imagine not playing so I'm kinda sitting on the fence. (P2).

I am finding motivation to like push hard and like work myself hard just a little bit low at the moment, just coz I'm uncertain of what I want to do next so yeah I just don't have that goal and I need to have a goal coz I'm that kind of person like I need to have a carrot you know dangling in front of me to work to something so yeah. (P2).

4.2.4 “Rehab is just one side of it”

Along with the factors specifically related to knee recovery, there were also a number of evident influences outside of this that participants reported having an impact on experience. These were mainly due to restrictions that were placed on them and the longevity of the recovery process. Below are sub-themes that describe this theme in more depth.

4.2.4.1 Lifestyle influence

There were many different lifestyle factors that appeared to affect the participants' recovery experience from ACLR. Out of these, two main factors appeared to have a significant influence.

The first was occupational considerations. Those who worked full time on top of recovery reported some struggle with finding a balance between occupational demands and the rehabilitation requirements. It was also apparent that an ACLR was significantly impactful for those who had physically demanding aspects to their job. This resulted in restrictions placed on tasks they were able to complete or reports of lower rehabilitation adherence due to elevated symptoms brought on by their job. Further to this, additional stress was reported through occupational factors, which differed between each participant in this situation:

I've got my work as well, like that takes up a lot of time and it's just trying to balance and some days I do do long days and my knee's sore so I don't go to the gym you know and there's all that kind of thing that like um, hinders it as well. (P2).

Balancing it with work. I work a lot. I usually work from 8am to 7pm and then having to go to the gym after that. In an ideal world, I'd want to go more than I did, or train more than I did. But you just have to balance things ... so just finding the balance without working 11 hours and day and then going to the gym, that's really difficult to do because you want to, you want to have a bit of a life too. So. Yeah that was, that was a struggle. (P7).

The second lifestyle factor was the impact that ACLR had on participants social lives. For most, it was reported they experienced social restrictions around what they were able to participate in, which led to feelings of frustration.

Like stuff like that with the flat, like 'oh, let's go to the driving range' and you're like 'oh, I'll come and I'll watch but I can't do it' and they're like 'oh, no, well we'll

go and do something else' and I'm like 'no, no, no, like, please don't!' Like I hate that kind of stuff um, and like, um, we'd always go for like walks or runs or something like that um, with a couple of my friends and you can't do that so you just not, like you're missing out on time there with them and, yeah, yeah. So that kind of stuff is hard. (P2).

I still went to the festival but I wouldn't like have to like that sucked coz I had to, I had to manage my time, like I would only go out to like watch the music for a little bit and then I'd go sit on the bank which was kind of lame but I had to do it. That was frustrating. (P2).

4.2.4.2 Support network

Participants recovery experience was also significantly influenced by their support network. Having a main support person or persons was evidently important to participants, as this gave someone to reach out to throughout the process. This individual was different for each participant and was either linked to close family or friends.

The best thing about the rehab was that I did have that other person with me, in my roommate, he was really, really good um and he had been through it before. (P6).

He [Dad] kind of kept me on the right track and made sure I was doing my rehab, going to the gym, going to physio so I think having someone to be a bit accountable to does help as well. (P3).

Reliance on family was also significant for participants. Early on in the recovery process, participants reported that dependency on their family was crucial, owing to the restrictions on movement and physical capabilities. Family assistance made the initial phase of recovery less complicated, which appeared to be greatly appreciated by participants.

Somewhere with a bed to lie on, and someone to cook you dinner and bring you things. That was amazing for the first couple of weeks. Coz I, you can't do anything in those first couple of days. You're so bedbound, it's not funny. (P7).

Further into the recovery, some participants described their family as an important support if they needed to talk to someone, while others suggested they knew their family cared for them but felt that a lack of understanding around the injury made it hard for them to be truly supportive.

Even if I was venting about things, they [parents] were just there, like even if I didn't want to hear what they wanted to say, they were just really good just being there for me. (P5).

My family and stuff are like very supportive, but they don't know like timeframes and stuff that you should be hitting and like they don't know if you're doing well or not in terms of your rehab because they don't know what to like, expect. (P2).

The influence of others also appeared to be significantly influential to participants' experience, with differing accounts of how this impacted on their journey. Two areas appeared to be significantly important.

The first was the idea that some participants reported feeling nervousness for what others might think of them, especially in the initial stages of recovery and then again at the time of RTS.

I guess crutching around and stuff, you wonder if you are like a, I guess, you know, other people looking at you, like oh shit, he's injured and stuff and he's around the locker room. (P6).

So I actually did have a lot of nerves and I was like, oh am I going to – I had that sense of like are people going to not, yeah they are, people are going to judge, like they're gonna be like, 'oh is she going to get back to where she was and all that. (P5).

The second main factor appeared to be the number of questions participants were asked throughout recovery. Some participants associated this with positive aspects of their experience, due to feeling supported and that others had an interest in what they were going through. In comparison to this, some participants associated questions received with a more negative viewpoint, suggesting it was a constant reminder of what they were going through, being known as the person who was injured or feeling pressure to provide answers on when they would be cleared for RTS.

I quite liked it [being asked questions]. I liked letting people know. It was like, yep, this is where I'm at, this is what's happening. (P5).

Oh, to be honest, I hate people asking me about it now, I'm just like it's fine, I've done my surgery, I'm just rehabbing, just leave me to it. (P2).

4.2.4.3 Re-emergence in sport through recovery

It was apparent that re-emergence in sport versus having a new focus was also influential in participants' experience of recovery. Some participants reported that having a focus outside of sports was an important aspect to coping with the situation. It allowed them space from the injury, which was significant to their recovery experience.

I think around the time I had, I had my exams so I think having to focus on something else as well really helps so you're not really sitting at home wallowing. (P3).

The fact that I've got a good, my priorities have changed and I can now focus on work. So that is my job, because I've got a really awesome job and I'm super thankful for it, is now my priority. Knowing that football is no longer my priority and I'm not going to put everything into it, I won't be as, I won't be as disappointed if I don't make it to a high level because it was never my priority to do that. (P7).

Others reported a high level of re-emergence in sport which was experienced as both a positive and a negative occurrence. Some participants reported a sense of inclusion in a positive way, some experienced levels of frustration at not being able to play, while others described experiences of both.

So even though I wasn't able to play, I was still really heavily involved in the games, like primary care and still being able to be part of the team. (P5).

I knew I wasn't playing this season so they asked me to be assistant coach for Roskill and I was like yeah that, like this is initially, that'd be good, coz I knew that I'd miss out but actually it's been very frustrating sitting on the side line and watching um people play hockey. (P2).

I think sometimes it's a positive thing, like sometimes it's a negative thing just because like, like you kinda want um, your space from it like it, it can be a reminder of how crap it can feel and like how crap it is but like in, in, in a positive, like it just kind of depends on your mindset it's like oh if like, it's also a positive thing because like your always reminded like okay let's get back, let's be motivated, let's you know that kind of feeling. (P1).

In addition to this, it was evident that some participants experienced this re-emergence within their occupational life, as their job was related to sporting associations. This was influential, as it was hard to get away from the fact they were recovering from ACLR.

I think working and football and futsal and so that was the same it was like sometimes it was amazing coz I was still around what I love and then sometimes it was like a constant reminder of what yeah, you can't actually play yeah. (P8).

All my like patients know I took 6 weeks off for my surgery, so they're all asking about it. I know they're doing it nicely, being like 'how's your knee?' but then they do, and then they're like 'so you going to go back and play hockey?' and I'm like 'I don't know' ... so it's just like hard to um, yeah, give like an answer coz I don't know what I want to do yet. So yeah. (P2)

Chapter Five: Discussion

The purpose of the current study was to explore how high-performance athletes experienced recovery from ACLR and identify the factors influencing this experience. It was evident from the findings that recovery is multifactorial and that it is very much an individual journey. Although there were common themes between participants, in most cases these themes were experienced in considerably different ways. What some viewed as a positive influencer, others viewed more negatively, while other factors appeared to fluctuate and were interpreted in both a positive and negative way. This makes for a very complex and multifaceted recovery process. A key finding of this study was that the recovery experience goes well beyond the physical element in rehabilitation. In particular, the psychological impact was found to be highly influential, both for positive and negative perceptions, especially in relation to emotional experience and cognitive aspects to recovery. Further to this, knowledge attainment, trust in professionals, the therapeutic relationship, lifestyle considerations, social influence and sport participation during rehabilitation all had varying effects. Rehabilitation professionals need to take an individualised approach to recovery, given the variations between individual experience.

5.1 “As a mental battle, it’s a bit of a rollercoaster”

The first theme highlights the importance that the psychological impact has on how individuals perceive ACLR recovery, particularly in relation to the emotional experience and coping. Due to the longevity of the injury and post-surgical rehabilitation, findings appeared to show a great deal of uncertainty experienced around what was to be expected throughout recovery, along with confusion about what was ‘normal’. It was evident that, unless an individual had experienced an ACLR previously, the unfamiliarity of the process seemed rather overwhelming for most and something that individuals needed to navigate through. Even if participants reported some knowledge of the injury, it was evident that experiencing the recovery first-hand was significantly different to simply knowing about ACLR or having watched someone go through it. Interestingly, those who reported a re-injury experience indicated that they were better equipped to deal with the recovery process of the secondary injury, compared to their first ACLR. This raises an essential question of how professionals may be able to facilitate individuals that are experiencing ACLR for the first time, with the aim to establish meaningful understanding around the injury and what might be expected throughout rehabilitation.

It has emerged over the last decade that psychological intervention is evidently important to recovery from ACLR (Ardern, Österberg, et al., 2016; Ardern, Taylor, Feller, Whitehead, et al., 2013; Flanigan et al., 2015). Some research even indicates it may be significantly more influential than physical rehabilitation (Flanigan et al., 2015). Although the physical element is essential for desired outcomes, this research supports other studies that being able to navigate the psychological component of ACLR is of importance to recovery, including its impact on knee functionality (Ardern, Österberg, et al., 2014; Ardern, Taylor, Feller, Whitehead, et al., 2013; Everhart et al., 2015; McPherson et al., 2019a; Rodriguez et al., 2019). Further to this, research suggests that those who report greater psychological experience throughout recovery, tend to associate this with better quality of life and knee-related satisfaction (Ardern, Österberg, et al., 2016). When reviewing research on psychological readiness, there appears to be a good association with positive factors relating to ACLR recovery. Studies demonstrate the impact psychological readiness has on RTS at pre-injury level, increased levels of knee satisfaction, greater knee quality of life, and improved confidence in knee function (Ardern, Österberg, et al., 2014; Webster et al., 2018). In contrast to this, psychological readiness has also been associated with negative aspects to recovery, especially relating to secondary ACL injuries and not being able to successfully RTS at desired levels (McPherson et al., 2019a; Webster et al., 2018). Considering these findings, research suggests that psychological factors assessed at the time of injury and throughout rehabilitation would be beneficial, as this can help identify those athletes who may require increased support in order to manage their psychological response more effectively (Chmielewski & George, 2019; McPherson et al., 2019b; Raoul et al., 2019).

When looking at this in relation to the current study, it was apparent that some individuals experienced psychological testing in regard to RTS readiness, however it was less apparent whether there was psychological testing completed prior to surgery. In addition to this, it was evident that limited support was offered around psychological impact throughout recovery, which may have benefited those who appeared to experience emotional or mental struggle. This contradicts findings by Ardern, Kvist, et al. (2016) who suggest that high-performance athletes have greater support for psychological aspects to recovery, which does not emerge within the current findings. Disparity between the two studies may be the result of funding or resource access owing to geographical difference, however further research would be required to determine why certain variation is apparent within high-performance athlete research.

The following will describe the psychological factors that were found to have an influence on the recovery experience in relation to the present study's first theme.

5.1.1 Emotional impact of recovery

As with previous research, findings from the current study suggest that ACLR can elicit many different emotional responses throughout recovery that impact on the psychological experience of injury. Morrey et al. (1999) advocates for a 'U' shaped emotional experience for athletes in relation to ACL injury, with heightened emotions experienced at the beginning of recovery and then again at the time of RTS. In contrast to his, Langford et al. (2009) concluded the emotional response to ACLR is progressively linear, with emotional response to injury improving over time.

When looking at the current study, results suggest a differing approach to previous research by demonstrating that the emotional experience throughout recovery is unique to the individual rather than being indicative of a specific pattern. Many different emotions were apparent for each athlete and did not always follow a 'U' shape or a linear progression. Rather, it was evident that emotional response appeared to be multifaceted, with many diverse reports on how and when individuals might have experienced different emotions. This demonstrates that emotional response to ACLR is subjective to individual experience, illustrating the importance of not generalising how and what an athlete might be feeling in relation to ACLR recovery.

An aspect to consider when assessing emotional response to ACLR may also be the occurrence of athletes not fully disclosing the emotional impact of the experience. This may be apparent due to various reasons, such as individual perceived judgement of being viewed as weak or vulnerable, past recall of the experience may be skewed based on the athletes current situation or the emotional response could be aligned to individual personality traits with some athletes being naturally more emotional than others. Based on this, it is important when viewing studies on emotional response to be mindful of other influential factors that could be apparent, as the results may not always tell the entire story.

Nevertheless, it is evident that ACLR can elicit a variety of emotions that are unique to an individual. As a result, research suggests that psychological monitoring should occur throughout the different stages of rehabilitation, as this will highlight if any emotional changes occur (Raoul et al., 2019). This is important, as it may help professionals identify those who may need increased support in this area, especially given the emotional diversity that was found in the current study.

5.1.2 Acceptance of the injury

Acceptance of the injury was influential to most participants in the current study and importance was placed on having a future-orientated perspective rather than 'dwelling' on the injury. This was important as it allowed athletes to focus on behaviours that would benefit their recovery and resulted in better recounts of experience overall. This aligns with previous research where acceptance of an injury has been found to be beneficial to recovery outcomes and how ACLR is perceived (Filbay et al., 2016). With adequate acceptance, functional behaviours are more easily accessible as athletes can detach themselves from negative emotions and focus on the present moment (Mahoney & Hanrahan, 2011). In contrast to this, those athletes who try to avoid negative emotions tend to experience more emotionally driven behaviours, often resulting in avoidance behaviours that can transfer into poor rehabilitation adherence (Mahoney & Hanrahan, 2011).

Although acceptance of the injury is influential, it is important to note that acceptance may be required to go well beyond the injury itself, especially in relation to athletes. ACL injury has been found to have long-lasting effects on knee function, sporting performance and RTS outcomes for some individuals (Arden et al., 2012; Harris et al., 2013; McCullough et al., 2012; te Wierike et al., 2013). This may mean that athletes may experience a career ending realisation, which may result in acceptance being harder to achieve (Mendonza et al., 2007). Furthermore, given that high-performance athletes have increased investment in sport participation, acceptance of the injury may be overshadowed by the emotional response they are experiencing (Arden, Taylor, et al., 2014; Czuppon et al., 2014). This was evident in the current study for one individual where secondary ACL injury brought about uncertainty around future involvement in sport. This influenced her emotional experience throughout rehabilitation given that potential sporting goals were diminished as a result of the injury.

From a clinical perspective, research indicates that acceptance and commitment therapy (ACT) may benefit those going through athletic injury (Mahoney & Hanrahan, 2011). This approach targets at negative emotional impact by encouraging experience of emotions rather than avoidance (Mahoney & Hanrahan, 2011). Also targeted is the athlete's awareness of being in the present moment, which is said to elicit and maintain more functional behaviours such as rehabilitation adherence (Mahoney & Hanrahan, 2011). Mahoney and Hanrahan (2011) completed a case study review, which investigated the potential usefulness of a brief ACT intervention on four athletes recovering from ACLR. The aim was to see whether ACT could help to alleviate emotional distress from injury and increase behaviours related to rehabilitation

adherence. Results indicated that ACT may be beneficial for athletes during the recovery process of ACLR, specifically relating to education around acceptance and related skills. Although it appears further investigation is warranted, there may be benefit in incorporating such an approach in the early stages of recovery, especially for those who appear to be dealing with emotional challenges and a lack of acceptance to injury circumstance.

5.1.3 RTS timeframes experienced

Similar to existing research, RTS time frames differed between participants in the current study. Some individuals were able to RTS within eight months of surgery, while others reported a time frame of up to two years. This aligns with previous studies that illustrate RTS timeframes are usually specified between six and 12 months, though some individuals may require longer than this (Ardern et al., 2012; Kaplan & Witvrouw, 2019; Müller et al., 2015). Research highlights that expectations around RTS should therefore be assessed based on the individual, with one participant in the current study suggesting that nine months is an unfair timeframe to put on ACLR recovery as it sets people up for disappointment. Further to this, results of the current study suggest that RTS timeframes had differing effects on individual experience. Some participants reported an eagerness to get back to sport but were frustrated by not being able to do so until being medically cleared, while others indicated that RTS was delayed due to needing extra time to increase physical and/or psychological readiness at their own discretion. Regardless of when individuals felt ready to RTS, it was evident that all participants struggled with the longevity of the injury and what restrictions were experienced. Information and communication from professionals appeared to help an individual process and cope with this, which is similar to findings from previous research (McVeigh & Pack, 2015). However, as highlighted by this study, professionals need to be attentive when facilitating ACLR recovery and provide extra support around RTS for those who need it.

Further to RTS timeframe, return to performance was also an apparent influencing factor within the current study. Results indicate that RTS does not always mean athletes are satisfied with this outcome as pre-injury level of performance may not coincide at the same time. Some athletes identified performance took up to three years to achieve, demonstrating that recovery from ACLR is not necessarily complete once RTS is reached. This may impact athletes in a number of ways, such as experiencing a variety of negative emotions or not being selected into desired teams due to others performing at a higher level. Previous research has also found similar results (Harris et al., 2013; McCullough et al., 2012). Sporting organisations should therefore be aware

of this, as support could be offered to the athlete to manage performance levels and pre-judgement on the athlete's ability by coaching personal could be altered.

5.1.4 Concern for re-injury

Concern for re-injury was evident for many participants but not all. Interestingly, this experience appeared to be related to the individual person rather than previous experience, as some participants who had experienced a secondary ACLR did not always report concern for re-injury even though this had occurred in the past. In addition, those who did report concern during their second ACLR experience tended to also report this in their first and of those who only experienced a primary ACLR, there were likewise mixed reports of concern apparent. This illustrates that concern for re-injury may be more related to the individual rather than circumstance. These findings reflect results such as seen in kinesiophobia literature (Ardern et al., 2012; Chmielewski & George, 2019). For those who do experience fear of re-injury, the differing reports of experience may be explained using three fear responses outlined by Filbay et al. (2016). These include fear-accommodation, where individuals modify functional movement to minimise risk of re-injury; fear-suppression, where individuals tend to ignore fear and participate in sport regardless; and fear-avoidance, where athletes may be influenced to cease participation to avoid re-injury. Although the current study did not investigate if the level of concern regarding re-injury did in fact influence a certain fear-response, it was likely that concern for re-injury may be linked to either modification or suppression for most of the athletes interviewed, with one experience indicating that fear-avoidance may be apparent.

In order for individuals to limit the impact that concern for re-injury has on recovery experience, it is suggested that a willingness to move past this is paramount if athletes wish to RTS at pre-injury level (Everhart et al., 2015). Further to this, those who do experience re-injury anxiety may benefit from psychological input in order to enhance their overall recovery. Imagery, modelling behaviour and in vivo exposure therapy are potential interventions that may help athletes to lessen the impact that fear has on ACLR recovery (Bien & Dubuque, 2015; Maddison, Prapavessis, & Clatworthy, 2006; Rodriguez et al., 2019; Wilczyńska, Łysak, & Podczarska-Głowacka, 2015). If concern for re-injury is not addressed, individuals may be vulnerable to increased risk of poor rehabilitation adherence, lack of confidence in the knee, decreased quality of life and reduced likelihood of being able to RTS at pre-injury level (Ardern, Österberg, et al., 2014; Fältström et al., 2016; Filbay et al., 2016; Pizzari et al., 2002; te Wierike et al., 2013).

An area of concern discussed in previous literature is the idea that not all professionals are equipped to identify non-verbal communication of fear during the recovery process (McVeigh & Pack, 2015). Given the impact that fear of re-injury can have, professionals should be trained to identify cues throughout recovery as not all participants will vocalise or be aware of the true impact that fear of re-injury can have on rehabilitation or RTS. As a result, it is important that professionals can identify and deal with fear in the appropriate manner, in order to enhance the overall experience of ACLR recovery.

5.1.5 Self-efficacy and fear of re-injury

In the current study, those who reported less concern for re-injury also reported higher levels of confidence in relation to knee function. Confidence has been linked with the construct of self-efficacy in previous research, suggesting that those who experience high levels of self-efficacy tend to experience greater levels of confidence, resulting in favoured outcomes reported (Ardern, Österberg, et al., 2016). When looking at this in relation to the current findings, it is possible that those who experienced less concern for re-injury may have additionally experienced higher levels of self-efficacy, which may have influenced less hesitation for future injury.

A study completed by Ardern, Taylor, Feller, Whitehead, et al. (2013) identified self-efficacy as possibly the most influential psychological factor for individuals reporting knee-related satisfaction, indicating that it should be addressed throughout rehabilitation. For those reporting low self-efficacy, studies demonstrate that goal setting, imagery and modelling interventions may be beneficial to increase patient confidence around knee function (Maddison et al., 2006; Scherzer et al., 2001; te Wierike et al., 2013). Thus, for those who report concern for re-injury, self-efficacy could be linked to hesitation or fear, owing to the levels of confidence that is reported. Although confidence was evident in the current findings, self-efficacy was not a term used by participants throughout the interviews. This may be the result of the qualitative methodology, as other terms such as confidence and mindset were evidently present which illustrate components of self-efficacy. Studies completed in this area are aligned to quantitative approaches to research, allowing the term self-efficacy to be explicitly stated, whereas participants in the current study may not use this terminology to describe their experience or have an awareness to this construct.

5.1.6 The physical side to recovery is still important

Although the current study supports previous findings suggesting psychological factors are more influential than the physical side to recovery, it does not dismiss the importance that quality physical rehabilitation has on ACLR recovery experience. A

sense of achievement was found to help individuals progress throughout rehabilitation, and this was often related to physical accomplishments that were achieved. Being able to run again was a clear example of this, demonstrating an interaction between physical and psychological aspects to recovery. Although this was evident, the current findings support the idea that psychological factors can be more influential (such as hesitation or fear on being able to run) however, it is also apparent in research that poor physical function can likewise have a significant effect on psychological experience (Ardern, Österberg, et al., 2016; Burland, Kostyun, et al., 2018). Thus, illustrating the importance for physical and psychological rehabilitation to coincide and align throughout the recovery period.

5.2 “Oh ACLs, I know something about this”

The second theme relates to the idea that knowledge acquisition is a key contributor to the recovery experience for all participants. This was evident for the informal learning process of the athlete, the formal education of the professional, experience around therapeutic relationship and the familiarity of shared experience. This theme relates to theme one as knowledge was evident in how an athlete perceived and understood the longevity of the injury. Those who were left with uncertainty tended to report more disruption to their recovery experience illustrating the importance of information and clarity for recovery.

5.2.1 Informal learning Process

The informal learning process appeared to be one of the most important aspects to recovery, given the uncertainty that surrounds first time ACLR experiences. Participants reported a significant amount of the unknown during the recovery process, with emphasis on the initial stage of rehabilitation and then again in relation to what was ‘normal’ to experience (for example, pain) and what was ‘concerning’. Most athletes in this study demonstrated personal responsibility when navigating this uncertainty and took the initiative to acquire information through asking questions or conducting individual research. This facilitated greater understanding of the injury and expectations, appearing to assist athletes to feel better prepared throughout the recovery process, along with greater confidence reported. For those who did not report this, high levels of uncertainty existed throughout recovery, impacting significantly on how they perceived their injury and how they dealt with rehabilitation. Previous research supports the idea that informal learning influences positive outcomes from ACLR, although it appears that self-directed learning has not been explored in much depth with previous research focusing more on the informal learning process through

professional input (McVeigh & Pack, 2015). A critique to the current study however is the lack of information that was obtained in relation to negative aspects of self-directed learning. This would be beneficial to have an understanding of, in addition to the positive effect of learning, given the amount of information that is easily accessible via platforms such as the internet (Matava et al., 2014).

5.2.2 Professionals education and competency

The importance of professional education was also highlighted in the current study. Professionals who were perceived to have a good education, reputation and experience behind them were often viewed by participants to be highly competent, helping to increase feelings of reassurance and trust experienced throughout recovery. Further to this, athletes who were able to obtain adequate information from professionals appeared to have a better recovery experience than athletes who reported less guidance from professionals. A study completed by McVeigh and Pack (2015) shows similar importance placed on the formal education of health professionals, suggesting that the role of education should not be undervalued when facilitating ACLR recovery. Results from McVeigh and Pack (2015) additionally illustrated that professionals were aware of the role they play in educating individuals' recovery, with communication being a pivotal function in the achievement of this. Notwithstanding, Ebert et al. (2019) recently advised that being able to educate patients in relation to the value of quality rehabilitation and rightly timed RTS is one of the most challenging aspects to facilitating ACLR recovery. Relating this to the current study, education around ACLR recovery appeared to be positively influential, especially in relation to RTS guidance. Participants often experience RTS readiness before medical clearance was given but identified that it was in their best interest to wait based on the information that had been provided by their surgeon or physiotherapist. The only time this was not apparent was where a participant experienced miscommunication from their professionals, leading to feelings of frustration and confusion. Once this communication issue was addressed, the participant agreed with the decision to delay RTS. Thus, the current study illustrates that if professionals display competency in educating patients around ACLR then recovery experience will benefit from this. In addition, an explanation for why education from professionals was highly influential might be related to the level of acceptance displayed in the current study. Those who experience less acceptance to injury may not be in a position to comprehend information, especially if they are guided by unrealistic expectations. Previous studies have suggested this may be the case, with individuals returning to sport despite being told otherwise by their surgeon or physiotherapist (Nawasreh et al.,

2017; Raoul et al., 2019). Due to this, professionals should seek out clarity when educating patients to establish whether comprehension has been achieved.

Further to this, although all participants experienced pre-operative discussions with their surgeon (and some with the physiotherapist), there were variations in this experience. Most athletes perceived the level of support around pre-operative discussions as highly effective, while a few suggested they felt unprepared, especially in relation to the psychological aspect to recovery. This shows some difference to findings by Scott et al. (2018) where most participants were found to have a negative experience of pre-operative discussions. An explanation for these disparities may be the comparisons between high-performance athletes and the general public, based on the population differences, however further research would need to be completed to determine if this was the case. As research indicates that well communicated pre-operative discussions are pivotal in allowing individuals the time to process the injury and establish realistic expectations (McVeigh & Pack, 2015; Scott et al., 2018; Sonesson et al., 2017). It follows, then, that professionals facilitating recovery—in particular surgeons and physiotherapists—should have an awareness of the impact pre-operative communication can have on individual's perception and understanding of ACLR. The current study showed that clarity from this discussion was not always established, with poorly executed discussions negatively impacting on some participants' recovery experience. However, for the majority these discussions were reported as beneficial. Further research could therefore investigate important topics to include in such discussions, to highlight any disparities in experience that might be apparent.

5.2.3 Therapeutic relationship qualities

Findings from the current study illustrate the importance of the therapeutic relationship and how this impacts recovery experience. This relationship was influential to athletes as it allowed individuals the chance to ask questions and get clarity when required, along with reports of enjoying rehabilitation. In contrast to this, those who reported a less than desirable relationship often felt let down and less motivated throughout recovery, with one athlete recalling a change in up to four physiotherapists before they were able to find a therapeutic relationship that supported their recovery. This finding is similar to findings from Scott et al. (2018), that found participants perceived an 'effective professional' to be educated, dedicated, easily approachable, a good communicator, and encouraging of a positive relationship. These attributes were also evident to participants in the current study in relation to how the therapeutic relationship was established and maintained throughout recovery, often influencing ACLR

experience in a number of ways. Those who perceived the therapeutic relationship to be highly effective reported a more straightforward process compared to those who were dissatisfied with the professionals they were working with. This perception was greatly impacted by the level of education and reputation a professional appeared to have, relating this to greater competency.

The current study augments the findings by Scott et al. (2018), as it demonstrates that professional accessibility was additionally influential to how athletes experienced recovery and the therapeutic relationship. Increased contact time was imperative as it allowed athletes to feel better prepared for rehabilitation and address any additional niggles that may impact on their recovery. Further to this, athletes also reported they felt more comfortable in the therapeutic relationship—especially in relation to physiotherapists—due to more familiarity as a result of increased contact time. This was mentioned by a few participants, suggesting they felt ‘lucky’ for the amount of support they received during their recovery and implied that the general ‘joe blogs’ may not be in the same position. This finding is supported by the Ardern, Kvist, et al. (2016), who suggest high-performance athletes have increased access to greater support in comparison to others however, findings from this study were in relation to psychological aspects. For the current study, it was found that increased physical support in most high-performance athletes was apparent, with little psychological support evident. Further research may be beneficial in order to understand the difference in experience between high-performance athletes and others in the general public, along with how to ensure all patients are supported in both physical and psychological recovery.

Interestingly, although all participants in the current study were either elite or semi-elite athletes, there appeared to be some disparity in contact time and accessibility between sports or level played. One elite participant reported considerably less contact time in comparison to other participants, especially in relation to physiotherapist support. This had a negative impact on recovery experience, influencing greater levels of uncertainty or frustration around how to complete rehabilitation requirements, especially relating to motivation and awareness around correct technique for exercises. This may relate more closely to what the general public may be exposed to, although more research would be required to explore the difference in professional athlete and general public experience in relation to contact time with professionals.

Additionally, although contact time was evident to influence recovery experience, participants also reported an awareness on the time and funding restrictions that influence accessibility to professionals. This was often provided as an explanation as to why some felt like a number and rushed through the medical system, especially in

relation to appointments with their surgeon. This raises an important question into how a balance can be developed between efficiency of medical practice and allowing patients to feel supported and understood.

An interesting aspect to the current study is the idea that high-performance athletes often deal with a team physiotherapist prior to their injury, with this same professional being used throughout their rehabilitation. This was the case with most athletes in the current study, with the majority of these participants suggesting this familiarity was beneficial to their recovery. Only one example of this prior relationship was reported as being both a positive and negative experience, as it was associated with being a constant reminder on the numerous sporting opportunities the participant was missing out on. However, it was reported that working with this physiotherapist was more comfortable and was beneficial for the future. Aside from this, most athletes reported that working with a team physiotherapist was beneficial, raising the question of what the general public may experience in comparison to this. This may also provide an explanation for why results in the current study highlighted the positive influence of the therapeutic relationship, given this relationship was already established. Although this may be the case, it further suggests that the maintenance of these relationships is also important, given the frustration and emotional disruption that can coincide with long-term injury (Heijne et al., 2008; Scott et al., 2018). This appears to be a new development for existing research, suggesting further studies could help identify the factors related to existing professional relationships in comparison to new professional relationships throughout the experience of ACLR recovery.

5.2.4 Shared experience

The concept of shared experience is the last aspect to recovery found in relation to knowledge and understanding. This relates to how participants perceived their own ACLR experience based on others that had been through this injury before. This influence could either be someone a participant knew, being told of others' experience or seeing professional athletes go through ACLR rehabilitation through different media platforms. An increase in motivation and confidence appeared to be a positive result of this; however, psychological distress was also reported as a negative aspect based on unrealistic comparisons that were made. This finding demonstrates the perceptions athletes can make based on comparing their own experience with that of others and relates to an intervention approach considered to be beneficial for ACLR recovery. Maddison et al. (2006) suggest that a modelling video, which is a technique based on learning through imitation of others, could be useful for those experiencing ACL injury and surgery. This may help to increase self-efficacy in athletes, given they are exposed

to others who achieve positive results. This is similar to those participants in the current study who described shared experience as a positive influence. In addition, modelling may also help to increase understanding, given the amount of uncertainty that has been linked with this type of injury. In light of the current findings, however, it would be advised that professionals monitor the influence modelling has on individuals throughout the intervention, as at times this may negatively impact recovery due to unrealistic comparisons. This is especially relevant to those athletes who may experience delays in rehabilitation for reasons such as additional injury or functional restriction.

5.3 “It’s not going to stop me from playing, ever!”

The third theme highlights the cognitive aspects influencing ACLR recovery. These include perceptions and beliefs about the recovery process, along with providing an explanation around how the mental side of recovery has a significant effect of behavioural outcomes experienced. It was found that factors in this theme also had some impact on how the longevity of injury was dealt with, highlighting the interactions between recovery factors and the multifaceted nature of ACLR recovery experience.

5.3.1 Mindset

Results of the current study suggest that mindset has a significant influence on how an athlete perceives their situation and how this impacts recovery. For the majority, it was reported that having a positive outlook towards the situation allowed individuals to move past the disappointment of sustaining the injury and focus their attention towards behaviours that will facilitate a favoured outcome. This acceptance and future emphasis were evidently important to a number of participants, allowing them to put increased effort into the rehabilitation process. Those who experienced a more negative perception towards ACLR, tended to report this mindset as a hindrance to their recovery, given that it influenced unhelpful behaviours such as poor rehabilitation adherence.

5.3.2 Motivation

Motivational differences within recovery were identified within the current study and relate to the concept of mindset. There were various factors that influenced motivation, along with how this has an impact on participant experience. For many, the desire to RTS was evident however, there were also many other factors that drove motivation. These relate to being pain free, gaining strength and fitness, general health aspirations, having access to superior facilities, being included in a sporting environment and the

ability to gain functional capacity to complete occupational demands. Some of these were also reported as a greater motivation than RTS for most participants. This finding is interesting given that most studies focus their attention on RTS being the main motivation for athletes (Arden, Taylor, et al., 2014; Lynch et al., 2015). This indicates the current results contradict some aspects of previous research, although the small sample size may be an explanation for this. Nevertheless, findings in the current study illustrate that a person's wider context affects motivation, with many factors reported as driving factors for success. This illustrates a practical implication that professionals need to take the time to understand what motivates an individual, and how they can incorporate this into the rehabilitation plan. Additionally, it was evident in the current study that when professionals did this, participants had a greater report of positive experience compared to those who reported a lack of understanding from the professionals they worked with.

Of particular importance is those participants who described a lack of motivation throughout recovery or the experience of motivation fluctuation at differing stages of their rehabilitation. The concept of boredom or uncertainty was associated with this experience, often influencing rehabilitation avoidance or a lack of intensity in physical sessions. These findings are similar to conclusions that have been made around motivation and ACLR recovery outcomes in previous research (Burland, Toonstra, et al., 2018; Sonesson et al., 2017). Studies show that those who lack motivation frequently report less desired outcomes, which is often associated with a lack of effort in completing rehabilitation requirements (Burland, Toonstra, et al., 2018; Pizzari et al., 2002). In contrast to this, those who report higher levels of motivation, are said to experience greater RTS at pre-injury level, better muscle function and greater satisfaction with knee capability (Bauer et al., 2014; Beischer et al., 2019; Everhart et al., 2015). This was likewise found in the present study as participants who reported less fluctuation with motivation, tended to have a greater focus on the goal they were trying to achieve. This gave purpose to their recovery experience and kept them moving forward in the recovery process. Additionally, it appeared that increased levels of motivation were also linked with greater rehabilitation adherence and better overall experience of ACLR recovery. These findings support previous studies, suggesting it is a key element for professionals to include in the recovery plan (Burland, Toonstra, et al., 2018; Sonesson et al., 2017).

Although this is evident, recent literature suggests that motivation may require greater attention in clinical settings, specifically related to motivation experienced throughout rehabilitation. Sonesson et al. (2017) identified that psychological intervention should run alongside physical rehabilitation and should include motivational aspects. This is

likely to increase the possibility that an athlete can RTS at pre-injury level or reach their desired outcomes. Athletes who struggle with motivation may benefit from psychological interventions such as positive self-talk, goal setting and motivational interviewing, as research suggests these techniques are beneficial to increase motivation and therefore overall recovery (Heijne et al., 2008; Scherzer et al., 2001; te Wierike et al., 2013).

An explanation for levels of motivation experienced following an ACLR may relate to the interactions between motivation, acceptance and emotional response; all factors found to influence recovery in the current study. Given that athletes can experience a vast range of emotions toward injury circumstance and the level of investment they have to sport participation is substantial, denial or avoidance behaviours may be apparent (Arder, Taylor, et al., 2014; Czuppon et al., 2014). As a result, athletes may experience a lack of motivation toward their injury, leading to a lack of acceptance and less desired outcomes (Sonesson et al., 2017). Based on this potential interaction, it would be advised that judgment on rehabilitation adherence from professionals should be explored in more depth as underlying issues such as denial or avoidance may be influential factors on presenting motivation levels. Addressing these issues may increase motivation following ACLR, which could influence more favourable outcomes as research suggests (Burland, Toonstra, et al., 2018; Fältström et al., 2016). Further to this, concern for re-injury or contextual factors were evidently more important to some individuals in the current study than others. These factors should also be explored in more depth to determine what is motivating athlete behaviour throughout rehabilitation. This process may highlight important considerations that professionals may need to understand in order to tailor a specific rehabilitation plan that will elicit desired results.

5.4 “Rehab is just one side of it”

The last theme in the current study relates to the broader life context of individual experience. In addition to factors that relate specifically to knee function, there appeared to be a number of key influencers unrelated to this that impacted on the recovery experience. This is similar to other studies that suggest outcomes from ACLR are not always associated with knee function alone (Arder, Österberg, et al., 2014; Arder et al., 2012; Nawasreh et al., 2017). Much like ACLR outcomes, the recovery experience also appears to follow the same trend. The current findings found three main broader life factors that had an impact on recovery: occupational considerations, social context (social engagement and social support), and emergence in sport. These were also found to impact on the previous themes, such as a sense of missing out from

theme one relating to the social context of this theme, further illustrating the multifaced nature of ACLR recovery experience.

5.4.1 Occupational considerations

Findings from the current study indicated that occupational considerations had an impact on the experience of ACLR recovery. Those who experienced fulltime work recalled difficulties in having to manage this alongside rehabilitation commitments. Trying to achieve this balance was not always straightforward for participants, with some mentioning the experience of added stress to the recovery process as a result. This suggests that occupational factors can impact on recovery experience in a number of ways, which is important for practical application. Professionals should take the time to understand how rehabilitation fits in with occupational commitments, as this could have a significant influence on developing a recovery plan that will be best suited to the individual and therefore one that is tailored to achieve desired outcomes based on individual circumstance.

These findings are similar to other studies that identify occupational considerations as a key factor to ACLR outcomes (Ardern, Österberg, et al., 2014; Ardern et al., 2012; Ardern, Taylor, et al., 2014; Gignac et al., 2015). However, given the current study looked more explicitly into the recovery experience, rather than outcomes specifically, there were some apparent disparities. The main disparity relates to time restrictions placed on participants to maintain a balance between work and rehabilitation commitments, while still reporting a desire to RTS at pre-injury level. Although this was the case, it was evident that some participants experienced a great sense of importance when discussing their employment, with one participant suggesting that having a job he loved allowed him peace of mind with not being able to RTS at the competitive level he would have liked. As a result, this had a positive impact on his mentality and gave him a primary purpose, rather than being dissatisfied with a lack of RTS. In addition to this, a further disparity to previous research was the impact that sport related employment has on recovery experience. This appears to be a new concept in ACLR recovery research, with some participants suggesting that having an occupation that relates to sports can be both a positive and negative aspect to recovery. Further research into how different occupations may influence recovery from ACLR would be advised.

5.4.2 Social engagement

Social aspects to recovery were also raised within the current study. Participants reported that they experienced a sense of missing out within the social context of their

recovery, suggesting the physical restrictions often meant they were not able to participate in social events they would have otherwise attended. Research suggests that social support is a key influencer into recovery from ACLR and can help individuals cope with the recovery process (Brewer et al., 2000; Burland, Toonstra, et al., 2018; Scott et al., 2018). This being the case, those who miss out on social connectedness may experience emotional distress through recovery, which was evident in the current findings. It may therefore be beneficial for athletes to receive additional psychological input in order to develop coping strategies to overcome this aspect of ACLR experience.

5.4.3 Social Support

In addition to social engagement, the level of social support participants received was also found to be highly influential on their recovery experience. Having a main support source was identified as an important factor for a number of participants, along with having the support of family or close friends if they were not identified as the main source. Previous research has also explored the impact that social networks have on ACLR outcomes, with studies suggesting that it is important for the recovery process but not necessarily for outcomes reported (Burland, Toonstra, et al., 2018). These findings are similar to the current study, where support systems appeared to enhance the rehabilitation experience, although outcomes of ACLR were not explicitly assessed. Burland, Toonstra, et al. (2018) advocates that having a good support system is crucial for an individual to cope with their situation, along with increasing levels of confidence to get through the rehabilitation phase. Additionally, research indicates that support systems can facilitate a reduction in stress and an increase in motivation experienced (Burland, Toonstra, et al., 2018; Scott et al., 2018). This was evident in the current study, with individuals indicating that their main support person played a pivotal role in rehabilitation adherence accountability, increasing motivation and the likelihood they would complete physical exercise requirements. Along with accountability and motivation, it was also clear that family support or that of close friends was important within the initial stages of recovery, specifically in the first few weeks post operation. This finding aligns with previous research, suggesting that support from loved ones, especially early in rehabilitation, can be a facilitator in helping individuals cope during ACLR experience (Burland, Toonstra, et al., 2018).

Additionally, providing support to athletes around how to cope with external influences, such as the influence of others, would be beneficial, given this was identified in the current study as a key factor to the recovery experience. For those who struggled with

external influence, having strategies to cope with this may allow athletes to handle situations more effectively, leading to less psychological distress as a result.

Although support from immediate personnel was highlighted as an important aspect to recovery, participants also felt a lack of understanding from these individuals and at times alluded to feeling alone because of this. As a result, restrictions were reported on the level of support they could receive from their social network. This contradicts previous findings by highlighting that support from close ones can also influence negative reports of experience if individuals feel misunderstood or alone. In response to this, it may be beneficial for professionals to provide information and support to close family or friends of individuals going through ACLR, as this may help with collective understanding and enhance the social support experienced by an athlete. Working with immediate support personnel may influence the recovery experience overall along with providing much needed support for those close to the athlete, as research has shown the additional impact that ACLR can have on loved ones (Scott et al., 2018).

5.4.4 Re-emergence in sport

The last broader life context factor found to influence the recovery experience was the sub-theme of re-emergence in sport. Participants expressed differing reports in relation to this, with all experiences being important to the recovery experience. Some athletes suggested re-emergence in sport was a positive aspect given they felt included in the team, while others described frustration at not being able to participate in sport and suggested this impacted their experience in a negative way. This appears to be the first study to identify this association.

Although further research is needed to explore how athletes manage sport participation throughout injury and rehabilitation, recommendations can be made based on the psychological research that has already been completed on ACLR recovery. It would be advised that early psychological intervention may help athletes navigate the emotional aspect of injury (Arder, Taylor, Feller, Whitehead, et al., 2013), especially those who experience negative emotional responses to re-emergence in sport. This may assist those who struggle with sports involvement, not only to process emotions, but to develop coping strategies around how they manage this balance more effectively. In addition to this, it is suggested that coaches should be involved in the communication and education around ACLR recovery plans. This approach may be valuable, as it would allow open discussions around balancing sport involvement during rehabilitation and agreement on a plan that will suit everyone's requirements without jeopardising the psychological experience of the athlete or the ACLR recovery process. In contrast to those who had high levels of sport involvement, participants in the current

study who reported external focus factors, such as university study or work, suggested this balance was beneficial to the experience of ACLR recovery. This may indicate that establishing a balance between recovery and life may be important, especially in relation to getting space from rehabilitation or the sporting context.

5.5 Clinical implications

As the recovery experience of ACLR is multifactorial, it is important that professionals facilitating recovery are aware of the differing factors that are influential. In addition, the complex integration of these factors and the differing reports of experience make recovery from ACLR an individualised experience. Based on the current findings, there are various clinical implications that can be ascertained.

Firstly, professionals need to be able to provide individuals who are experiencing ACLR—especially for the first time—with the necessary education around the surgical procedure and rehabilitation. This is essential in order to create meaningful understanding and awareness around the injury itself, along with what might be expected. In addition to this, professionals should be aware of the importance of pre-operative discussions and preparatory activities with patients, in order to prepare them for the recovery process and limit the uncertainty experienced.

Secondly, psychological testing and monitoring should coincide with physical rehabilitation in order to facilitate an effective holistic approach for recovery. Based on the current findings, emotional changes, RTS support, concern for re-injury, self-efficacy and motivation are all areas specific to ACLR recovery that professionals should be attentive to. Psychological interventions such as self-talk, goal setting, motivational interviewing, modelling and ACT have all been shown to have positive effects on ACLR recovery and the psychological aspects mentioned above. Therefore, it may be beneficial for professionals to include such approaches within the rehabilitation plan to enhance overall recovery.

Thirdly, broader life context should be considered in the recovery plan in order to ensure that individuals are provided with effective plans that will coincide with individual circumstances. This may include occupational demands, social context, family support or other life factors that could influence recovery. In addition, the immediate support network of individuals recovering from ACLR may need to be involved in some aspects of the recovery plan, given the impact ACLR can have on these individuals, along with creating a collective understanding of how to assist their loved one throughout the recovery process. This may help those experiencing ACLR recovery to cope better with

their situation, along with helping them feel more understood by loved ones throughout the process.

Fourthly, individuals recovering from ACLR may require additional support in relation to balancing sport participation throughout rehabilitation, along with coaching or management personnel being included in these discussions. This will allow the establishment of plans that accommodate the needs of all those involved, and which target psychological aspects to recovery for the athlete experiencing ACLR.

Finally, professionals should actively include athletes in the recovery process by considering the use of patient-centred assessments to gather important information that may influence the rehabilitation plan and involving athletes in the decision-making process to allow for coherent understanding and complete buy-in.

5.6 Strengths of the study

There were a number of strengths that enhanced the credibility and meaningfulness of the present study's findings. Firstly, qualitative research allows phenomena to be explored in depth, with a particular emphasis on studies relating to human experience. Due to this, the experience of ACLR recovery studied in this way provides a foundation to acquire meaningful information that might not necessarily be obtained through a quantitative approach.

Secondly, using interpretive description allowed the research project to be adapted throughout the study, particularly through data collection and being guided by what was of importance to participants. This was also apparent within the interviews, as semi-structured interviews give the ability to guide questioning based on participant answers. As a result, more in-depth data was able to be obtained, giving strength to the final analysis.

Thirdly, qualitative research is a necessary scientific approach to knowledge acquisition, as it provides the platform to explore subtleties and complexities that quantitative research may not be able to do. For this reason, it was apparent in the current study that many ideas and questions raised around ACLR recovery experience not only augmented previous quantitative research but also provided recommendations for future research. This resulted from a detailed interview and qualitative analysis that further strengthened the current findings.

Lastly, the population characteristics provide strength to the current study by using a range of ages, various sporting types and the focus on elite and semi-elite athletes.

This allows findings to be applied to a target audience of high-performance sport, while taking into consideration a generous age range and multiple sporting disciplines.

5.7 Limitations of the study

There are a few limitations of the current study that should be kept in mind. Firstly, the inexperience of the primary researcher in relation to qualitative research was a limitation as the quality of the data elicited and rigor of analysis relies on the skills of the researcher in qualitative research. Although inexperience of the primary researcher was apparent, this was compensated by the close supervision of the research project by the supervisors.

Secondly, due to the research project being a master's thesis, a clear limitation to the current study was time and funding restrictions. This impacted on the recruitment process undertaken, along with the time and commitment needed for study analysis. The research would have benefitted from the inclusion of more diverse perspectives on the recovery experience to further enhance the analysis.

Thirdly, the balance between male and female participants in the current study is a further limitation based on the ratio of 2:6, respectively. Having more male participants may have provided more clarity around any gender differences that might be apparent within this population. However, given that research suggests females are more vulnerable to experiencing an ACL injury, as evidenced by statistics, the split between males and females was arguably justified through the selection process.

Lastly, as with any qualitative research project, a main limitation to the current study is the restrictions placed on feasibility to make wider generalisations in comparison to quantitative research. This is apparent due to the uncertainty around findings being statistically significant or simply as a result of chance.

5.8 Future research

Based on the current findings, there are some clear recommendations for future research. These are discussed below.

1. It was apparent in the current study that secondary ACL injury is a common occurrence that impacts on recovery experience. Due to the purpose of the current study, the re-experience of ACLR was not explored in depth and should be explored further in future research. For those who do experience ACLR multiple times, it would be beneficial to explore how this impacts recovery

experience and if there are any factors specific to this occurrence of particular importance.

2. Future research is required on the relevance of ACT for ACLR recovery experience and if this psychological intervention is beneficial for this population. It was clear in the current study that acceptance was important to participants, along with having a future-orientated mindset. In light of this, it appears that ACT may be a useful treatment approach; however, future research could add to the understanding and applicability of this approach in relation to ACLR.
3. The current study indicated that contact time with professionals was important to participants, with differences in this accessibility apparent between athletes. It follows, therefore, that future research into the differences of contact time experienced between high-performance athletes and the general public would be of significance, in order to determine what impact this has on ACLR recovery experience.
4. The emergence of sport participation throughout rehabilitation in the current study appeared to impact on athlete experience of ACLR. It would be beneficial to investigate this topic further with the aim of providing recommendations for clinical practice and an increased awareness for sporting organisations in order to help assist their athletes who are experiencing ACLR rehabilitation.
5. As with any qualitative research, the results of the current study are difficult to generalise to a wider population. Therefore, quantitative research ought to be undertaken to investigate the current findings further and to determine statistical (and clinical) significance of any potential effects.

5.9 Conclusion

The current study highlights the longevity of ACLR recovery and how much commitment is required to navigate through rehabilitation. Numerous factors influence this experience, with no one journey being quite like the next. It was evident that psychological aspects to recovery are influential to high-performance athletes, especially in relation to the emotional response that can impact on how one perceives their experience. Factors such as understanding ACLR, knowledge, professional influence, mindset, motivation and having a goal-orientated focus appeared to influence how one coped with the longevity of recovery. The experience of these factors was greatly dependent on the individual, which emphasises the importance of recovery plans being aligned to this. In addition, broader life aspects were likewise found to influence recovery, especially in relation to occupational demands, social context and re-emergence in sport. Given the number of factors that influence recovery experience, it is not surprising how complex and individualised ACLR rehabilitation can

be. As a result, it is imperative that psychological components to recovery should coincide with physical rehabilitation, as this will enhance the overall recovery experience of ACLR in high-performance athletes.

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Appendices

Appendix A: Ethics Letter



Auckland University of Technology Ethics Committee (AUTC)

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AUT

TE WĀNANGA ARONUI
O TĀMAKI MAKAU RAU

7 June 2019

Alice Theadom
Faculty of Health and Environmental Sciences

Dear Alice

Re Ethics Application: **19/118 Factors influencing recovery from Anterior Cruciate Ligament (ACL) reconstruction within a New Zealand Context**

Thank you for providing evidence as requested, which satisfies the points raised by the Auckland University of Technology Ethics Committee (AUTC).

Your ethics application has been approved for three years until 6 June 2022.

Standard Conditions of Approval

1. A progress report is due annually on the anniversary of the approval date, using form EA2, which is available online through <http://www.aut.ac.nz/research/researchethics>.
2. A final report is due at the expiration of the approval period, or, upon completion of project, using form EA3, which is available online through <http://www.aut.ac.nz/research/researchethics>.
3. Any amendments to the project must be approved by AUTC prior to being implemented. Amendments can be requested using the EA2 form: <http://www.aut.ac.nz/research/researchethics>.
4. Any serious or unexpected adverse events must be reported to AUTC Secretariat as a matter of priority.
5. Any unforeseen events that might affect continued ethical acceptability of the project should also be reported to the AUTC Secretariat as a matter of priority.

Please quote the application number and title on all future correspondence related to this project.

AUTC grants ethical approval only. If you require management approval for access for your research from another institution or organisation, then you are responsible for obtaining it. You are reminded that it is your responsibility to ensure that the spelling and grammar of documents being provided to participants or external organisations is of a high standard.

For any enquiries, please contact ethics@aut.ac.nz

Yours sincerely,

Kate O'Connor
Executive Manager
Auckland University of Technology Ethics Committee

Cc: kathenny05@gmail.com; Daniel Devcich

Appendix B: Research advertisement



Research Study focusing on Anterior Cruciate Ligament (ACL) Recovery in New Zealand

- Have you ruptured an ACL ligament and had reconstructive surgery within the last 5 years?
- Are you over 16 years of age?
- Do you live in Northland, Auckland or Waikato?

If so, we would like to invite you to be part of a research study looking at the rehabilitation experience following reconstructive surgery.

With little information currently known on ACL recovery in New Zealand, the aim of the study is to identify what factors influence the outcome of rehabilitation. The interview will take up to 90 minutes to complete and we will come to you.

Inclusion Criteria

- If you are 16 years of age or older
- If you have had an ACL reconstruction within the last 5 years
- If you have completed the first 9 months of rehabilitation
- If you live in Northland, Auckland or Waikato Region
- If you are a National Level (semi-elite) or International Level (Elite) Athlete.

Exclusion Criteria

- If you are under the age of 16
- If you are currently in the first 9 months of rehabilitation
- If your injury was more than 5 years ago
- If you do not speak English fluently
- If you are familiar with the primary researcher

As a thank you for your time, everyone who participates will receive a \$30.00 gift voucher at the completion of the interview from a store of choice from the following.



If you are interested, please contact Kathryn Henry before the 7th of August 2019 via email or phone as listed below.

Email: kathenry05@gmail.com

Phone: 0211623311 (text or call)

Approved by the Auckland University of Technology Ethics Committee on 07 June 2019 AUTEK Reference number 19/118

Appendix C: Participant information sheet



Participant Information Sheet

Date Information Sheet Produced: 04/04/2019

Project Title: Factors influencing recovery from Anterior Cruciate Ligament (ACL) reconstruction within a New Zealand context.

An Invitation

My name is Kathryn Henry and I am a master's student at Auckland University of Technology (AUT). As part of my master's qualification, I am conducting a research project on the experience of rehabilitation following an ACL reconstruction (ACL-R) in New Zealand.

I am working with Associate Professor Alice Theadom and Dr Daniel Devcich and we would like to invite you to participate in this research study. Your participation is voluntary. You are free to discontinue your participation at any time without any disadvantage.

What is the purpose of this research?

With little information currently known on ACL-R rehabilitation within New Zealand, the aim of the study is to identify what helps or hinders people's recovery. It will also contribute to the completion of my Master's in Health Science, Rehabilitation Psychology.

How was I identified and why am I being invited to participate in this research?

The study is aimed at semi-elite or elite athletes in the Northland, Auckland and Waikato regions over the age of 16. Information regarding this study has been advertised to regional and national level sporting organisations in the named regions. You are receiving this invitation as a member of one of these sporting organisations.

We are looking to talk to people who have experienced an ACL-R and are between 9 months and 5 years post-surgery. If this applies to you, we would like to hear from you.

Elite Athlete: this refers to those athletes who compete at the International level for New Zealand in the open age group competitions.

Semi-elite Athlete: this refers to those athletes who compete at the National level within New Zealand in the open age group competitions.

How do I agree to participate in this research?

At the beginning of the interview you will be asked whether you have read this information sheet and give consent to take part in the study. If your answer is yes, you will be provided with a consent form to fill in before any further questions are asked.

Your participation in this research is voluntary (it is your choice) and whether or not you choose to participate will neither advantage nor disadvantage you. You are able to withdraw from the study at any time. If you choose to withdraw from the study, then you will be offered the choice between having any data that is identifiable as belonging to you removed or allowing it to continue to be used. However, once the findings have been produced, removal of your data may not be possible.

What will happen in this research?

Participation in this project involves talking to me about your experience of rehabilitation following your ACL-R, along with information around your injury and surgical process prior to your reconstruction. All questions are voluntary. The interview will take approximately 30mins to 90mins to complete. The interview will be audio-recorded, and the conversation is then written up so that we can look at what you were saying. To save you time and resources I can travel to a location convenient for you for the interview. As a thank you for your time, at the end of the interview you will be offered a \$30.00 gift card.

What are the discomforts and risks?

The interview process will be completely confidential and taken at a pace that you are comfortable with. Due to the nature of ACL reconstruction rehabilitation you may experience some discomfort or upset in sharing your story.

How will these discomforts and risks be alleviated?

We can stop the interview at any time, and you are welcome to take a break whenever you need to. You do not need to answer every question if you do not wish to do so.

What are the benefits?

The study hopes to provide information to health and research professionals that will allow ACL-R rehabilitation to enhance positive outcomes for individuals within a New Zealand context. It will look to identify possible intervention strategies that could assist rehabilitation and the experience for future ACL-R individuals. Some people find talking about their experiences helpful.

From a personal perspective, the study will also allow myself to gain the qualification needed to help rehabilitation individuals in a clinical setting in the future.

What compensation is available for injury or negligence?

In the unlikely event of a physical injury as a result of your participation in this study, rehabilitation and compensation for injury by accident may be available from the Accident Compensation Corporation, providing the incident details satisfy the requirements of the law and the Corporation's regulations.

How will my privacy be protected?

You will not be able to be identified in any report arising from this study. You will be given a study reference number and all personal details that could identify you will be removed so the information that you share with us will remain confidential.

What are the costs of participating in this research?

The interview will take some of your time. I will travel at no expense to you to conduct the interview.

What opportunity do I have to consider this invitation?

You will be given 2 weeks to consider this invitation.

Will I receive feedback on the results of this research?

You will be given an A4 summary sheet outlining the findings of the study at the completion of the thesis. This will be sent via email or post.

What do I do if I have concerns about this research?

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor, Alice Theadom, alice.theadom@aut.ac.nz, 09 921 9999 Ext 7805.

Concerns regarding the conduct of the research should be notified to the Executive Secretary of AUTC, Kate O'Connor, ethics@aut.ac.nz, 921 9999 ext 6038.

Whom do I contact for further information about this research?

Please keep this Information Sheet and a copy of the Consent Form for your future reference. You are also able to contact the research team as follows:

Researcher Contact Details:

Kathryn Henry – Email Address: katheryn05@gmail.com

Project Supervisor Contact Details:

Alice Theadom

Email Address: alice.theadom@aut.ac.nz

Phone Number: 09 921 9999 Ext 7805

Approved by the Auckland University of Technology Ethics Committee on 07 June 2019 AUTC Reference number 19/118

Appendix D: Participant consent form



Consent Form

Project title: Factors influencing recovery from ACL reconstruction in a New Zealand context

Project Supervisor: Alice Theadom

Researcher: Kathryn Henry

- ☐ I have read and understood the information provided about this research project in the Information Sheet dated 04/04/2019.
- ☐ I have had an opportunity to ask questions and to have them answered.
- ☐ I understand that notes will be taken during the interviews and that they will also be audio-taped and transcribed.
- ☐ I understand that taking part in this study is voluntary (my choice) and that I may withdraw from the study at any time without being disadvantaged in any way.
- ☐ I understand that if I withdraw from the study then I will be offered the choice between having any data that is identifiable as belonging to me removed or allowing it to continue to be used. However, once the findings have been produced, removal of my data may not be possible.
- ☐ I agree to take part in this research.
- ☐ I wish to receive a summary of the research findings (please tick one): Yes ☐ No ☐

Participants Signature :

Participants Name :

Participants Contact Details (if appropriate) :

.....

Date :

Approved by the Auckland University of Technology Ethics Committee on 07 June 2019 AUTEK Reference number 19/118

Note: The Participant should retain a copy of this form.

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Appendix E: Interview schedule

Semi Structured Interview Questions

Focus Area	Question
Injury	<i>Could you tell me how you ruptured your ACL?</i>
Pre-surgery	<i>How did you find the time between injury and surgery?</i>
Surgery	<i>How did you find the surgical process?</i>
Rehabilitation	<i>How did you find the rehabilitation experience?</i>
Influencing Factors	<i>What things do you feel helped you most through the recovery process?</i>
	<i>Was there anything that you didn't find helpful or that hindered your recovery?</i>
Health System	<i>How was your experience of the New Zealand Health System?</i>
Present Time	<i>How are you doing now?</i>
	<i>Is there anything that you would like to add about your experience of recovery from an ACL injury?</i>