Australian Football League (AFL) Players' Experiences of, and Sense-Making around Injury to their Hamstring

This thesis is submitted in partial fulfilment of the Honours degree of Bachelor of Psychology

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October 2018

Word Count: 8,459

TABLE OF CONTENTS

Abstract

Hamstring injuries (HSI) are the cause of the highest number of games missed through injury in the AFL each year (16.6 matches per club). Recurrence rates are also high, at about 14%, with both of these figures remaining stable over the last ten years, causing significant economic and performance-based challenges. To date, most research has focused on the physical, rather than psychological, factors related to HSI. In sports injury research, the topic of ACL injury has received most research attention from a psychological perspective. Athletes' fear of re-injury has been found to be a significant predictor of return-to-sport (RTS) outcomes following ACL injury, and 'psychological readiness' has been found to be the best predictor of RTS outcomes one-year following ACL surgery. The current exploratory qualitative study aimed to examine the nature of athletes' experiences of, and sense-making around, injury to their hamstring, with a focus on three phases: injury response, rehabilitation and return to sport. Semi-structured interviews were conducted with 15 athletes from AFL clubs in two states. Thematic analysis was used to analyse the data, with two main themes identified: (1) When to stop, when to go - Players responses to hamstring injury and (2) Trust - The club has my back. The first theme describes players' interpretations of pain and fear throughout the injury experience. The second theme discusses the central role that the medical team has in player experiences, both around injury understanding, but also throughout the rehabilitation and return-to-sport phase. Recommendations for future research are discussed.

Declaration

I certify that this work contains no material which has been accepted for the award of any other degree or diploma in my name, in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

In addition, I certify that no part of this work will, in the future, be used in a submission in my name, for any other degree or diploma in any university or other tertiary institution without the prior approval of the University of Adelaide and where applicable, any partner institution responsible for the joint-award of this degree.

I also give permission for the digital version of my thesis to be made available on the web, via the University's digital research repository, the Library Search and also through web search engines, unless permission has been granted by the University to restrict access for a period of time.

I acknowledge the support I have received for my research through the provision of an Australian Government Research Training Program Scholarship.

Simon Pearson
October, 2018

Acknowledgements

I would like to thank my supervisor, Amanda LeCouteur. I would also like to thank my external supervisor, Lorimer Moseley for his support and guidance. I would also like to thank my partner Emma Loechel for her amazing support throughout the writing of this thesis, without her it wouldn't have been possible. Lastly, I'd like to thank my mum for her endless support for many years.

CHAPTER 1:

Introduction

1.1 Overview

This project explores the nature of AFL players' experiences of, and sense-making around, injury to their hamstring, in addition to the rehabilitation and return-to-sport (RTS) phases of this sporting injury.

In this chapter, research relating to hamstring injury management will be outlined. The literature on the influence of psychological factors in sporting injury and upon RTS will also be outlined, both from a qualitative and a quantitative perspective. Chapter 2 details the theoretical framework and methodological approach of the study, describing data collection and analysis. Chapter 3 reports the analysis, illustrated with extracts from the data set. In the concluding chapter, findings from the study are summarised and potential future implications discussed.

1.2 Research Justification

Previous research from both a quantitative and qualitative perspective on psychological factors in sporting injury and RTS outcomes has reported difficulty in generalising findings to specific populations, due to samples often consisting of recreational and elite athletes across multiple sports (Ruddock- Hudson et al., 2012). It has been recommended that future research focus clearly on defined athletic populations to further investigate the psychological factors associated with RTS (Ardern et al., 2012). A qualitative approach has been described as the reliable way of exploring psychological responses to injury, to enable comprehensive accounts of an athletes' injury experience (Ruddock-Hudson, O'Halloran, & Murphy, 2012).

1.3 The Nature of Hamstring Injury

Hamstring injury is defined as a traumatic disruption or overuse injury to the muscle in the back of the thigh region, leading to a player being unable to participate fully in training or competition (Ekstrand et al., 2011). Hamstring injury is commonly reported to result from high-speed running: the biomechanical forces exerted through the hamstring muscles incrementally increase as running speed increases (Schache, Dorn, Blanch, Brown, & Pandy, 2012). However, injury has also been reported to occur during other activities that place load through the hamstring muscles, including twisting, accelerating, kicking and jumping (Ekstrand et al., 2011; Schache et al., 2012).

1.4 Epidemiology

Hamstring injury (HSI) continues to be the most prevalent injury and cause of the most matches missed per year across all 18 clubs in the Australian Football League (AFL) (16.6 matches missed per club) (Australian Football League, 2017). Although there has been a lot of research directed to improving understanding of this injury, its prevalence has remained relatively stable over the last ten years (Australian Football League, 2017). Re-injury of the hamstring in individual players is also an ongoing problem, with recurrence rates of 15% remaining relatively stable over this same ten year period also (Australian Football League, 2017).

1.5 Current Trends in Hamstring Injury Management and Research

Understanding the nature of hamstring injuries and how to best manage them has been widely acknowledged as a complex issue (Erickson & Sherry, 2017; Gustaaf Reurink, Whiteley, & Tol, 2015). In particular, finding a balance between maximising RTS and minimising re-injury risk provides significant challenges to sporting clubs (Gustaaf Reurink et al., 2015). Research has focused on understanding these objectives from a physical perspective, exploring factors

including: the use of MRI in predicting prognosis, RTS and re-injury risk (Gustaaf Reurink et al., 2015); different rehabilitation protocols (Erickson & Sherry, 2017); injury prevention strategies (Timmins et al., 2015); risk factors associated with re-injury (Gustaaf Reurink et al., 2015; Visser, Reijman, Heijboer, & Bos, 2012), and developing reliable RTS criteria (van der Horst, Backx, Goedhart, & Huisstede, 2017). Despite this attention to the physical aspects of HSI and management, there remains considerable ambiguity on the clinical application of findings, highlighting the limitations of current understanding in this complex and multi-faceted injury (Gustaaf Reurink et al., 2015). In short, although the physical aspects of hamstring injury and management have dominated research (Gustaaf Reurink et al., 2015), psychological factors have received little attention in this specific injury.

Research on risk factors for HSI, with its focus on a biomedical approach, has produced limited results. Investigations into strength deficiencies in the hamstring muscles, a longstanding accepted risk factor, is now disputed to identify athletes at risk of injury (Dyk et al., 2016; Opar et al., 2015; Shield & Bourne, 2018). Recent research has explored local muscle factors that may predispose athletes to increased risk of HSI (Timmins et al., 2015). In summary, the only risk factor for HSI where there is a consensus in the literature is a *past history of hamstring injury* (Erickson & Sherry, 2017). A past history of hamstring injury could be considered an extremely non-specific risk factor, and therefore it could be hypothesised that other non-muscle factors, such as psychological factors, are contributing. The relationship between psychological factors and HSI has yet to be examined in any detail.

1.6 The use of Magnetic Resonance Imaging

Magnetic Resonance Imaging (MRI), a medical tool used to gather detailed visual images of soft tissues in the human body, has been widely used for many years in HSI research and

clinical practice. It has gained a reputation as being able to answer the important questions for players and medical staff in predicting both time to RTS and re-injury risk (Reurink G et al., 2015; Gustaaf Reurink et al., 2015; Visser et al., 2012). In fact, up until very recently, HSI research has largely ignored clinical findings (e.g. flexibility, strength, palpation findings), even though they are the basis of clinical practice, instead relying on MRI findings often in isolation (Gustaaf Reurink et al., 2015; Visser et al., 2012). In the strongest methodological study to date, a systematic review found no strong evidence for the use of MRI in predicting time to RTS (Reurink G et al., 2015). Methodological limitations were the main reason for that finding, with none of the included studies analysing whether or not the addition of MRI provided additional clinical value on top of normal clinical assessment (Gustaaf Reurink et al., 2015). In a further study which controlled for the predicted benefits of clinical assessment and MRI, it was found that MRI did not provide any meaningful additional prognostic information (Moen MH et al., 2014). This suggests that the current research into HSI, dominated by the use of MRI, does not provide a clear picture of the complex nature of HSI and how best to manage it.

1.7 Hamstring Injury Diagnostic Classification

The diagnostic classification of HSI is another factor that has not had an agreed consensus amongst researchers and clinicians, with numerous classifications referenced, resulting in a lack of consistency in terminology and diagnostic entities (Pollock, James, Lee, & Chakraverty, 2014; Visser et al., 2012). Commonly used grading systems have often classified HSI based on three grades – mild (Grade 1), moderate (Grade 2) and complete (Grade 3) HSI; however this simplistic grading system fails to account for the more recently acknowledged concept of a Grade 0 injury, which has no imaging evidence of pathology (Pollock et al., 2014; Visser et al., 2012). In addition, Grade 0 injuries prognostically have been associated with faster

RTS times than other diagnosed hamstring injuries, so they are an important diagnostic distinction to make (Hallén & Ekstrand, 2014; Pollock et al., 2014).

Arguably the most up to date diagnostic classification system in measuring the severity of HSI is the British Athletics Classification system, which aims to encompass the whole range of HSI, ranging from Grade 0, no muscle injury, to Grade 4, where a complete tear of the muscle or tendon occurs (Pollock et al., 2014). Within this classification system, both Grade 0 and Grade 1 injuries are often not associated with any muscle damage on MRI. Grade 1 is associated with the presence of oedema , however nil or <1cm of muscle fibre damage (Pollock et al., 2014).

The concept of pain or injury being a poor predictor of the extent of tissue damage has been demonstrated within many musculoskeletal injuries, with chronic low back pain being a good example (Babatunde et al., 2017; O'Sullivan, 2012). A systematic review by Brinjikji et al. (2015) found that medical imaging findings of spine degeneration are present in high proportions of asymptomatic individuals, highlighting the limitation in radiological findings being a valid explanation for patients' pain experiences. The evidence has become indisputable that chronic low back pain is associated with a complex combination of biopsychosocial factors, with these factors leading to fears, avoidance behaviours, maladaptive and catastrophising beliefs, and pain behaviour, all of which have the potential to influence pain and disability (Babatunde et al., 2017; O'Sullivan, 2012). Within a hamstring injury perspective, the relationship between MRI findings and 53 athletes who had RTS successfully following the a physiotherapy led sport-specific RTS program, found that 89% had oedema present on MRI (G Reurink et al., 2013). Furthermore, the presence of oedema on MRI did not predict players who suffered re-injury (G Reurink et al., 2013). These findings suggest that the presence of oedema on MRI, consistent often with a Grade 1 diagnosis, could be considered a 'normal' MRI finding.

The mounting evidence against the clinical usefulness of MRI in predicting time to RTS and re-injury risk, leads to the suggestion that other factors may be influencing recovery from HSI (Gustaaf Reurink et al., 2015). Instead of conceptualising HSI as purely biomedical/anatomical, as is also described in the latest British Athletics muscle injury grading classification (Pollock et al., 2014), investigations into biopsychosocial factors are required to gain greater insight into this injury.

1.8 Criteria for Return to Sport after Hamstring Injury

A Delphi procedure in 2017 collated the expert opinions of experienced medical and sports professions associated with FIFA soccer teams to define a definition for RTS after hamstring injury. The group of fifty-eight professionals included physiotherapists, orthopaedic surgeons, and performance coaches with practical experience in the management of hamstring injury. Through a process of questionnaire collation it was agreed that the definition of RTS was when a player received criteria-based medical clearance, in addition to demonstrating a 'psychological readiness' to RTS (van der Horst et al., 2017). However, there is still currently no agreed, reliable RTS clinical tool that assesses when a player can safely RTS (Erickson & Sherry, 2017; van der Horst, van de Hoef, Reurink, Huisstede, & Backx, 2016). Factors important in the RTS decision-making process, such as "reaching the athletes' pre-injury level", "absence of pain", "similar strength" (van der Horst et al. (2016) and "psychological readiness" (Erickson & Sherry, 2017), have been proposed, but no measures have been defined for these RTS criteria in the context of HSI. Decisions are therefore based on subjective judgements of athletes and medical staff involved (Reurink G et al., 2015). Furthermore, 'psychological readiness' of athletes' has not been researched within a HSI context, which is needed to specifically explore the factors directly impacting HSI upon RTS.

1.9 Psychological Factors in Sporting Injury

There has been a significant amount of research to date exploring the relationship between psychological factors and sporting injury (Ardern, Taylor, Feller, & Webster, 2012b; Podlog, Banham, Wadey, & Hannon, 2015). A qualitative systematic review summarised the key influencing factors on players experiences of injury and RTS. Factors found to be important included: players intrinsic or extrinsic motivation; confidence in the quality of the rehabilitation process; 'psychological readiness' to RTS; and the degree of social support provided for players (Podlog & Eklung, 2007). This led on to a more recent quantitative systematic review, which demonstrated the relevance of these key psychological factors on the rehabilitation process and RTS. The studies consisted of recreational and elite athlete populations, involved in a wide range of sports. Apart from a small number of studies that focused on ACL injury, the remainder of the studies were non-specific in regards what injury was researched (Ardern et al., 2012b).

The emotional responses of athletes have been found to be directly influenced by a player's injury severity, with more severe injuries, requiring longer time away from sport, being associated with increased and longer negative emotional responses (e.g., frustration, anger). Emotional responses have also been found to improve throughout rehabilitation, provided rehabilitation has been successful, as athletes progressed towards RTS (Ardern et al., 2012b; Podlog & Eklung, 2007). In a study of 43 AFL players from one club, exploratory and semi-structured interviews described players responses to a wide spectrum of injuries, finding that players initial emotional responses to injury included negative responses such as: shock, disappointment, anger regardless of severity (Ruddock-Hudson et al., 2012). They described how long-term or career-threatening injuries, unsurprisingly, were described as resulting in more prolonged, unpredictable and more severe negative emotional responses through the injury

period. Although the large majority of hamstring injuries are of a mild severity, the emotional responses to hamstring injury have yet to be researched.

In a more recent qualitative study looking at seven athletes across a range of sports (e.g., rugby, gymnastics, soccer, martial arts), 'psychological readiness' in RTS was also described as being influenced by athletes' confidence in the quality of the rehabilitation process completed, their perception that their injured body part had healed and that returning to pre-injury levels of performance was possible (Podlog et al., 2015).

The association between fear and RTS has frequently been reported by athletes in qualitative research, with increased anxiety and fear of re-injury reported as a prominent emotion upon RTS (Podlog & Eklung, 2007). However, these findings have been across a wide range of sports, mostly amongst sporting injuries of a severe nature, such as ACL injury. Within ACL literature, fear of re-injury, measured through the 'psychological readiness' ACL-RSI outcomes measure, has been found to be the best predictor of RTS outcomes one year post-ACL surgery (Langford, Webster, & Feller, 2009). In a study of 209 recreational and elite athletes it was demonstrated that people who had returned to their pre-injury level of sport had significantly lower levels of fear of re-injury than those who had not (Ardern, Taylor, Feller, & Webster, 2012a). To date, no research has explored the psychological responses of athletes specifically following hamstring injury, which in comparison to ACL injury, is a mild injury with shorter RTS timeframes.

1.10 Psychological Research on Hamstring Injury

Evidence for a link between physiology and psychology in HSI has been demonstrated in a preliminary study (Askling, Nilsson, & Thorstensson, 2010). In addition to common clinical assessment RTS criteria (e.g. strength, flexibility, palpation), a measure of perceived insecurity

was measured during an active ballistic hamstring flexibility test. This involved asking athletes to perform a straight-leg raise as fast as possible without taking any risk of injury. Results found were highly significant, with 95% of athletes reporting insecurity at an average score of (52%), compared to 0% of uninjured athletes. Athletes who did report insecurity were recommended to complete an additional 1-2 weeks of rehabilitation, continuing this process until no insecurity was reported on the test. Results indicated that additional time to rehabilitation until athletes felt safe to move was associated with no re-injuries, suggesting that this clinical test was superior at preventing re-injury prior to RTS than normal RTS criteria. This also indicated that there may be a link between an athlete's physiological state and their psychological state, justifying further exploration of psychological factors influencing hamstring injury (Askling et al., 2010).

1.11 Summary

Available literature shows that hamstring injury management is highly biomedical – diagnosis relies on MRI, but that is not very good. Optimising RTS and minimising re-injury risk relies on MRI, strength, and accurate RTS criteria, however these are not very good either. Sporting injury is a biopsychosocial event, yet to date there has been very limited exploration of psychological factors associated with hamstring injury rehabilitation and RTS. Specifically, the nature of players' experiences of, and sense-making around, injury to their hamstring, in addition to the rehabilitation and RTS phases of this injury, remains unknown. This research will fill this gap in the knowledge base.

1.12 Research Aim

This study will use a qualitative approach to explore the nature of players' experiences of, and sense-making around, injury to their hamstring, in addition to the rehabilitation and return to sport phases of this injury. Specifically, this study will aim to explore players' understanding of

their injury diagnosis, in addition to exploring their psychological responses to injury, rehabilitation and return to sport. The desired outcome of this study will be to improve understanding of hamstring injury, which may provide new insight into improving the management of this complex injury, in addition to the important factor of guiding potential future research within a biopsychosocial framework.

CHAPTER 2:

Methodology

2.1 Participants

A purposive sampling approach was employed to recruit 15 male participants from two professional, Australian Football League (AFL) clubs. Participants were aged between 19 - 31 years, and for inclusion, needed to have experienced at least one hamstring injury in the previous 12 months.

2.2 Participant Hamstring Injury Characteristics

Nine players (60%) reported a past history of hamstring injury, with five players (55%) reporting having re-injured it three or more times. One player (5%) had a past history of an ACL injury. Thirteen players (87%) had an MRI scan as part of their diagnosis. Two players (13%) had a diagnosis of Grade 0, as confirmed on MRI scan. The remainder of the injuries ranged in diagnosis from a grade 1 to a grade 2 injury. The diagnostic classification systems used to report MRI findings was variable. The time to RTS for injuries ranged from four days up to nine weeks.

2.3 Interview Schedule

An exploratory, semi-structured interview schedule was designed, based around three phases of the injury experience: initial injury, rehabilitation and return-to-sport (RTS). The integrated model of response to sport injury and rehabilitation was used in developing questions for the initial injury and rehabilitation phases (Walker, Thatcher, & Lavallee, 2007). These questions addressed participants' interpretation of the injury (e.g., Can you describe your most recent hamstring injury?); emotional responses (e.g., When the injury happened, how did you feel?); and behavioural responses (e.g., Can you tell me about any changes in your behaviour following your injury?). Questions concerning the RTS stage were developed by

using the Anterior Cruciate Ligament Return to Sport After Injury (ACL-RSI) outcome measure as a guide (Webster, Feller, & Lambros, 2008). The ACL-RSI measures the 'psychological readiness' of an athlete RTS post-ACL surgery and it has been shown to be the best predictor of RTS outcomes one-year post-ACL surgery (Ardern, Kvist, & Webster, 2015). These questions addressed players' emotions (e.g., Can you tell me about your emotions when you returned to sport?), risk appraisal (e.g., Were you worried at all about re-injuring your hamstring?) and confidence (e.g., How confident were you that you could play without concern for your hamstring?).

Athletes were also asked about their understanding of the injury diagnosis, of different rehabilitative exercises used, and of their understanding and interpretation of pain throughout the injury experience. The interviewer is a practising physiotherapist and has professional knowledge of hamstring injury and its rehabilitation.

2.4 Procedure

Following approval from the University of Adelaide Ethics Committee, AFL clubs were contacted via email and invited to participate in the study. Two clubs agreed to participate. The Club's medical representatives were contacted and provided with information on the study (including a participant information sheet and inclusion criteria information). Participants who fitted the inclusion criteria were identified by each club and a suitable time was organised for the researcher (SP) to conduct interviews. Eight interviews were conducted over two days at one club, and seven interviews were carried out over four days at the second club.

Both clubs were visited within a one-month period. Players were verbally informed of the aims of the research, in addition to being provided with written informed consent after reading the Participant Information Sheet. They were also verbally assured of the confidentiality of the

research. Face-to-face interviews were conducted in a private room, lasting for 30-60 minutes. Background information relating to past and current injury history was gathered at the commencement of the interview. Interviews involved players being encouraged to talk freely about their injury experience. Participants were guided through questions on the interview schedule, with the order varying with participant responses. Open-ended questions were asked first during each of the three phases of the interview process. Interviews were audio-recorded and transcribed verbatim by the researcher (SP).

2.5 Data Analysis

Throughout the interview process interviews were reviewed and the interview schedule was modified, including the exclusion of questions that weren't relevant and the inclusion of emerging topics. The interview material was analysed using inductive thematic analysis (TA), as outlined by Braun and Clarke (2006) in their six-step approach. Initially, the process involved familiarisation with the data, through reading and re-reading transcripts, with notes taken on preliminary ideas and themes. The entire data set was systematically coded, with two interview transcriptions reviewed and coded by a second researcher with extensive experience in qualitative analysis. Codes were then collated into candidate themes, to give an idea on their prevalence and value in the data. For the purposes of analysis a theme is defined as a common recurring pattern across a dataset, organized around a central organising concept, capturing the core point of a coherent and meaningful pattern in the data (Braun & Clarke, 2013). Themes identified by the researcher were reviewed by the researcher's supervisor. The final phase of TA involved reporting the themes (Braun & Clarke, 2006).

An audit trail was maintained throughout the research to enable a detailed record of the process to be maintained. Copies of transcripts, interview notes, self-reflections and interview

question modifications were kept. The researcher's professional position as a physiotherapist with an interest in understanding the biopsychosocial nature of pain and injury experience was reflected upon throughout the research.

CHAPTER 3:

Analysis

3.1 Overview

The purpose of this study was to use an inductive thematic analysis approach to provide a descriptive account of AFL players experiences of, and sense-making around, injury to their hamstring, in addition to the rehabilitation and return-to-sport phases of the injury. Two salient themes were identified that illustrated this research aim. The first theme, *When to stop, when to go - Players responses to hamstring injury,* formed the core analysis of players experiences and sense-making around this injury; and the second theme *Trust - The club has my back,* encapsulated the first theme, highlighting the strong influence that the medical team has on players experiences and sense-making around hamstring injury, in addition to providing players with confidence in the rehabilitation and RTS phases.

3.2 When to stop, when to go - Players' responses to hamstring injury

This first theme was based on players' experiences of, and sense-making around, 'pain' and 'fear', two psychological constructs that influenced understanding of injury, in addition to participation in rehabilitation following injury. To make clear, the descriptions of pain experienced by players in the analysis was in the same area as their hamstring injury.

The large majority of players reported experiencing pain during rehabilitation. Experiences of pain were influenced by a range of factors, including a willingness to explore and push into pain, a past history of previous hamstring injury, a perception that experiencing pain was helping them progress faster through rehabilitation, and communication received from the medical team.

3.2.1 Subjective nature of hamstring injury

The subjective nature of hamstring injury influenced the certainty in players understanding of how far they could push themselves during rehabilitation. This was described by a number of players as being a point of difference in hamstring injury compared to other injuries. Reflecting the subjective nature, the responses of players to their experiences of pain were diverse, however the large majority of experiences were positive, assisting in a faster RTS. These two extracts contrast the willingness to explore pain in rehabilitation, based on a player's interpretation of their pain experience. The first extract illustrates a more conservative approach, the second, a more aggressive approach.

> I guess there's more judgement involved… it's really a comfort thing… generally you want to stay in comfort with a hamstring injury, where as with other injuries you get told structurally there's nothing wrong so you can go as fast as you can. With a hamstring I feel like that's not necessarily true because if you… go really quick I might do damage… I feel like that judgement part on the individual athlete is different perhaps to other injuries. (Participant 13, lines 847-858)

> It was strange mentally like how hard do I push it compared to other injuries. I think a hammy gives you a reminder that you can't push it that hard, you can always feel it more than other injuries. It's more of a mental thing like I said early days how hard am I going to push it before I re-injure it? (lines 676-681)
>
> But as each session went on I was fine …I was able to do more, I was just like I'm going to be fine. It's a bit of a mental battle, like how hard can I push it today compared to yesterday?...because I could always still feel it.

(Participant 9, lines 389-392)

Players' descriptions of their understanding around pain were diverse, with descriptions being influenced by both their own individual judgements, as well as their interpretations of communication they received from the medical team. A number of players described how the sensation of pain provided them with direct feedback on their current functional capacity, with the feeling of pain being a positive thing, allowing them to push the boundaries further in each training session and to progress faster towards RTS.

> Well it felt like I knew my limit and that I could push it so if I kept going at it a little, kept feeling that little bit of pain eventually it would go away and then I'd be able to get more range, so that's what I was thinking, to try and push it.
> (Participant 4, lines 224-228)

> What I figured out was the earlier you can get this stuff going, even if there is a level of discomfort but obviously not causing harm, it is actually ok to feel a little uncomfortable in terms of the area, because in the long run...I think it's pretty normal...I learnt that with the first one because I pushed the boundaries...and each time I ran I'd run quicker.
> (Participant 11, lines 298-325)

3.2.2 Medical team communication

Players' understanding on how to respond to pain was influenced strongly by their interpretation of communication and guidance they received from their respective medical teams.

Based on this, players' experiences varied, and this variation was amongst both teams. Some players reported an understanding that when they felt pain, they should stop. Others reported that they were instructed to push themselves to the point where they could feel some pain, such as an awareness or an aching sensation, and then to stop. Others reported that they were encouraged to push further into pain, beyond an initial pain sensation, and up to the point where they felt they were going to hurt themselves and then to back it off.

> They were saying go pain free so I didn't feel anything and if I was feeling something to pull it back a little bit.
> (Participant 12, lines 185-186)

> They encouraged me to push to where I could feel my hammy couldn't go any more sort of thing, just don't go beyond that. They always pushed me to just the point of where you thought it would hurt you sort of thing and just to back it off a little bit once you got to that point.
> (Participant 9, lines 338-341)

> The pain was like a sharp sort of pain, aching pain, through my hammy, so they said the aches sort of ok, but it was a little bit sharper when I went to a quicker speed, so that's when I knew I probably gotta pull it back a little bit.
> (Participant 3, lines 179-181)

These examples demonstrate the highly varied interpretations of pain that players held, with these variations consisting across both teams. These interpretations could have been influenced by both their own individual interpretation of pain, as well as by their interpretations of communication received. Some players recounted their interpretations of communication with the medical team with some ambiguity, with their use of language demonstrating uncertainty. The extract immediately above demonstrates this point with the player's use of the terms "sort of" and "probably", as does the extract directly below this with the use of the phrase "we want you to push it, but don't push it too hard sorta thing".

> They were pretty much saying um we want you to push it, but don't push it too hard sorta thing, so I was pushing it but it was tight it wasn't painful but it was uncomfortable and then yeah it got to a point where it was like borderline painful and I stopped.
> (Participant 15, lines 412-414)

3.2.3 Awareness, 'when to go, when to stop'; two contrasting interpretations

The subjective interpretation of pain by players was also illustrated through their description of the sensation of 'awareness'. 40% of players experienced awareness, with players' interpretation of the term varying considerably. Interpretation of awareness was influenced by both individual judgements and understanding from the medical team's communication. Descriptions used by players of awareness included: strong awareness, vague awareness, neurally sensation, dull feeling and unpredictable.

Half of the players described the sensation as being one of a non-threatening nature. These players were not worried by it, describing it as a normal sensation as part of their injury recovery, and also as a normal sensation experienced day to day.

> It wasn't somethings wrong kinda thing...it was just awareness more than anything. (Participant 7, lines 52-54)

> It's an awareness, it's not a pain...like this is going to tear again, its more...it's a weird thing to describe, you always feel that area, like I still feel that area now...I know that it's ok though, I don't worry...I'm still able to function and all my strengths good... I'm still able to sprint fine.
> (Participant 11, lines 860-866)

The other half of players described 'awareness' using language of a threatening nature. Players interpretations were influenced by both communication received from the medical team and also a past history of injury to their hamstring, with the 'awareness' reminding them of past injuries, leading to a feeling of concern and worry that they may re-injure their hamstring again.

> Even yesterday, running, I had a vague awareness when I was running, it wasn't painful, but probably because I'm so worried about doing my hammy I don't know whether I can push it. Maybe I could actually push it and run normally, or run at a higher speed, but because I've got that sort of awareness it's like in my head a little bit I don't want to push it. So it's probably for me a little bit of worry associated with it, where as some blokes,

> who might not have had much hammy issues, are like I feel a bit tight but I can run fine or whatever or keep trying.
>
> (Participant 2, lines 131-138) (WC = 560)

> In the run throughs I felt uncomfortable that I might have been in a high-risk category to do it again...I felt that it wasn't quite feeling comfortable running that quickly...it was like some sharp pain or at least a strong awareness
>
> (Participant 13, lines 141-145)

3.2.4 The association between pain and fear

Just over half of all players described a direct association between experiencing a sensation of pain and a "fear of re-injury". Players were prompted with questions asking if they had been "fearful of re-injuring" their hamstring throughout either rehabilitation or upon RTS. Players interpretation of the association between "pain" and "fear" was not consistent. For the majority of players, the experience was short-term, due to the pain either disappearing when the injury had recovered, or due to the player still experiencing the pain, however no longer interpreting it as a threat of re-injury.

> But as each session went on and I was fine …I was able to do more, I was just like I'm going to be fine. It's a bit of a mental battle, like how hard can I push it today compared to yesterday? Or what else can I do better for it? Because I could always still feel it.
>
> (Participant 9, lines 389-392)

Descriptions of the association between pain and "fear of re-injury" during rehabilitation included also where players felt the need to stop whilst running due to a "fear of re-injury". Players also reported experiencing sensations that reminded them of previous injury.

> It was nearly like another cramp, it started like the start of a cramp your muscles sort of tighten but you can still run and I was doing that. Then the next rep it did that but it did it more severe and like really started to grab and that's when I was having to stop and think I might re-injure myself here
>
> (Participant 15, lines 434-439)

3.2.5 Past history of hamstring injury

One third of players described their confidence in having injured their hamstring based on previous similar events of hamstring injury, where their experience of pain was the same or similar to their previous injury. Players based their judgements strongly on these memories.

> Because I'd done it so often I just told them I'm pretty sure it's just a grade one just a small one but I definitely tweaked it. I'd done it enough times to know what it is.
>
> (Participant 8, lines 53-54)

> Just a sharp pain like I've done one before so um the one I did last year it was just running, went to take off off the line...you get like a sharp sorta crampy pain um sorta real real distinctive spot... so I knew I'd done it.
>
> (Participant 11, lines 75-82)

> I think because in 2016 I sort of knew what it was, and um [.] just felt like exactly the same feeling as back then and...it turned out to be exactly the same thing
>
> (Participant 1, lines 98-99)

Players also gave vivid descriptions of their pain based on the area where they felt it, how they injured it and how it felt after they had injured it compared to in the past. Just having the feeling of the same sensation from the past was enough to make some players feel highly confident that they had injured their hamstring, even if they were aware of and discussed the mechanism of injury as being from less common causes, such as kicking a football, or changing direction.

> Same area, the whole thing was exactly the same…I knew the same thing had happened and that's what had happened…can't have been that quick because I was accelerating still…yeah I'm surprised by that…but then I couldn't get over the symptoms it was this pinching sorta feeling which I've had before…which has shown to be strains or tears or whatever in the past…it was like, it was just a feeling I knew it was something sinister…I was 100%.
>
> (Participant 13, lines 391-411)

3.2.6 The influence of memory and fear on future injury

Just under half of players reported a future "fear of re-injury" associated with either a memory of injuring their hamstring previously, or a "fear of re-injury" associated with returning

to pre-injury levels of function. Players' described similarities from previous hamstring injury events that was making them fearful now. These similarities included: a fear of injuring the hamstring in a similar manner as to how they had done so in the past, such as running at high-speed or picking a football up off the ground. Also, fear of injury was described based on a memory of it previously occurring at a similar point in time as to what had happened in the past. This example illustrates the powerful influence of memory on fear.

> I was really cautious, so mentally I remember one session I was like I'm gonna do it here. I didn't do it, I got through fine, but it was just mentally for me because I'd had a recurring one a couple of times in the past ...I was in that block 2-3 weeks post and I was like this is where it's happened in the past … and I was a bit nervous going in
> (Participant 1, lines 195-204)

Players also described their fears associated with returning to pre-injury levels of function. This was illustrated through apprehension at the stage of returning to sport or describing limitations in physical tasks during the rehabilitation phase. 'Fear of re-injury' was linked to player beliefs in activities that they conceptualised as high-risk activities, such as high-speed running and kicking the football.

> In the run throughs as I said I felt uncomfortable that I might have been in a high-risk category to do it again...I felt that it wasn't quite feeling comfortable running that quickly...it was like some sharp pain or at least a strong awareness
> (Participant 13, lines 141-145)

This theme has illustrated the subjective and variable nature of players pain interpretations and experiences, in addition to how they are further influenced by fear associated with pain, but also from memories associated with a past history of hamstring injury. These experiences for players are further influenced by communication they receive from their medical team. These experiences directly affect players participation in rehabilitation, as well as RTS, illustrating an influence of psychological factors on recovery from hamstring injury.

3.3 Trust - The club has my back

The second and final theme was built upon the repeated references to a high level of 'trust' that players held in their respective medical teams. A high level of trust was described by players in relation to their experiences throughout the whole injury process, which led to players possessing high levels of confidence in understanding the diagnostic process post-injury, in addition to the rehabilitation and RTS phases. This was the case even in the descriptions of players of aspects that were not clear to them.

3.3.1 Trust in the diagnosis and understanding of injury

Communication received from the medical team played a significant role in shaping players understanding, with the medical team being the foundation of their understanding. A high level of trust and a clear understanding in their injury was described by nearly all players in regards their communication with their respective medical team. A positive environment of dialogue between player and medical team was described, with open and direct communication, reassurance and confirmation of injury provided to many players.

> Was pretty clear the process, the physios were really good with outlining the plan to get us back and up and going.
> (Participant 1, lines 121-122)

> Obviously like I have full trust in them you know…so I just followed the protocol of what they wanted me to do
> (Participant 6, lines 120-125)

> They were all pretty good...I understood everything, even from the scans. They went through it with me very well
> (Participant 9, lines 192-196)

3.3.2 Trusting in diagnosis, despite individual and medical team ambiguity

When players were prompted to explain their understanding of their diagnosis in more depth, just under half of the players (47%) from both teams reported aspects that they were not sure about. Players' described their clinical assessment findings being inconsistent with their physical functioning levels, and also not understanding their MRI findings. 30% of players in the sample reported a disconnect between understanding their MRI findings and their physical symptoms. Players reported factors including: being surprised at the minimal findings found on MRI despite symptoms; questioning the relevance of minimal MRI findings on their ability to RTS faster; and being confused at the presence of no findings on MRI.

> I just did it for their own peace of mind...with the scan I was like this is nothing really...just the smallness of it you know.
>
> (Participant 6, lines 384-393)

Furthermore, a small proportion of players described how both the medical team and themselves were unsure on their diagnosis, however, despite these inconsistencies, players maintained a high level of trust and confidence in their medical team.

> They are a bit unsure of what's going on...but I don't feel like we're not on the same page...I am very trusting in our medical staff and fitness staff. I've always had a good relationship with them.
>
> (Participant 2, lines 239-241)

Looking at one of the teams separately, the majority of these players, described their understanding of injury and confidence in diagnosis, using tissue-based language. These players frequently referred directly to their MRI findings to describe their understanding of their injury, in addition to using tissue-based conceptualisation terms such as "nerves", "fluid", "damage", "Grade 1".

> Well we started to think that it was potentially more neural like some of the fluid from the initial strain was sitting on the nerve in there...causing some pain to go through there at times.
>
> (Participant 5, lines 29-31)

> I was more confident when I got the scan and it showed hey there's a bit of a nick physically saw it with the [medical team] like look you know there's a bit of damage there (Participant 6, lines 125-127)

> I didn't really know what to expect I just waited for the scan and it come up clear and I was fine
> (Participant 7, lines 133-134)

3.3.3 Hamstring injury and early movement

Trust in the medical team supported players' adoption of an aggressive approach to rehabilitation, which was facilitated by the medical team. Players described how they were surprised at the ability to be able to start rehabilitation so quickly, in addition to describing how they were up and running and back into their gym exercises very quickly. This had a positive effect on their motivations and confidence to RTS.

> I'd never really done anything before, so basically you're straight in to rehab in terms of strengthening it again which was kinda cool…I thought oh there's a tear there, how long you gotta rest it for? I've not done any research or anything, so I was just going on what the physio said and I was really pumped with that because I didn't want to sit around and wait
> (Participant 3, lines 120-131)

> The messaging was the more you can run and push it a little bit the better it's going to heal...that was basically my aim...running as much as I could.
> (Participant 7, lines 334-336)

Players contrasted hamstring injury to other injures that they had previously experienced, with players stating how hamstring injury enabled them to do more sooner, was an injury that was predictable in that they experienced daily improvements and progressed faster towards RTS.

> There an injury each day you get better and you get better and they feel sorta average at the start, but at the back end of it they get better quickly
> (Participant 11, lines 801-803)

Furthermore, players described how they were running again two day's post-injury, which, to some players was a surprise, not realising this was possible. Players' described how they were trusting and compliant with the medical team's direction on rehabilitation.

> They got me moving very quickly and even for the first day when I did the hammy and the next day I was still sore, but once I started moving it and warming it my range of movement became much better.
> (Participant 9, lines 163-165)

3.3.4 Positive emotional responses established through trust and early movement

The very large majority of players' emotional responses to HSI were positive. These positive responses were influenced by players high levels of trust and confidence in the medical team, the nature of hamstring injury allowing an aggressive approach to rehabilitation, and players high levels of motivation to RTS as fast as possible.

The majority of players' emotional responses consisted of an initial short-lived negative response followed by a positive response. Players' initial negative responses commonly included frustration, disappointment and being upset. Players described the injury as bad timing and feeling like they had let the team down.

> I was just frustrated… I wanted to play because I've done a full pre-season, I've been in the senior team week after week, and then for that to happen…I was just really frustrated…why did this have to happen now?
> (Participant 9, lines 107-109)

Following an initial short-lived negative response, a positive outlook was described by the large majority of players. Players described how they had a high level of trust and belief in their medical team's knowledge in helping them, providing them with confidence that they would RTS quickly.

Many players described viewing their injury as nothing major and a minor setback. The majority of injuries experienced in this study also occurred in pre-season, with the majority of these players describing the injury as a good opportunity to freshen up, both mentally and physically, enabling them to focus on improving strength and conditioning in other parts of their body.

> I felt you know ah I'm missing training and then within 24hrs I flipped it and I was like cool, I can be in the gym a bit more and get more strength up … freshen up a bit so it was all good… I felt fine, I just attacked it and I wasn't in there for very long.
> (Participant 13, lines 251-255)

A number of players also reflected on their injury from a sense of perspective and acceptance, describing how the injury was out of their control. Their major response was being ready to move on quickly. Players' discussed how either previous hamstring injuries or past experiences with more severe injuries meant they knew what they had to do now, as they had been in this situation before. Aside from one player who was in rehabilitation for about 10 weeks, all of the injuries in this study resulted in RTS time ranging from a few days up to three weeks.

> I knew I did it, almost disbelief you know...I thought it would just be 3 or 4 weeks... a little freshen up for me but it was a bit longer... I was shocked at first and then I was ready to move on.
> (Participant 4, lines 53-57)

3.3.5 Enhanced motivation from the medical team

A third of the sample described how the specific rehabilitation timeline that was provided for them by the medical team, including specific goals to aim to achieve throughout rehabilitation, provided them with additional motivation, positive feedback and helped facilitate

a faster RTS. Players described how they would try and beat the timeline that had been set for them by the medical team, helping to reduce their frustration and improve their confidence.

> When I could see where I was at and where they wanted me to be at, when I was in front, it was a good motivation...I might be back quicker than what they say. I was frustrated, but as I could see you're meant to be here, but you're actually doing more... it was good for me... motivation made me feel a bit better
>
> (Participant 9, lines 232-242)

3.3.6 Trust and confidence in the rehabilitation

Most players described their high levels of trust and confidence in both the medical team and the rehabilitation approach. Players talked about their trust in the knowledge of the medical team, of their past positive experiences of injury management, the professional facilities at their disposal, and in their confidence in the specific rehabilitation of hamstring injury, which they reported has evolved over recent years.

> Straight away I know that they're amazing at what they do and from our point of view the best in the business. As soon as they said do this I was doing it. I was super confident that by following what they were saying I'd be back pretty quick.
>
> (Participant 3, lines 141-146)

> Yeah I was always confident with the guys here...I've always been pretty confident with them... all the exercises made sense and they were working the right muscles.

(Participant 8, lines 126-135)

I think 5-6 years ago when that was happening compared to now the way we rehab it and strengthen hammies I've got a lot of confidence coming back generally.

(Participant 2, lines 158-159)

3.3.7 A smooth transition back to sport

The large majority of players' described their high levels of confidence in RTS once they had progressed through the rehabilitation phase. All players, except for two, had progressed through to the RTS phase of recovery when they were interviewed. The large majority of players' reported no issues with their hamstring injury upon RTS. Players' described the process as a really smooth transition, being 100% confident, feeling the best they had ever felt and of not thinking about their hamstring.

Yeah fine (assured tone). I haven't missed a beat, played 5-6 games straight...all GPS stuff through the roof...yeah almost feel the best I've felt…

(Participant 11, lines 924-928)

Yeah it was good, I haven't felt it or had second thoughts on it or anything like that so it's been really good...I was upbeat, felt good, it was good to have that challenge of a personal goal and I achieved it.

(Participant 4, lines 270-272)

> Good... confidently played a good game... was running at peak speed... felt really confident.
>
> (Participant 6, lines 508-510)

A large proportion of players also reported a range of different factors that they experienced upon RTS. The main one was the transition to a higher intensity of what competition brings, describing it as a mental challenge, as feeling underdone, being unsure how the body would go, nervous that the HSI would return, being a bit hesitant for the early stages, dealing with cramping in the body and of being fearful of re-injury.

Regarding fear of re-injury upon RTS, a small proportion of players reported this. For the majority of these players' it was a short-term worry associated with the increased physical demands of RTS. It was also reported as being due to a short timeframe of RTS following recent HSI. The quick resolution of fear of re-injury, or lack of, was dependent on how successfully they transitioned back into the increased physical demands of RTS. These two descriptions illustrate this:

> It got tight during a game and I just know how to not sprint and kind of keep it in an area where I'm comfortable with running…I got in a comfort space where I couldn't sprint, but I could stay in an area where I was comfortable and I knew nothing was going to happen…it was only during the later end of the game, because I was fine at the start…probably just fatigue…I'd had a long stint on the ground.
>
> (Participant 8, lines 225-247)

> Like I said my first game back its way more intense…as soon as I got through that first game its gone, its done, I don't need to worry about it anymore, I feel fine…as soon as I knew I was back and I could do everything at full capacity nothing worried me. (Participant 9, lines 626-631)

This theme has demonstrated how the experiences of players and their meaning-making around hamstring injury is grounded in the high level of trust they have in their medical team. Players rely on their medical team for their knowledge, expertise and guidance to help them recover from injury. These experiences with their medical team facilitate their progression through the injury, from understanding what is wrong, to undertaking rehabilitation, through to RTS, feeling confident they can return to their pre-injury level of function.

CHAPTER 4:

Discussion

4.1 Overview

This study was the first to explore players' experiences of, and sense-making around, injury to the hamstring in the AFL. Previous research had recommended this type of approach due to a lack of focus on specific injuries in athlete populations (Ardern et al., 2012b; Ruddock-Hudson et al., 2012). This study was also the first to explore players experiences of pain throughout the hamstring injury experience. A qualitative approach was used to gain an improved understanding of this common, but complex injury, which continues to maintain relatively stable injury rates over the last 10 years in the AFL (Australian Football League, 2017).

Exploratory, semi-structured interviews were performed with 15 players from two AFL clubs. Inductive thematic analysis produced two salient themes from the interview data: (1) *When to stop, when to go – the subjective nature of hamstring injury*; and (2) *Trust – the club has my back*. The first theme, 'When to stop, when to go – the subjective nature of hamstring injury', outlined players interpretations and experiences of psychological constructs including pain, fear and memory, that they used to conceptualise their understanding of hamstring injury. The second theme, 'Trust – the club has my back', was built upon players use of language that demonstrated their conceptualisation and understanding of injury, pain and the rehabilitation process through the communication they received from their respective medical teams. Players from both teams described high levels of trust and confidence throughout the whole injury process.

4.1.1 Previous research comparisons

A number of findings in this study were consistent with previous psychological research. Some of these findings it could be said were not unexpected in this study, due to the professional

environment of AFL clubs, meaning the resources and support available to players is high. However, they still reinforce the positive effect on outcomes that these different factors promote. Players' emotional responses in this study consisted of an immediate negative emotional response followed by a positive response. This was consistent with previous research in response to injuries categorised as of a mild severity, both from an AFL sample of one team (Ruddock-Hudson et al., 2012) and earlier research (Ardern et al., 2012b; Podlog & Eklung, 2007).

Furthermore, this study demonstrated players high levels of trust and confidence in the medical team, in addition to the rehabilitation approaches used, facilitating positive emotional responses towards recovery. These findings were consistent with past research (Ardern et al., 2012b; Podlog & Eklung, 2007). Positive emotional responses were also further enhanced by increased motivation of players in this study, enhanced through the structured and goal-setting support of the medical team (Podlog & Eklung, 2007). Also consistent with previous research, positive emotional responses demonstrated by athletes, in addition to beliefs in their ability to return to pre-injury levels of function, were associated with shorter RTS times for players (Podlog et al., 2015; Ruddock-Hudson et al., 2012).

Findings in this study appear to challenge past qualitative research that has found negative emotions such as a fear of re-injury and anxiousness to be a prominent emotion upon RTS (Podlog & Eklung, 2007). Although, a fear of re-injury was reported by some players in this study upon RTS, it was only in a small proportion of players. The large majority of players in this study reported feeling highly confident in RTS, especially when they had completed rehabilitation for the optimal amount of time. These findings suggest the experience of a fear of re-injury upon RTS may be different in hamstring injury, compared to ACL injury. This would make sense, due to the increased severity of ACL injury and associated greater length of time

away from competition (1 year), which has been shown to lead to increased negative emotional responses upon RTS (Ardern et al., 2015; Podlog & Eklung, 2007).

4.1.2 Pain, fear and a past history of injury

The large majority of players in this study described experiencing pain in the area of their injured hamstring during rehabilitation. The large majority of these players also experienced fear associated with this pain, with players' interpretations of this experience highly varied. For half of these players, this fear was short-lived, not posing an issue for progression back to a successful RTS. It was described by some players as a positive factor, providing them with direct feedback on their current limitations and allowing them to push harder in rehabilitation, assisting them achieve a faster RTS. For other players, the experience of fear associated with pain was a negative experience, resulting in a fear of re-injury and affecting their ability to undertake rehabilitation.

This study also showed a wide range of player interpretations of messaging received from the medical team, from both clubs, demonstrating how this could be influenced by both player interpretation of the message, as well as the clarity and consistency of the communication from the medical team.

Fear of re-injury, without the presence of pain, was also a common experience for a large number of players. For many players this was also a short-lived experience, however for some it was not, and it negatively affected their ability to undertake rehabilitation.

A past history of hamstring injury, the only commonly agreed risk factor in hamstring injury, had a strong influence for the majority of players, in how they interpreted both their understanding of pain and diagnosis, but also their understanding of future injury. These players' conceptualisations of pain and injury was influenced strongly by their memories of past injury,

resulting in an increased confidence in their current injury diagnosis, in addition to an increased fear of future injury. This was also the case when they aware that their mechanism of injury had been from a less common cause. As a result, these factors directly influenced how some of these players participated in rehabilitation and how far they felt they could push themselves physically.

4.1.3 Biomedical understanding of injury in players

The use of tissue-based language by the majority of players from one club demonstrated an emphasis on MRI findings for understanding injury. This reflected a biomedical model-based understanding of hamstring injury. Descriptions by players demonstrated how their conceptualisations around injury, which were influenced by medical team communication, were based on a clinical measure that has been shown to be a poor clinical tool in helping understand both RTS and re-injury risk (Moen MH et al., 2014).

Furthermore, 30% of players, with players from both clubs, reported not understanding the relationship between their MRI findings and their physical symptoms. Players reported being surprised at the minimal findings found on MRI despite their symptoms, questioning the relevance of their minimal MRI findings on their ability to RTS faster, and being confused at the presence of no findings on MRI. These descriptions from players provide insightful feedback into how MRI findings are influencing some players understandings around injury. Players understanding may be influenced by both their own individual reasoning, as well as from the communication they received from their medical team. This suggests that the challenge for clinical practice is to utilise MRI appropriately to assist in hamstring injury management (Moen MH et al., 2014; Gustaaf Reurink et al., 2015).

4.2 Limitations & Future Research

There were two main limitations from this study. The main limitation was the time periods between player injury and interview data collection, as reported in previous research (Ruddock-Hudson et al., 2012). Time periods ranged from a few days up to just under 6 months, meaning the reliability of player accounts could be questioned. Some players may have found it difficult to both recall and accurately differentiate emotions that they experienced at different time periods following their injury. Future research could correct this limitation by undertaking prospective, longitudinal research. Data could be collected at critical time periods along the injury continuum, allowing players to describe their injury experience as it happened. This approach would provide a more accurate representation of events, feelings and emotions.

The second limitation in this study was the small cross-sectional representation of the 18 AFL clubs, with data collection only from two AFL clubs. Future research that collected data from a greater number of AFL clubs would allow a more representative sample of the AFL player population.

However, the data collection from two AFL clubs in this study was also a strength, because it highlighted how players' experiences and sense-making around hamstring injury was directly influenced by their respective medical team. Differences described by players from the two clubs illustrated the important role that medical teams have in shaping player understanding and sense-making around injury.

Based on the findings in this study, which showed how players from both teams had high levels of trust in their medical teams, future research could explore this further by looking at the use of language and communication styles between medical teams and players. For example, the findings from this study support future research that looks at the different types of language used by medical teams and players, and how these influence player experience of injury. Qualitative

research could be used to do this, performing interviews with players. Furthermore, the triangulation of data, through the interviewing of members of the medical team, would further enhance rigour and trustworthiness in the data.

Future research that focuses on individual factors is recommended to build upon this study's findings, which suggest a potential relationship between psychological factors and physical factors in hamstring injury. The only commonly agreed upon risk factor for hamstring injury, a past history of injury, was found in this study to influence players' experience and conceptualisation of pain, fear of future injury and also their ability to participate fully in rehabilitation. These findings could be built upon in future research, to try and understand more about the interplay between these factors. Specifically, players with and without a past history of injury, could be compared to each other to see how their experiences of hamstring injury differ. Longitudinal qualitative research would also be an effective way of doing this.

4.3 Implications

Based on findings in this study, medical teams are recommended to communicate with players regarding players' understanding of their injury and to clarify any aspects they are unsure of if needed. Clarification around MRI findings and the relevance to their recovery and re-injury risk should also be clearly communicated (Gustaaf Reurink et al., 2015). During rehabilitation, players should be educated as clearly as possible by the medical team on how far they can push into pain during rehabilitation exercises. Furthermore, it is recommended to casually screen players for any concerns they may have (e.g., fear of re-injury, making their injury worse) and to address these as clinically appropriate if needed. Lastly, it is recommended to casually screen injured players with a past history of hamstring injury for any concerns or issues they may be having in their recovery from injury, also addressing them as seen clinically appropriate.

4.4 Conclusion

This study is the first study that has explored AFL players' experiences of hamstring injury, in addition to exploring potential psychological factors that are influencing outcomes. This study's findings suggest a potential relationship between psychological factors and physical factors, especially players' that have a past history of hamstring injury. Future research should explore these findings further, to build upon this new approach to looking at hamstring injury.

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Appendices

Appendix A: Interview Schedule

A. Interpretation of injury

1. Can you tell me about your most recent hamstring injury?
2. When the injury happened, how did you feel? Do you remember exactly when it happened? Can you remember what feelings you had, as you walked off? The next day? What did it mean to you? What do you think your overall response was to the injury?
3. What communication did you get from the medical team about your injury? What was your understanding of your injury diagnosis? Did they perform an MRI? What was your understanding of this?
4. Was there any aspects at all of the injury information that they discussed with you that you did not understand, or found confusing?

B. Rehab

1. Can you tell me about the rehabilitation process for you?
2. How did you feel during the rehabilitation period? Or, how would you have described your overall emotional state? Or, compared to normally do you think?

   Sub-questions to enable elaboration:
3. Did you feel as part of the team as you normally would?
4. Was your mood ‘flatter than usual’;

5. Were you ‘upbeat/downbeat’; ‘confident, motivated and had a spring in your step’; or did you have ‘lower motivation or less keen on seeing people and being with your teammates’?
6. How did you find the specific exercises that were set for you during your recovery? E.g. Did they challenge you? Did you experience pain or other physical sensations when doing them? Was this expected? Did the medical team educate you about this?
7. Was the rehab process boring for you?
8. Did you worry at all about re-injuring your hamstring during rehabilitation?
9. How did you find the progressions of running during rehab? Did they challenge you?
10. During rehabilitation, did you have any feelings of pain or tightness in that area? If so, when? What did this mean to you? What did you do about it? Did you communicate this to medical or coaching staff? What did they say about this?
11. How did this compare to pain or tightness that you felt in other parts of your body? (e.g. other hamstring, thigh, calf muscle)?
12. Did you feel well supported throughout your rehabilitation? If so, how? If not, in what way?
13. Did your rehabilitation include any other training or input? E.g. speaking to a sports psychologist; strategies to maximize confidence in RTS, relaxation exercises, education on the injury understanding and maximizing your recovery. Could also ask, about if players do work with a sports psychologist and if so in what contexts.

C. Return to Sport (RTS)

1. I now want to talk about returning to sport from this injury. How did this go for you?
2. How long was your recovery time to RTS? Was this time period what you expected?

3. Tell me about your emotions when you RTS?
4. Did you feel ready to RTS?
5. Did any aspect of your injury concern you upon RTS?
6. Were you worried at all about re-injuring your hamstring? Did this change over time? Was there anything you felt that helped you build this confidence? Was RTS different for you than when you were training?
7. Are you confident that you can now play your sport without concern for your hamstring? Are there any factors for you that you feel give you that confidence in your body that it is ok?
8. Do you still experience any pain, awareness, or tightness in your HS? If so, what do these sensations tell you or mean to you? How do these compare to pain or tightness in other areas of your body (e.g. other hamstring, thigh, calf muscles)?
9. Did you receive any psychological input prior to RTS?
10. Compared to other injuries how would you compare recovering from a hamstring injury with recovering from other injuries?

Appendix B: Consent Form

THE UNIVERSITY of ADELAIDE

[redacted]

CONSENT FORM

1. I have read the attached Information Sheet and agree to take part in the following research project:

Title:	**The Experience of Hamstring Injury**
Ethics Approval Number:	[redacted]

2. I have had the project, so far as it affects me, and the potential risks and burdens fully explained to my satisfaction by the research worker. I have had the opportunity to ask any questions I may have about the project and my participation. My consent is given freely.

3. Although I understand the purpose of the research project is to contribute to the development of knowledge in the area of hamstring injury management, it has also been explained that my involvement may not be of any benefit to me.

4. I agree to participate in the activities as outlined in the participant information sheet.

5. I agree to be:
   ☐ Audio recorded

6. I understand that I am free to withdraw from the project at any time, up until the written report of the study is submitted for examination.

7. I have been informed that the information gained in the project may potentially be published in a journal article, thesis, news articles, or presented at conferences.

8. I have been informed that my personal identity will be kept anonymous in published materials.

9. My information will only be used for the purpose of this research project and it will only be disclosed according to the consent provided, except where disclosure is required by law.

10. I am aware that I should keep a copy of this Consent Form, when completed, and the attached Information Sheet.

Participant to complete:

Name: _____ Signature: _____ Date: _____

Appendix C: Participant Information Sheet

THE UNIVERSITY of ADELAIDE

PARTICIPANT INFORMATION SHEET

PROJECT TITLE: The Experience of Hamstring Injury
HUMAN RESEARCH ETHICS COMMITTEE APPROVAL NUMBER: [redacted]
PRINCIPAL INVESTIGATOR: Assoc. Prof. Amanda Le Couteur
STUDENT RESEARCHER: Simon Pearson
STUDENT'S DEGREE: Honours, Bachelor Psychological Sciences

Dear Participant,

You are invited to participate in the research project described below.

What is the project about?
This research project aims to understand how athletes experience hamstring injury, its rehabilitation and return to sport.

Who is undertaking the project?
Mr Simon Pearson, a Physiotherapist is conducting this study which forms the basis for his Honours Degree in the Bachelor of Psychological Science at the University of Adelaide. The project is under the supervision of Assoc. Prof. Amanda Le Couteur at the University of Adelaide. Prof. Lorimer Moseley, (School of Health Sciences) at the University of South Australia, will co-supervise the project.

Why am I being invited to participate?
You are being invited as you are an elite Aussie Rules Football player who has experienced a hamstring injury in the last 12 months.

What am I being invited to do and how much time will my involvement in the project take?
You are being invited to take part in a face-to-face interview conducted by Simon Pearson about your experience of hamstring injury. The interview will take place at a location that is convenient for you and will take approximately 30-45 minutes to complete.

Are there any risks associated with participating in this project?
There are no foreseeable risks involved in participating in this project. However, if you have any concerns or you experience any emotional distress at any time whilst participating in the study, please inform the researchers.

What are the potential benefits of the research project?
Currently, there is very little research on the personal experience of hamstring injury in elite Australian Rules Football players. By participating in this study, you will be contributing to the development of knowledge in this area, which has the potential to improve outcomes for players in the future.

Can I withdraw from the project?
Yes. Participation in this project is entirely voluntary and you may withdraw from the project at any time up until the written report of the study is submitted for examination.

What will happen to my information?
All audio-recordings and interview transcriptions will be stored on password protected devices. Participants' identities will be kept anonymous throughout the research process and no personally identifying information will be reported. Information will be analysed to form a report that will be written up as an Honours thesis. A shorter research article may also be completed for publication in a scientific journal.

Who do I contact if I have any questions about the project?
For any questions about the project, please contact any of the following researchers:

[redacted]

What if I have a complaint or any concerns?
The study has been approved by the Human Research Ethics Subcommittee in the School of Psychology at the University of Adelaide (approval number 18/56). This research project will be conducted according to the NHMRC National Statement on Ethical Conduct in Human Research (2007). If you have questions associated with the practical aspects of your participation in the project, or wish to raise a concern or complaint about the project, then you should consult the Principal Investigator. If you wish to speak with an independent person regarding any ethical issue relating to the research, please contact the convenor of the Subcommittee for Human Research in the School of Psychology, Dr Paul Delfabbro on 8313 4936 or email Paul.delfabbro@adelaide.edu.au. Any complaint or concern will be treated in confidence, will be fully investigated and you will be informed of the outcome.

If I want to participate, what do I do?
[redacted]

We appreciate your interest in this study and hope to hear from you soon.

[redacted]