REHABILITATION AND RETURN TO PLAY IN CONCUSSED ATHLETES: A QUALITATIVE MULTI-CASE STUDY

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DEDICATION

To my father, who never had the chance to realize his hopes and dreams.

To my mother, who always supported me with her love and care.

To my sister, my closest and dearest friend

ABSTRACT

The Return to Sport protocol (RTS) requires concussed athletes to progress through a symptom-limited 6 Stage process before returning to sport. While this protocol is beneficial for managing the physical symptoms of a concussion, it is limited in considering the psychosocial factors of rehabilitation. Given that psychosocial elements of rehabilitation have been associated with athletes' readiness to return to sport in musculoskeletal injuries, understanding the psychosocial elements of sports-related concussions (SRC) rehabilitation may be beneficial for understanding athletes' psychological readiness to return to sport following RTS. This qualitative multiple-case study utilized a combination of timelining and two semi-structured interviews to explore the psychosocial factors of concussion rehabilitation and psychological readiness to return to sport. Five themes were developed from athletes' shared experiences of concussion rehabilitation and return to sport. These findings provide preliminary evidence of the complex psychosocial factors that influence concussed athletes' rehabilitation and readiness to return to sport.

PREFACE

All of the work presented was conducted through the Psychology for Active Living and Sports Laboratory (PALS) at the University of Lethbridge. This project and the methods contained were approved by the University of Lethbridge Research and Ethics Board [HPRC #2021-042]. I was the lead investigator, responsible for study design, data collection and analysis, as well as manuscript composition. More specifically, I proposed the idea of adapting the timelining methods from Sheridan et al., 2011 for application within a sports concussion rehabilitation context. Rathwell., S. and Gonzalez C. were the lead supervisors for this project and were involved throughout the project from conceptualization of the study to thesis composition. Caron, J. provided critical input on the design of this study through a qualitative lens, both with how the project situated itself within the sports concussion literature and the philosophical assumptions adopted for this project. Doan, J. provided input from a post-positivist perspective which strengthened this project. Caron, J. and Doan, J. were committee members who helped evaluate and shape the methodology for this study.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ACL = Anterior cruciate ligament
ACL-RSI = Anterior Cruciate Ligament – Return to Sport after Injury scale
CT = Computed Tomography
DTI = Diffusion Tensor Imaging
I-PRRS = Injury - Psychological Readiness to Return to Sport Scaled
KSES = Knee Self-Efficacy Scale
MRI = Magnetic Resonance Imaging
mTBI = Mild traumatic brain injury
RIAI = Re-Injury Anxiety Inventory
RTS = Return to Sport protocol
SIS = Second Impact Syndrome
SRC = Sports-related concussion
TBI = Traumatic brain injury

CHAPTER 1: LITERATURE REVIEW AND INTRODUCTION

What is a Concussion?

A concussion is a type of mild traumatic brain injury (mTBI) that occurs when accelerative forces acting on the head or body are translated to the brain (Daneshvar, Nowinski, McKee, & Cantu, 2011). When sufficient, such forces can strain neurons within the brain (Meaney & Smith, 2010) leading to a variety of abnormalities in their physiological function (Giza & Hovda, 2001). Additionally, small structural deficits associated with concussion occur in the white matter of the brain (Gardner et al., 2012). While these structural changes can be seen in vivo using diffusion tensor imaging (Lees et al., 2021), other imaging techniques that are commonly employed for diagnosing traumatic brain injuries (e.g. MRI, CT) are ineffective for determining the presence of a concussion (Pulsipher et al., 2011).

Concussion injuries are of primary concern within the athletic population. More than half of all concussions in Canada are sport related (Gordon et al., 2006), with athletes experiencing as many as 21.5 concussions per 1000 athletic exposures (Echlin et al., 2010). When considering that an athletic exposure is any instance of sports participation (competition, practice, recreational etc.), there is notable risk for concussive injury in athletes. This is particularly concerning when considering the limitations associated with concussion diagnosis in athletes.

Issues with Concussion Diagnosis

Current recommendations for concussion diagnosis involve the measurement of signs and symptoms. This can be particularly challenging when considering the variability of signs and symptoms that are associated with concussion. For instance, concussions can include (a) observable disorientation or

confusion, impaired balance, slower reaction time, and impaired verbal learning and memory (Carney et al., 2014), (b) wide ranging symptomology such as cognitive (i.e. brain fog, difficulties thinking) somatic (i.e. headaches, sensitivity to light) and emotional (i.e. emotional dysregulation) deficits, and (c) can take up to seventy-two hours to present (McCrory et al., 2017). These injury characteristics can make concussions particularly difficult to identify within the sporting context. For instance, when training individuals to detect signs of concussion, only 47% of diagnosed concussions from NHL games were associated with visible signs (Echemendia et al., 2018). Additionally, while athletes have reported knowledge of the somatic symptoms related to concussion (i.e. nausea and headaches), they have challenges recognizing other aspects of concussion injury (i.e. emotional symptoms, restlessness) (Fedor & Gunstad, 2015). Since the detection of symptoms relies heavily on athlete self-report (Lempke et al., 2020; Yue et al., 2020) an athlete's inability to recognize symptoms may mean they are overlooked during concussion assessment. Beyond the inherent challenges with identifying concussions, further challenges have been experienced with athletes' willingness to accurately report their concussion.

In an anonymous survey of 262 collegiate athletes, Torres and colleagues (2013) reported 43% of athletes with a concussion history hiding their symptoms to continue participation. Additionally, 22% of athletes that they surveyed reported being unlikely to report concussion symptoms in the future. Sometimes referred to as 'sandbagging', the underreporting or masking of concussion symptoms by athletes continues to challenge SRC assessment (Conway et al., 2020; Delaney et al., 2018; McAllister-Deitrick et al., 2022; Rizzo et al., 2021). Different reasons for underreporting have been identified in the literature. In some instances, athletes have reported believing that further participation

would not worsen their symptoms, and that reporting symptoms would not make a difference in their recovery time (Kroshus et al., 2020). Alternatively, a survey of 986 collegiate athletes found that the top two reasons for male and female athletes to avoid reporting a suspected concussion were “I do not want to lose playing time” and “I didn’t want to miss a game” (McAllister-Deitrick et al., 2022). Interestingly, when measuring NCAA athletes’ education and reporting behaviours Conway and colleagues (2020) found that athletes with greater knowledge of concussion facts (causes, diagnosis, sequelae, recovery) were more likely to agree with reasons why an athlete might hide their symptoms. The willingness of athletes to underreport symptoms is particularly concerning when considering how continued participation can increase symptom severity (Asken et al., 2018), and put them at risk for Second Impact Syndrome (SIS; Stovitz et al., 2017).

SIS is a life-threatening complication that can occur when an athlete receives a concussive impact before a previous concussion has healed. SIS is characterized by rapid swelling in the brain which can lead to cognitive and motor deficits often resulting in death or permanent impairment (McLendon, Kralik, Grayson, & Golomb, 2016). While the mechanism through which SIS occurs is still debated, there seems to be a connection to previously received, unresolved concussions. As such, it is crucial that an athlete’s concussion is identified and properly managed before returning to competitive sport.

The Return to Sport protocol

The recognition of concussion as a serious medical injury has led to the development of the Return to Sport protocol (RTS; McCrory et al., 2017). RTS is a 6 Stage rehabilitation protocol designed to help healthcare providers guide athletes through

a gradual reintroduction to physical activity with the goal of returning the athlete to preinjury levels of sport participation. The athlete should begin Stage 1 of the protocol when they are no longer experiencing symptoms, with each stage requiring a minimum of twenty-four hours to complete. Stage 1 begins with a reintroduction to daily activities such as school or work. Within Stage 2 there is an increase in heart rate through light physical exercise (i.e. walking or stationary cycling), followed by Stage 3 which introduces movement in the form of sport specific drills (i.e. running or skating drills). Stage 4 allows athletes to return to hard non-contact training drills and may begin resistance training.

Table 1

Current Graduated Return to Sport Protocol

Stage	Aim	Activity	Goal
1	Symptom-limited activity	Daily activities	Gradual reintroduction to work/school
2	Light aerobic exercise	Walking or stationary cycling	Increase heart rate
3	Sport-specific exercise	Running or skating drills	Add movement
4	Non-contact training drills	Harder training drills, may start resistance training	Exercise, coordination and increased thinking
5	Full contact practice	Can begin normal training following medical clearance	Restore confidence, assess functional skills
6	Return to Sport	Normal gameplay	

Note. This table represents the graduated Return to Sport protocol for concussion rehabilitation outlined in McCrory et al., 2017. Athletes can only begin the protocol when asymptomatic, with a minimum of 24-48 hours following injury. If an athlete experiences symptoms during the protocol, they must return to the previous stage until symptoms subside.

Medical clearance is required for Stage 5 (McCrory et al., 2017), upon which the athlete is allowed to return to full contact practices. Finally, Stage 6 is where the athlete returns to competitive sports participation. If the athlete reports symptoms at any stage, they must return to the previous rehabilitation stage until symptoms subside. While each stage must last a minimum of 24 hours, it should be noted that this requirement is not based on physiological measurements of the athlete's condition. Rather, 24 hours was determined to be the maximum amount of time required for symptoms exacerbated by exercise to present (Kissick & Johnston, 2005). If symptoms are present at any stage, the athlete must return to the previous stage of activity where symptoms were not present, and can only progress when stages are completed symptom-free. As a result, it is the management of symptoms, not physiological recovery, that are used to determine if athletes' are ready to return to sport.

Limitations of the Return to Sport Protocol

While the RTS is useful for helping concussed athletes gradually return to physical activity and sports participation, it is limited in considering the psychological aspects of rehabilitation (Bloom et al., 2020). Specifically, the RTS suggests that a goal of rehabilitation should be 'increased thinking' in Stage 3, while 'restore confidence' is a goal of Stage 4. Despite these recommendations, it isn't clear how athletes are supposed to achieve these psychological goals. Furthermore, it does not consider other factors that may influence an athlete during their rehabilitation process. For instance, athletes have reported experiencing feelings of isolation and loss during their concussion rehabilitation (Cassilo & Sanderson, 2019) and emotions such as anxiety and depression when experiencing protracted-concussion symptoms (André-Morin et al., 2017). While

the RTS may be useful for helping athletes feel physically ready to return to sport (i.e. no symptoms) it does little to consider whether athletes are psychologically ready to return to sport.

Psychological Readiness to Return to Sport

Research on psychological readiness to return to sport initially developed in response to the reported impact that injury could have on the psychological states of athletes. Specifically, reports of fear, anxiety, depression, as well as decreases in self-efficacy and confidence beliefs led researchers to posit that a successful return to sport following an injury should involve rehabilitating athletes until they are both physically ready and psychologically ready before they return (Heil et al., 1993; Quinn et al., 1999; Weiss et al., 1987). Indeed, evidence suggests that even though physically recovered, some athletes have noted the role of psychological factors in their ability to return to preinjury levels of performance (Webster et al., 2008; Glazer, 2009; Podlog et al., 2015).

More recently, psychological readiness to return to sport has been described as a state of mental preparedness to resume sport specific activities, which contains cognitive, affective, and behavioral components (Podlog et al., 2022). This broad definition has been borne out of research that has highlighted the complexity of factors that seem to contribute to an athletes' psychological readiness to return to sport. For instance, Podlog and colleagues (2015) took a qualitative approach to understanding psychological readiness by asking athletes with musculoskeletal injuries what it meant to them to be psychologically ready, and what contributes to their psychological readiness. In this study, they recruited seven collegiate athletes who had experienced varying types of musculoskeletal injury ranging both in severity and recovery time. These athletes participated in a focus group and one-to-one semi-structured interviews. From the results

of these interviews, they identified three dimensions of psychological readiness: confidence in returning to sport, realistic expectations of one's sporting capabilities, and motivation to regain previous performance standards.

One important precursor to readiness that Podlog and colleagues (2015) identified across two of the dimensions (i.e. confidence in returning to sport, motivation to regain previous performance standards) was social support. Specifically, athletes expressed that establishing supportive relationships with medical practitioners was key for developing trust in their rehabilitation and for developing the confidence needed to feel ready to return to sport. Additionally, athletes also reported fear of reinjury, achievement of physical standards, and effective goal setting as precursors to psychological readiness. Specifically, athletes reported that minimizing fear of reinjury was important for feeling confident that they previously injured body part could perform appropriately upon returning to sport.

Another attempt at measuring psychological readiness occurred when Glazer (2009) created the Injury-Psychological Readiness to Return to Sport (I-PRRS; Glazer, 2009) scale. The I-PRRS is a 10 item questionnaire based on a five point Likert scale which asks the athlete about their confidence when returning to sport following an athletic injury. To develop this scale, Glazer surveyed a group of individuals as an expert panel which included four athletic trainers which were also professors, with one professor holding a doctorate in sport psychology, and three varsity coaches who coached at the NCAA Division III level. Of the three coaches, one was a formerly injured athlete, one taught sport psychology at the college level, and the third was a formerly injured athlete and a master's degree

student in sport psychology. Glazer then used their questionnaire responses to develop the I-PRRS. The I-PRRS asks athletes about their overall confidence to play, confidence to play without pain, and confidence to be successful, among other items. Though this scale is reported to measure psychological readiness, the article does not define the construct of psychological readiness, nor identify whether measures of confidence to return to sport are sufficient for determining psychological readiness.

Rather than address psychological readiness, the ACL-Return to Sport after Injury (ACL-RSI) scale was developed to measure the psychological impact of returning to sport after anterior cruciate ligament (ACL) reconstruction surgery (Webster et al., 2008). This scale measures three types of responses related to the continuation of sport: emotions (i.e. fear of re-injury, anxiety), confidence in performance, and risk appraisal. Validation of this scale suggested that individuals who had given up on returning to sport scored lower on the psychological factors that were measured than individuals who were either already competing, or were planning to return to sport participation. While findings here suggest that there are multiple psychological factors involved when returning to sport, claims that it is an assessment of psychological readiness are concerning. More recent literature (Ardern et al., 2014; Faleide et al., 2020; Wörner, Thorborg, Webster, Stålman, & Eek, 2020) has reported that this scale measures psychological readiness to return to sport. While both the I-PRRS and the ACL-RSI are useful for measuring psychological factors, it should be noted that none of the aforementioned studies have identified nor measured the construct of psychological readiness to return to sport.

While progress has been made in understanding psychological readiness, much of the research has focused on either specific injury types (ACL injury; McPherson et al., 2019; Webster et al., 2018) or musculoskeletal injuries in general (Conti et al., 2019).

Such an approach therefore does not consider the unique challenges faced by concussed athletes during rehabilitation. For example, while confidence and cognitive deficits are an important part of concussion injury (Kutcher et al., 2014), other psychological factors related to concussion have also been reported including anxiety (Sandel et al., 2017), depression (Yrondi et al., 2017), as well as preliminary evidence for fear of reinjury (Anderson et al., 2019).

Psychosocial Factors in Concussion Rehabilitation

Athletes have also reported a variety of social challenges related to their concussion. This has included isolation from teammates and coaches (Caron et al., 2013) as well as pressure from teammates, coaches, parents, and fans to continue participating in sport (Kroshus et al., 2015). Alarmingly, athletes who experienced pressure from each of these sources were least likely to report their concussion. To highlight the complexity of the social experience of concussions, Caron and colleagues (2021) explored the social dynamics of three athletes' experiences of concussion rehabilitation by interviewing one coach and one teammate for each formerly concussed athlete that was interviewed. Interestingly, each concussed athletes' experience highlighted a different change in their social dynamic. This included: changes in role and identity, external and internal pressure to return to sport, and tensions between the type of support that the athlete desired as compared to what coaches and teammates believed the athlete needed (Caron et al., 2021). However, inconsistent application of concussion protocols, the coaches' distrust of concussion symptoms, changes to athletic identity, and the dominant sport culture all represented challenges that athletes faced during their concussion rehabilitation (Caron et al., 2021). Current research suggests the

possibility of multiple psychosocial factors that play a role in athletes' rehabilitation. Yet, understanding what role they may play in an athletes' readiness to return to sport is less clear. Research on fear of re-injury however examples how psychological factors can influence functional outcomes, and its potential implications for athletes recovering from concussions.

Fear of Re-injury

Although the study of psychological readiness in sport is still in its infancy, other parallel bodies of literature exist from which we can gain important information as it pertains to psychological constructs related to injury. One body of research that may be particularly informative is that of fear of re-injury. Fear of re-injury has been associated with reduced recovery outcomes for both chronic (Vlaeyen & Linton, 2000) and acute (Tripp et al., 2007) musculoskeletal injuries. More recently, fear of reinjury has been implicated as one of the most frequent causes for reduced sports participation following ACL reconstruction in athletes (Hsu, et al., 2017). The relationship between fear of reinjury and functional outcomes of recovery is detailed in the fear-avoidance model.

The fear-avoidance model (Vlaeyen et al., 1995) describes the process through which fear of reinjury can lead to poor recovery outcomes. Following an injury, fear of reinjury can occur during the recovery process. While such fear is not inherently detrimental, it can become problematic when it is catastrophized. Catastrophizing occurs when the injury or consequences of an injury (i.e. pain) are perceived to be more severe than the injury itself. This catastrophizing results in the individual avoiding behaviours they believe may expose them to further injury or pain both during and after recovery. Such avoidance can result in reduced participation in preinjury activities and those

required for recovery, leading to an overall loss of function and greater risk of future injury.

Although the fear avoidance model has yet to be applied to concussions, parallels can be drawn between athletes concerns in the concussion literature and the construct of fear. For instance, collegiate football players have expressed an expectation of concussion exposure as a result of their sport participation, with as many as 42% believing that they will experience a concussion as part of their sports participation (Baugh et al., 2017). Moreover, athletes appear to be aware of the long-term cognitive impairment (Stein et al., 2015), unpredictable timeline for recovery (Bloom et al., 2004), and career ending potential of a concussion (Caron et al., 2013). The aforementioned anticipation of concussion and recognition of the consequences of concussive injury may actually contribute to athletes developing a fear of reinjury and maladaptive avoidance behaviours.

While the relationship between concussion and fear of reinjury has not been explicitly studied, evidence of negative outcomes of fear avoidance behaviours can be inferred from past studies. For instance, a systematic review and meta-analysis found that athletes with a concussion history were twice as likely to sustain a musculoskeletal injury than athletes without a history of concussion (McPherson et al., 2019). In addition, athletes who were followed when returning to sport after a concussion had an incidence rate of musculoskeletal injury that was 1.67 times greater than non-concussed athletes during the same time period. Such a disposition towards further injury may not only highlight the presence of maladaptive behaviours but indicate a lack of readiness when returning to the sporting context.

In sum, fear of reinjury may be particularly useful for complementing our understanding of psychological readiness given the negative impact it can have on rehabilitation outcomes. However, fear of re-injury may likely be experienced differently by the concussed athlete population when compared to those athletes who have experienced musculoskeletal injuries. The current study aims to understand nuances of fear of re-injury with a unique sample of previously concussed athletes.

Purpose

It seems that the psychosocial factors of concussion play an important role in concussed athlete's return to sport. However, how psychological readiness develops alongside psychosocial factors and whether concussed athletes feel ready to return once they've completed rehabilitation is still unclear. Therefore, the purpose of this case study was to qualitatively explore the psychosocial factors that affect athletes' RTS following a SRC. The two research questions that guided this study are (a) What psychosocial factors affect athletes' return to sport protocol (RTS) experiences following a sports-related concussion (SRC)? And (b) Do athletes feel psychologically ready to return to sport after completing the return to sport protocol?

CHAPTER 2: METHODOLOGY AND METHODS

This chapter will outline the qualitative methodology and methods used in this study. Methodologically, the philosophical assumptions and multiple-case study approach will be described. Following this, methods including recruitment, procedures, data collection, analysis, and qualitative rigour will be explained.

Philosophical Assumptions.

This study was grounded in ontological relativism and epistemological social constructivism (Gerstenmaier & Mandl, 2001). Ontology refers to how the nature of reality is treated, while epistemology is the nature of knowledge. Ontological relativism is the view that reality cannot be parsed from subjective experience and is instead dependent on the interpretation of the individual (Tamminen et al., 2020). As a result, reality becomes synonymous with human experience as there is no way to observe and communicate reality outside of our human perceptions (Denzin & Lincoln, 2008). In this way, the athletes' concussion experience represents the reality of concussion symptomology, rehabilitation, and return to sport. This approach positions each athlete's shared experience as sufficient for representing the reality of their individual concussion rehabilitation.

Constructivism is the position that knowledge is constructed from the cognitive processes of the mind and is the result of experience and past knowledge construction (Kukla, 2013). Constructivism is idealist. It assumes the constructions of individuals to be real, and it is these constructions that create the reality of the individual. While constructions can be multiple and conflicting, they are all treated as meaningful sources of knowledge (Schwandt, 1994).

Social constructivism extends this position by recognizing that social interaction is inseparable from the way humans understand the world, and is integral to knowledge construction. Social constructivism is a transactional/subjectivist epistemology. That is, if the mind constructs knowledge, and these constructions are shaped by experience, the construction of knowledge is a transactional process that occurs between the individual, the world, and other individuals that they interact with. This process also occurs between the researcher and the participant during data collection. The researcher and participant both bring with them realities, knowledge and experiences, which become exchanged and used to construct new knowledge and understandings. It is important to recognize that while they work together in constructing knowledge (ie. through interviews and analysis) the knowledge that is constructed may be interpreted differently between individuals. For this study, the researcher will construct an understanding of the events unique to each athlete's concussion, while identifying the similarities that occur across rehabilitation experiences. By recognizing these experiences as each athlete's knowledge of their concussion, the researcher develops their understanding of the psychosocial factors of concussion rehabilitation by analyzing athletes' individual knowledge, and comparing knowledge across cases.

Ontological relativism and epistemological social constructivism are appropriate for studying athletes with concussions when considering the unique experiences of injury and rehabilitation. Therapists, coaches, family members, and teammates play an undeniable role in the concussion rehabilitation process (Covassin et al., 2014). The role of social support has been noted as an important area to understand within the sport concussion context (Bloom et al., 2004) and has recently been explored within youth concussion recovery (Kita et al., 2020). When combined with the athlete's understanding

and their perception of rehabilitation, these interact to shape the athlete's knowledge of rehabilitation and the reality of their experience. Through ontological relativism and epistemological social constructivism, the psychosocial factors that athletes experience during rehabilitation and return to sport from a concussion will be best understood.

Multiple-case Study

A multiple-case study approach was used for this study (Yin, 2018). Case study is a common method for understanding unique historical events, singular social programs, and unique clinical presentations of disease (e.g., Kerr et al., 2006; Tomes, 2006; Zhang et al., 2020). The value of a case-study approach comes from its applicability for obtaining in-depth understanding of poorly understood phenomenon, while recognizing that the boundary between the phenomenon and the context cannot be separated when understanding real world experiences (Yin, 2018). While the use of case study methodology for understanding singular phenomena has proven valuable across many disciplines, a major limitation has been the inability for case study research to make comparisons between cases. This was addressed by the development of the multiple-case approach (Yin, 2018).

The multiple-case study acknowledges the limitations of traditional case-studies by recruiting multiple cases so that cross-case analysis can be conducted. Though cross-case comparisons are not meant to make the results more generalizable to a population, they are useful for identifying which findings are most theoretically generalizable (Yin, 2018). Moreover, Yin (2018) notes that multiple-case study designs are useful because they recognize that understanding

both the similarities and differences across cases can enhance our understanding of what is unique within each individual case as well (Yin, 2018).

Given the variability of concussion signs and symptoms identified in the literature (Junn et al., 2015; McCrory et al., 2017), it is likely that the experiences of concussed athletes' will be highly varied as they progress through their rehabilitation and RTS. A multiple-case approach seems uniquely capable of identifying factors that are most generalizable to theory while retaining important variations among cases.

Recruitment

Convenience and snowball sampling were used to recruit post-secondary athletes from Canadian universities. Yin (2018) suggests that 6-10 participants is a sufficient sample size to provide compelling support when aggregating data for a multiple-case study, though smaller sample sizes have been recommended to improve the feasibility of cross-case data analysis (Schoch, 2016). Recruitment for this study occurred between September 2021 and February 2022. Athletes were recruited from varsity sports teams at Canadian universities that have historically high rates of concussion incidences for males and females (Koh et al., 2003). A recruitment letter was provided to coaches of varsity teams (**Appendix A**). Coaches were asked to send a recruitment letter to their athletes (**Appendix B**).

In order to participate in this study, cases were defined as Canadian university athletes who a) experienced a post-secondary sports related concussion within the past five years, b) participated in RTS for concussion rehabilitation, and c) received medical clearance to return to sport. Athletes who expressed interest in participating in the study were contacted through email and given a letter of consent (**Appendix C**) and online screening questionnaire (**Appendix D)** to complete using Qualtrics online survey

software (Qualtrics, Provo, UT). Athletes who met the inclusion criteria were contacted by email to begin their participation in the study.

Participants

Four athletes (three female and one male) met our inclusion criteria. Pseudonyms were chosen by the researcher for each participant to protect their anonymity. Athletes participated in Soccer (n=2) and Rugby (n=2). Athletes' year of post-secondary participation ranged from 1st to 3rd year at time of concussion. Data collection for participants began from 1 month to 4 years following their most recent concussion. Time between the concussion incident and clearance to return to sport ranged from 13 to 31 days (*M = 20.25*), with time between concussion and return to sport ranging between 14 to >90 days. Detailed demographics for each participant are contained in Table 1.

Data Collection

Data were collected remotely using a multi-method multiple-case study design (Yin, 2018). Specifically, data collection occurred through timelining and remote one-on-one semi-structured open-ended interviews using zoom online conferencing software.

Timelining

Timelining is a process where participants visually represent events related to the subject of inquiry in a chronological order (Sheridan et al., 2011). Sheridan and colleagues (2011) found that timelining was most effective when treated as an iterative process. From having women retrospectively timeline their weight loss experiences, Sheridan and colleagues (2011) found that when participants have the opportunity to continually return to the timeline as an ongoing process, the

timeline became more representative of the participant's experience and understanding of events. Moreover, the graphic elicitation allowed a point of reference for organization of thoughts, memory elicitation, and reflection, which could in turn discussion between the researcher and participant.

Table 2

Participant Demographics

Name	Sex	Sport	Year of post-secondary participation	Time since concussion	Time to RTS clearance	Time to RTS
Rachel	Female	Soccer	3rd year	1 month	20 days	27 days
Megan	Female	Rugby	1st year	4 years	17 days	>90 days
Julia	Female	Rugby	2nd year	4 years	31 days	41 days
Luke	Male	Soccer	1st year	2 years	13 days	14 days

Visual methods of data collection, such as timelining, have been proposed as a way to improve the quality of data collected within the field of qualitative sport psychology research (Smith & Sparkes, 2016). The use of visual methods within the sport psychology literature has demonstrated the value of timelining specifically (Kendellen & Camire, 2019) and can be used to provided depth to sport concussion rehabilitation inquiry (Caron et al., 2017). Thus, timelining may provide participant's greater agency when representing their experiences and allow for unique insights that could not be reached through other methods, or interviewing alone.

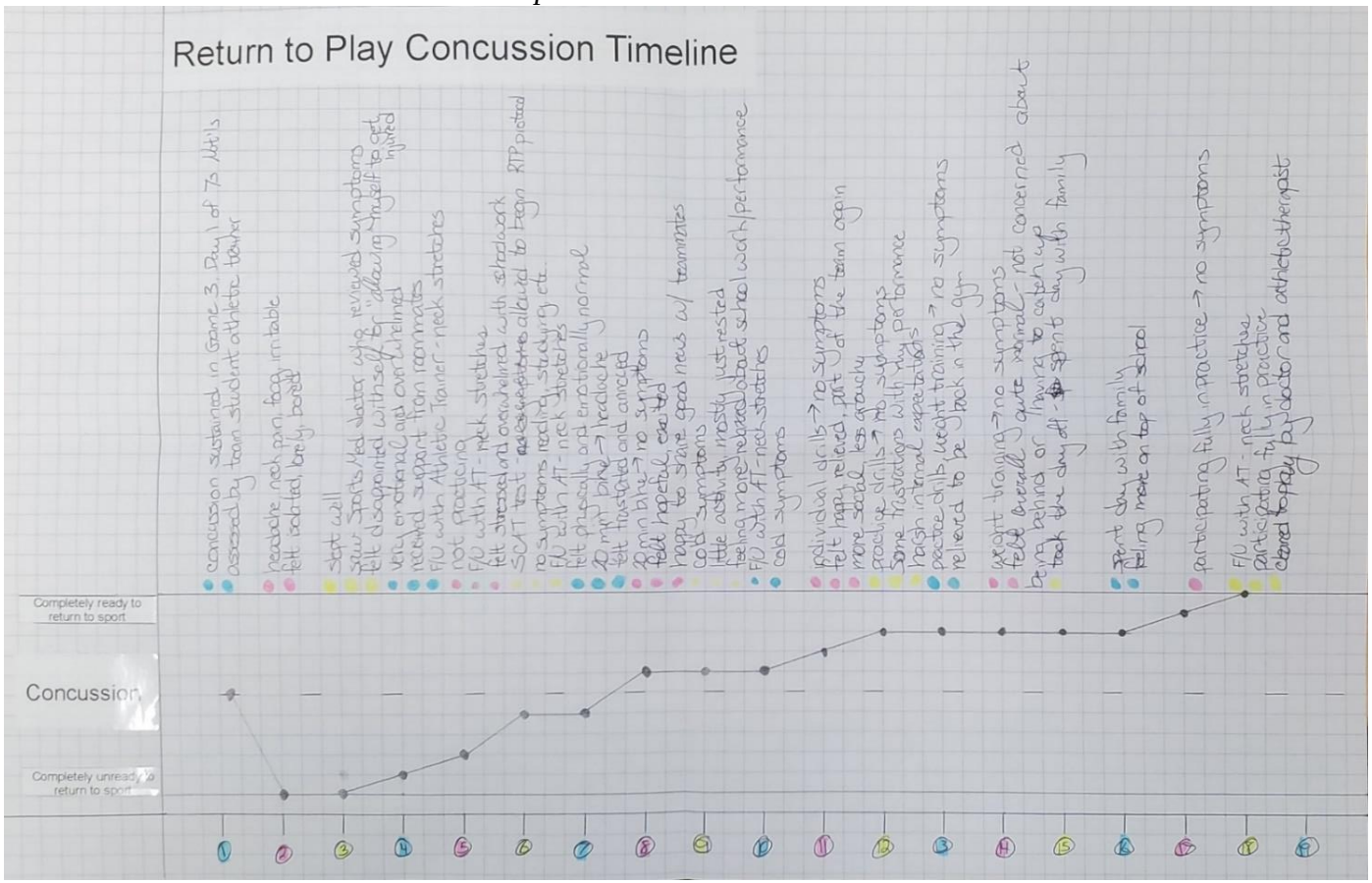
After obtaining consent, a package containing the materials for timelining was delivered or mailed to participants depending on their preference and in compliance with

COVID-19 protocols. The package included five size A3 sheets of paper (29.7cm x 42.0cm), standard pens, pencils, highlighters, and a timelining instruction booklet (**Appendix E**). Following the receipt of the package, an initial meeting was conducted remotely or in-person with the participant using the online video communication platform Zoom. At this meeting, the primary researcher discussed the purpose and procedures of the study with the participant. This meeting was also used to review the timelining package and instructions with the participant. Specifically, the participant was told that the first page of the timeline would be titled "return to sport concussion timeline".

When describing timelining, participants were directed to a size A3 paper (29.7cm x 42.0cm), which contained a horizontal axis running along the long edge of the paper and a vertical axis on the short edge (see **Appendix E**). The primary researcher explained that the horizontal axis denotes time and allowed participants to choose the time scale that best fit their RTS. Specifically, the horizontal axis began with their most recent concussion incident and ended when they returned to competitive sport. The researcher instructed participants to use the horizontal axis of the timeline to place all relevant events to their concussion rehabilitation in chronological order. Given that rehabilitation times vary, the horizontal scale was dependent on participant's recovery timeline. For the example timeline provided (Figure 1.) the horizontal axis is defined as 'days' with each numbered dash representing each progressive day following the concussive incident. Coloured highlighters were provided for athletes to add additional detail to their timelines if they so choose. In Figure 1, the athlete used highlighters to connect their descriptions to the corresponding days of their concussion rehabilitation.

Figure 1

Concussion Rehabilitation Timeline Example



Note. This figure represents the rehabilitation timeline created by participant Megan. The timeline is read from left to right, with the 'Return to Play Concussion Timeline' title at the top so that the readiness dimension is in the vertical axis and time is in the horizontal

axis. The ‘Concussion’ label is place in the middle of the readiness dimension and represents the day the athlete received their concussion. The readiness dimension ranges from ‘completely ready to return to sport’ at the top, and completely unready to return to sport’ at the bottom. Athletes used this readiness dimension to indicate how ready to return to sport they were on each day during their rehabilitation. Above the readiness dimension is a descriptive area where the athlete can use text to describe the important events and experiences of their rehabilitation. Athletes were also given highlighters to add additional meaning to their timelines if they desired. Here, Megan used colored highlighters to connect her descriptions with the day in which they occurred.

Using the vertical readiness dimension, participants were asked to indicate their perceived level of readiness to return to sport for each event included on their timeline. As such, the vertical axis was used as a readiness dimension with “completely ready to return to sport” located at the top, and “completely unready to return to sport” located at the bottom (Figure 1.). The vertical dimension of the timeline was 10cm in length. The vertical axis allowed athletes to express how ready they felt they were to return to competitive sport at each time point. By including readiness as a point of description for each event, it allowed the researcher to inquire as to why athletes felt more or less ready, giving greater opportunity for conversations to focus on those factors that athletes attribute to their psychological readiness.

Participants kept their timelines for the entire duration of data collection. Allowing the participants continuous access to timelines created a fluid iterative process, where participants could engage with and review their timelines both during and between interviews. As well, participants were informed that if they wished, they could consult documentation of their rehabilitation (i.e. texts, calendars, emails) if they wished. It was expected that greater agency over timeline creation and more opportunities to engage with the timeline would result in timelines that more closely represented the experiences of the participant (Sheridan et al., 2011).

First interview

For each interview, the timeline was incorporated in two ways: (a) to help facilitate discussion, and (b) to plot new information on the timeline that arose during the interview. In the first interview, participants were questioned about their most recent SRC (**Appendix F**). This interview was designed to progress athletes chronologically through their concussion rehabilitation, beginning with their concussion, inquiring about each

stage of rehabilitation, and ending with their completion of the RTS. Questions explored the concussive event, initial reaction to the injury, experiences during the rehabilitation process, emotional affect during rehabilitation related to their experience, and social support during rehabilitation. Questions relating to rehabilitation experiences were asked for each stage of the rehabilitation process. For example, questions included "What emotions did you experience in relation to your concussion during Stage X of your rehabilitation?", "What or who helped you at Stage X of your concussion rehabilitation?", "What challenges did you experience at Stage X of your concussion rehabilitation?", "How did you feel about your rehabilitation experience as a whole?". As the interview progressed, the researcher referred to events on the timeline to allow participants to elaborate on their importance. Finally, participants were asked if there are any events on the timeline that they would like to discuss that haven't been discussed as part of the interview. At the conclusion of the interview, each participant was asked if they would like to put anything new on their timeline. At the end of the interview, the participant was asked to reflect on the topics discussed during the interview and to continue engaging with the timeline when possible prior to the second interview.

Second interview

The second interview was conducted 1-2 weeks following the first interview. The second interview contained questions regarding the return to competitive participation following the completion of rehabilitation, and whether athletes felt ready to return to competitive sport (**Appendix G**). Questions included "How was it decided that it was time for you to return to full competitive participation?", "Tell me about your first competitive game following your return

to sport?", "How do you feel about your performance during that game?". The second interview was also used as an opportunity to debrief from timelining with the participant. This was be used to gain the participant's perspective on the timelining process, what they enjoyed, and what they would improve upon. Information from such questions informed whether challenges with timelining impacted data collection. Following the completion of data collection, participants were provided with a closing statements document that allowed them to provide commentary on their experiences participating in this study, contact information for health support, and researcher's contact information (**Appendix H**).

Analysis

Data analysis was ongoing with data collection. Audio from interviews were recorded using Zoom (Zoom Video Communications Inc., 2022), and then transcribed verbatim. Transcripts were analyzed using Nvivo transcription software (QSR International, 2022). Data were analyzed using an inductive reflexive thematic analysis technique outlined in Braun and Clarke (2020). Thematic analysis (TA) is the process of identifying patterns within the data set, interpreting those patterns, and creating descriptions (i.e. themes) of meaning with those interpretations (Smith & Sparkes, 2016). TA is flexible as it can be applied to a variety of research questions and types of data, though it is most commonly used to analyze semi-structured interviews. TA can be particularly useful in newer areas of research where theoretical concepts are still in their infancy. This can in part be attributed to the ability to apply thematic analysis inductively. Inductive analysis is a bottom-up approach to analysis where coding and theme creation is data driven, rather than theory driven (Patton, 1990). Though it is not atheoretical, inductive analysis emphasizes creating meaning from the data first which may or may not

support pre-existing theories, rather than applying theories to the data to determine whether it fits (i.e. theoretical thematic analysis; Braun & Clarke, 2020).

For this study, a reflexive inductive thematic analysis was applied using both semantic and latent coding to build sub-themes and themes. While semantic coding refers to explicit meaning and patterns within the data, latent codes identify implicit patterns and meanings that may underlie the explicit nature of the data. While there is some theoretical backing for interpreting the results once themes have been completed (e.g., Podlog et al., 2015; Vlaeyen & Linton, 2000), there is limited theory available on the psychosocial factors involved in the concussion rehabilitation of athletes and how they relate to readiness to return to sport following a concussion (Caron et al., 2018; Covassin et al., 2017). As a result, an inductive thematic approach seemed the most appropriate for identifying the psychosocial factors of RTS. Thematic analysis was first conducted in a within-case process where individual cases were analyzed to create themes about their individual experience of psychosocial factors of concussion rehabilitation and psychological readiness to return to sport. Following this, a cross-case synthesis was conducted where cases were analyzed collectively to create themes from the aggregate data of all cases.

Within-case Analysis

First, semantic and latent codes related to the psychosocial factors of concussion rehabilitation were coded from interview transcripts. During this process, the rehabilitation stages of the RTS were identified in the data by identifying stages outlined in the RTS to events described in the timeline and interviews. Subthemes were created for each stage of the RTS by triangulating

patterns within the codes, timeline descriptions, and readiness to return to sport dimension of the athlete's timeline. Psychosocial factors in each stage were coded and then grouped into sub-themes based on the meaning and frequency of psychological and social factors represented within the codes. Sub-themes therefore represented psychological and social factors that were most common within their respective stage of rehabilitation. Athletes' responses to questions about their perceptions of psychological readiness were coded and grouped into subthemes. Subthemes were then used to create themes that represent overarching patterns of the psychosocial factors of rehabilitation and readiness to return to sport in each stage of the athletes' rehabilitation process.

Cross-case Synthesis

Once within-case analysis was completed for each case, within-case subthemes were pulled from the within-case analysis of each case for cross-case synthesis. First, subthemes were analyzed for patterns of meaning related to the psychosocial factors of concussion rehabilitation and psychological readiness to return to sport for each stage of concussion rehabilitation. Second, within-case subthemes were analyzed across concussion rehabilitation stages for commonalities in psychosocial factors and psychological readiness to return to sport. Following this, subthemes were clustered into themes based on patterns in their semantic and latent meanings. Subtheme clusters were confirmed by analyzing the similarity of clusters within each theme. Finally, cross-case themes were reviewed alongside timelines to identify patterns of meaning between themes, stages of the rehabilitation process (i.e. beginning of the rehabilitation process, return to sport) and changes in the readiness dimension of the timelines (i.e. "completely ready/unready to return to sport").

Qualitative Rigour

During all stages of data collection, the interviewer was aware of the research purpose and research question. A reflexivity journal was kept by the researcher to maintain awareness of their presuppositions regarding the athletes' experiences with concussion and RTS (Tufford & Newman, 2012). As such, the reflexivity journal documented personal biases and experiences of the researcher throughout the research process. This assisted the researcher in acknowledging the role their biases played in collecting and analyzing data.

One important aspect of timelining is ensuring that the events contained on the graph are representative of the participant's views of what is most important to their experience (Sheridan et al., 2011). To retain this, the researcher only guided the initial introduction to timelining for participants, and then answered any questions participants had during the study. Timelines were kept with participants throughout the study, allowing for data collection on the timelines to be participant led. During both the within-case and cross-case steps of data analysis, the primary author relied on two critical friends, one a professor in sport psychology, and another a graduate student in sport psychology, to provide feedback on the content of created themes.

CHAPTER 3: RESULTS

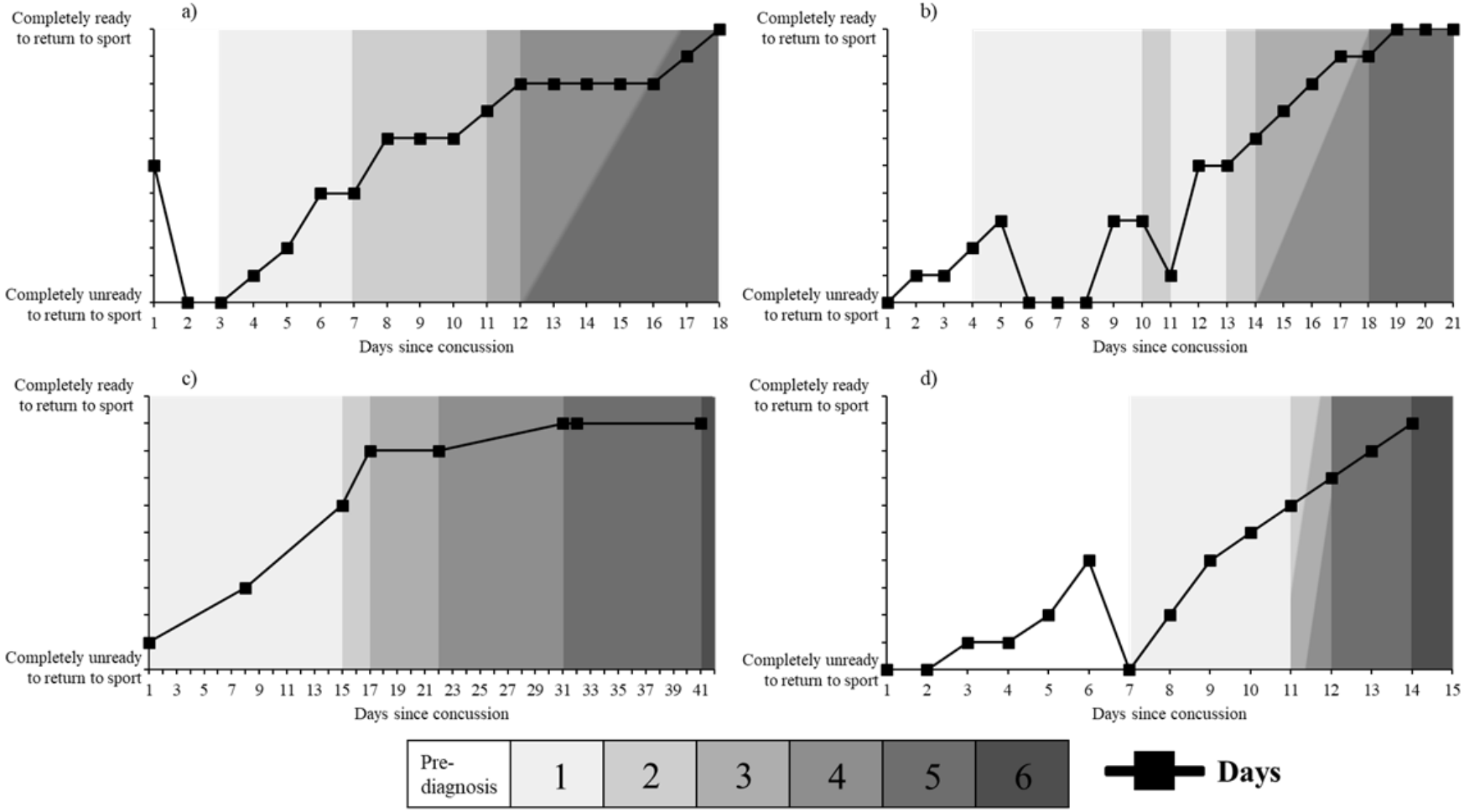
This chapter will present the results of the timelines and interviews collected on the most recent sports-related concussion rehabilitation of four Canadian university athletes. First, case descriptions created from the within-case themes of each athlete will be presented which highlight prominent psychosocial factors of rehabilitation for each athlete. Additionally, five themes were created from the cross-case synthesis: a) Initial concussion response influenced by athlete's perception of concussion symptoms, b) Athletes experience concussion related challenges returning to work and school, c) Social agents influence athletes' experiences and perceptions of their concussion rehabilitation throughout the return to sport process, d) Athletes create time-sensitive rehabilitation goals around sporting events which have negative psychosocial effects when not achieved, e) Athletes' perceptions and experiences of readiness to return to sport during concussion rehabilitation and their return to competitive sport.

Case Descriptions

Descriptions of each athlete's concussion rehabilitation experience were written using their respective within-case themes. These descriptions are written to highlight the psycho-social factors that were prominent in each athletes' concussion recovery experience. Descriptions are chronological, beginning with the athlete's concussion injury followed by their rehabilitation process until their return to sport. Pseudonyms were given to athletes to protect their anonymity (i.e., Megan, Julia, Rachel, and Luke). For a visual representation of the readiness dimension for each timeline each athlete created, see Figure 2.

Figure 2

Athlete Concussion Rehabilitation Timelines



Note. This figure represents readiness dimensions created by Megan (a), Rachel (b), Julia (c), and Luke (d). Readiness to return to sport is represented in the vertical axis, with ‘completely ready to return to sport’ represented at the top of the axis, and ‘completely unready to return to sport’ at the bottom of the axis. The days following the concussion injury are represented in the horizontal axis along the bottom. The color gradient represents rehabilitation stages as athletes progressed through the Return to Sport protocol, with colors included on each athletes’ rehabilitation to show their progression through the stages of RTS. Polychromatic areas represent instances where exercises for separate stages as defined by the Return to Sport protocol were administered during the same time period. For individual readiness dimensions, see **Appendices I-L.**

Megan

On the last day of a competitive weekend, Megan found herself fatigued. Unable to follow through with a tackle, Megan's opponent fell on top of her. Megan was removed from play by an athletic trainer who assessed her for a concussion. In the days following the injury, Megan found that her somatic symptoms limited her ability to participate in social activities with teammates. These symptoms made Megan irritable, frustrated, and angry. While Megan felt this was due to her concussion, she also directed the anger towards herself, believing she was at fault for receiving the concussion. This led her to question whether she deserved to have her position on the team, feeling pressure to return to this position. After receiving initial help from the student athletic trainer with the assessment and management of her symptoms, Megan saw the lead athletic therapist at her university who helped her schedule an appointment with a physician for diagnosis. Though finding it difficult to accept her concussion diagnosis from the physician, she felt optimistic about following the rehabilitation protocol.

Prior to beginning Stage 1 of her rehabilitation, Megan felt frustrated that her symptoms had subsided, but she still needed to complete the protocol. At the same time, Megan found herself isolating from teammates, which allowed her to avoid conversations about her concussion, and her performance when she was injured. At this time, Megan turned to her roommates as she felt close to them and she liked that they were not part of her team. Here, she felt cared for as an individual, as conversations with roommates did not focus on her concussion, or performance over the weekend.

Beginning Stage 1, Megan found herself continuing to isolate from teammates. At the same time, Megan found herself worried about how her concussion would affect her ability to perform in university classes. As she progressed through her rehabilitation protocol, she continued to struggle with her university courses. Experiencing feelings of loneliness, disappointment, guilt, and frustration alongside the stress of school, Megan began to feel overwhelmed. This culminated when Megan cancelled plans with friends to instead traveling to her family home to receive support from her mother. At home, her mother emphasized that though she was experiencing challenges, she believed that Megan could overcome them.

Progressing to Stage 2, Megan began to experience a headache. Frustrated, she felt like she had failed the rehabilitation stage. To cope with these feelings, Megan reframed her perspective by acknowledging that while she did not complete the stage when she wanted to, it did not mean that she had failed. The next day, she was able to successfully complete Stage 2.

Moving into Stage 3, Megan's teammates shared their excitement with her progress and participation in drills. Megan shared in this excitement despite having difficulties adhering to the exercise restrictions of her rehabilitation. With no more competitive games for the current season, team practices were reduced both in intensity and physical contact. In this context, Megan was allowed to participate in full practices with her team for Stage 4 of her rehabilitation. Finally, after being cleared to return to sport after a long rehabilitation timeline, Megan felt she was fully recovered, yet did not have an opportunity to participate in a competitive game until the next season.

Julia

Going in for a tackle, Julia lost consciousness. Upon regaining consciousness, Julia found herself escorted to the sideline for a concussion assessment. Not experiencing any symptoms that she associated with a concussion, Julia was resistant to the athletic trainer's recommendation that she attend an emergency room to see a physician. Only after being explained why she should go to the emergency room by her coach did Julia allow her parents to take her to the hospital where she received her concussion diagnosis.

Though eager to return to sport, Julia's family and coach emphasized that she should follow the rehabilitation protocol and only return when she had recovered. Following their advice, Julia contacted the team trainer. Here, the trainer provided email correspondence with Julia about beginning her protocol, and would provide information to her remotely as she progressed through her concussion rehabilitation.

Having taken time off work for rugby, Julia experienced internal pressure to return to work the next day. At work, Julia felt comfortable sharing her injury with her coworkers who helped her modify her duties. This allowed Julia to minimize symptoms, while being able to complete her shifts. Though it was not identified by her trainer, this return to work effectively represented the beginning of Stage 1 in her progression through the RTS.

Beginning Stage 2 of her rehabilitation, Julia experienced a slight headache while beginning light exercise. Cautious about not receiving face-to-face correspondence with her trainer, Julia decided to take a slow approach to her rehabilitation. Though no longer experiencing symptoms for several days, Julia took her time before entering Stage 3 of her rehabilitation.

During Stage 3 Julia's team began to reduce the intensity of their practices as a close member of their athletic community recently passed away. Unintentionally, these changes allowed Julia to participate more in her teams practices. Such change helped her reconnect with her team and receive more support from her teammates.

While in Stage 4, Julia's practices increased in intensity. Though Julia felt her team was understanding of her limitations, she found it difficult having to monitor her own participation and remove herself from drills. Julia's parents and friends understood the challenges she faced with her concussion, and helped her avoid social activities that might worsen her symptoms. While appreciative that she could take her time with recovery, she was also aware of how many opportunities for practice and skill building she was missing. Throughout the course of her rehabilitation, Julia found herself receiving help from friends and family. While her parents prevented her from seeing a concert that they believed may worsen her symptoms, her friends modified social activities so that she could be included without worsening her concussion.

As Julia proceeded to Stage 5, she became nervous that she may miss training camp, which marked the beginning of her university team's competitive season. This event was important to her, as she felt it was necessary to attend if she was to be ready for the coming season. Fortunately, Julia was cleared to return to competitive sport the day before training camp began. Julia had minimal issues and participated in her first competitive game nine days later.

Rachel

Rachel received her concussion colliding with a teammate during competition. While initially dizzy, Rachel didn't believe she had received a concussion. With a desire to continue playing, Rachel told the athletic trainer that she was fine. By the time the

game had finished, Rachel was experiencing symptoms and was assessed for a concussion by the athletic trainer. Though she was injured, Rachel's coach shared his expectation that she should be able to return to sport in two weeks for a weekend of competitive games.

Adopting her coach's expectation, Rachel felt urgency to progress through her rehabilitation as quickly as possible. Returning to school the day after her concussion, Rachel experienced worsening symptoms in the academic environment, which made it more difficult for her to concentrate in classes. Though still in the first stage of her rehabilitation, Rachel began perceiving internal and external pressure to return to sport. In response, Rachel felt conflicted internally about whether she should prioritize her health and follow the rehabilitation process, or prioritize returning to sport as soon as possible.

Rachel talked to her parents about her frustrations and internal conflict related to her rehabilitation. While they sympathized with her frustrations, they also emphasized the danger and potential long-term consequences of not following her concussion rehabilitation. Required to attend games and practices as a spectator, Rachel was frustrated having to watch other athletes participate in her sport, and experienced worsening symptoms from her attendance. However, Rachel found support when talking to other injured teammates, where she felt they could relate to each other about their injury-related frustrations and desires to return to sport.

Once symptoms subsided, Rachel felt ready to push herself to return to competition as soon as possible. Upon exercising for Stage 2, Rachel's symptoms

returned. Initially, Rachel hid her symptoms from the athletic trainer, though she shared that she was experiencing symptoms the next day when they worsened.

Once symptoms subsided, Rachel was able to continue with her rehabilitation without experiencing symptoms. Though she found happiness increasing her exercise and participating in drills, Rachel felt frustrated with the slow progression of her rehabilitation, and the limited applicability of drills to her role as a goalie.

Rachel was cleared to return to sport the day before her team's next competitive game, which she had used as her return to sport goal during her rehabilitation. Unfortunately, Rachel was not included on the roster for that weekend, and instead, had to watch the games as a spectator. Frustrated, angry, and disappointed at being unable to participate, Rachel called her parents after to express her frustrations. One week later, and after several more practices, Rachel was able to return to sport.

Luke

Luke participated as a midfielder for his university soccer team. During a game, Luke collided with an opponent while attempting to head the ball. Experiencing symptoms from the collision, Luke suspected that he received a concussion due to perceived similarities with his previous concussion experiences. Luke was immediately removed from play after his collision and was assessed by an athletic trainer. The trainer believed he received a concussion and Luke was removed from play and informed that he should see a physician for a diagnosis.

As Luke' concussion aligned with the beginning of the academic year, Luke spent the next three days resting from his injury and moving into his new residence. Luke began school on the fifth day following his injury, which did not cause issues for his concussion

and only required him to participate in reviewing the schedules and syllabi for his courses.

On day six, Luke attended an appointment with a physician. Not believing his concussion was too serious, Luke was advised by the physician to try weighted exercise to test whether he had a concussion. The next day Luke attempted a barbell squat which resulted in feelings of pressure and pain in his head. This led Luke to call his physician, who then diagnosed him with a concussion.

Shocked by the return of his symptoms, Luke felt concerns about the long-term health implications of his concussed. Additionally, he also felt he was losing out due to being removed from competition early in the year. With few academic and athletic responsibilities, Luke decided to prioritize his health during Stage 1 of his rehabilitation.

Though his symptoms had subsided, Luke spent the next three days attending school and avoiding exercising. During this period, Luke also felt pressure to make sure he returned in time for the upcoming competitive games, which was held in his hometown. For Luke, if he could return to sport in time, he could get to play his sport and use the game as an opportunity to visit his family. On the 11th day of his rehabilitation, Luke engaged in a solo workout, and non-contact drills at practice, effectively progressing himself through stages 2-4 of the RTS.

The following day, Luke participated in full contact practices. Concerned about causing further injury, Luke was cautious about the situations he put himself in practice and intensity with which he participated in drills. These concerns were mirrored by his athletic trainer, who limited the amount of time he could participate in practices. As a result, Luke felt he had lost some confidence in his ability to participate within his sport. Despite this, Luke felt ready to participate in the competitive game the following day.

Cross-case Synthesis

The aim of the cross-case synthesis was to collectively analyze data across all cases to create themes that represent patterns in the data. Themes created from this analysis represent psychosocial factors that athletes commonly highlighted during their concussion rehabilitation process and their readiness to return to sport following rehabilitation. To differentiate them from interviews, quotes taken from timelines are represented in italics. Five higher-order themes stemmed from our analysis: These themes will be illustrated by using quotes from the athletes' timelines and interviews.

Initial concussion response influenced by athlete's perception of concussion symptoms

Athletes formed beliefs about whether they received a concussion immediately after the contact that caused their injury or not. Athletes' concussion beliefs were shaped by their perception of symptoms. For instance, though not previously diagnosed, Luke explained:

> I think I might have had one other concussion from soccer as well. So, that's how I kind of knew how to gauge myself, whether I did or didn't have a concussion and what the symptoms were. Just because I've had it before.

Luke used his previous concussion experience to understand his symptoms following contact. Believing that these symptoms were representative of his previous concussion experience, Luke was subsequently removed from play for assessment. Megan also believed she had a concussion following her injury. "I knew immediately that my headache and neck pain was from my concussion and then my irritability was a connection of me being angry with myself and also a result of the concussion." Although Megan attributed her somatic symptoms to her concussion, she also recognized and

attributed emotional changes to her injury. Like Luke, Megan was removed from the field for assessment following her injury.

While athletes' perceptions of symptoms could reinforce athletes' removal from play, it could also act as a barrier. For instance, Rachel initially experienced dizziness from contact, but her symptoms quickly subsided:

> Yeah, so as soon as I got up I felt a little bit dizzy, but that went away kind of fast, that's why I was like 'It's probably nothing' but then, I didn't really feel it in the game. I think I was just telling myself I was fine so I didn't really feel it as much.

Believing she was fine, Rachel sent away the athletic trainer so that she could finish the match. Ignoring her returning symptoms as the game progressed, Rachel received an assessment from the student athletic trainer after the game had finished.

Julia also questioned whether she had received a concussion. Initially, Julia was unconscious from her injury and was taken to the sideline for concussion assessment. Though this assessment indicated she had a concussion, Julia explained why she didn't believe this was the case "Because I had no physiological symptoms of nausea, puking, difficulties to sound, I didn't think that it was real". This made Julia resistant to further medical care, feeling it unnecessary to visit an emergency room. Only after her coach outlined the importance of emergency assessment, and with guidance from her parents, did Julia access additional medical care:

> If I was doing that by myself I may not have gone in. We had a really good coach who I had a connection with who talked me through what the process was going to be like, that needed to go to emergency. Having my family there too was really nice because I didn't really know what was going on.

Athletes experience concussion-related challenges returning to work and school

Three athletes noted that their symptoms worsened when they returned to school or work, negatively impacting their ability to fulfill these roles. This impact was influenced by whether modifications were made to their school or work. For instance, while working with children, Julia modified her work responsibilities and managed her symptoms by avoiding physically demanding tasks, "I felt comfortable going and I didn't want to leave the other camp counselor alone so I had just said that I wasn't gonna be doing the physical activity, I wasn't going swimming, none of that stuff." and working in quiet locations when needed "Yeah, when you have eighteen kids playing games in a gym, there's lots of yelling so I just wouldn't go. We had an office, so I would do office work while they would take the kids to play games."

In contrast, Rachel returned to school immediately and attended regular classes without modification. *"Day 2 – Not feeling well, minor symptoms including feeling foggy and light sensitivity. Back to school as it was Monday, difficulty concentrating."* This led to a worsening of symptoms, which made it more difficult to attend and concentrate in class. Even in the absence of symptoms, concussions affected athletes academically. Megan's concern's about how her concussion could impact academic performance also made the return more challenging:

> I was worried because I was really struggling with a class at this point. We were getting close to finals and I was really frustrated that I wasn't able to work on my assignments the way that I would have wanted to.

As a result, Megan experienced emotional challenges related to her school work. "Definitely feelings of being overwhelmed. That was a big one. Feeling depressed and feeling very anxious. I remember trying to work on this assignment and it was not making

sense". Emotions related to her concerns about how her concussion impacted her school work became both a barrier to studying as well as performing within the class.

Only one athlete (Luke) experienced no challenges related to his return to school. Instead, Luke felt positive about returning to school because it allowed him to maintain regular contact with his teammates, thus, reducing his feelings of isolation from the team:

> It was nice to see some of the guys around campus, being able to see them in classes and still talk with them. I think if school wasn't on it would've had more of a setback on my life, on my social life. I would've been more isolated if I hadn't seen them.

Luke also attributed his positive experience to his light workload and absence of symptoms. Interestingly, Luke believed his return to school would have been impacted if he experienced symptoms in school:

> I didn't feel that much pressure when I would do school work. I didn't really feel any pain or lack of conversation so that I was really happy with. I definitely would've stopped doing homework or anything if I couldn't focus.

This response both complimented and contrasted with the experiences of the other athletes. While Luke agreed that symptoms would negatively impact his ability to go to school, he felt that forgoing attendance would be an option which was not shared by the other athletes when returning to school or work.

Social agents influence athletes' experiences and perceptions of their concussion rehabilitation throughout the return to sport process

Athletes identified several types of stakeholders who played a role in their rehabilitation process including: healthcare providers (i.e., student athletic

trainers, therapists, and physicians), team members (i.e., coaches, assistant coaches, and teammates), and family and friends. While social agents played a role in all athletes' rehabilitation, the importance athletes placed on different social agents varied.

The Role of Healthcare Providers During the Rehabilitation Process.

Physicians. Healthcare providers fulfilled different roles in prioritizing athletes' health. Physicians saw athletes either shortly after their injury, or within seven days of the concussive incident to diagnose whether athletes had a concussion. All athletes reported seeing a physician for their concussion diagnosis. While athletes' had little to say regarding their meeting with physicians, Luke shared a unique experience regarding his physician's appointment. During this appointment, the physician suggested that Luke could attempt exercise to gauge whether he had recovered from his injury. This advice influenced how Luke felt about his rehabilitation prospects and how long Luke believed it would take for him to return to sport. "I was optimistic after the physician said that because I thought 'Okay, maybe it's a minor one or it's already healed enough'". Following the physician's advice, Luke attempted a barbell squat the next day, upon which he experienced a worsening of symptoms. "That's where the whole timeline kind of got reset on September 6th, because I tried to do a squat and immediately felt pain in my head. I knew without a doubt I had a concussion". Once Luke experienced these symptoms, he was able to contact the physician, and was given a concussion diagnosis.

Athletic Trainers. Student athletic trainers were the first point of healthcare contact for the athletes. Trainers were: (a) involved in on-field assessment, ("the trainer woke me up and I was escorted off the field, basically, and then he started doing the typical assessment questions"), (b) conducted follow-up assessments and monitoring athletes throughout their rehabilitation ("Our team trainer was on me, doing the baseline

list of symptoms and basically seeing what symptoms I had. But yeah, she was pretty much on me every day, the whole process"), (c) advised athletes during rehabilitation stages ("I told the athletic trainer 'I just finished my bike ride and now I have a headache'. And she was like 'Okay, yep, now you gotta wait twenty-four hours before you can try again'"), as well as (d) documenting and reporting symptomology and rehabilitation progress to an athletic therapist. "Then the student trainers would kind of report back to the head physio and say 'Another practice, he's still good' all that."

While athletes were appreciative of the role trainers played, some negative feelings were expressed when athletes felt their trainer was intrusive in their training sessions, especially in the later stages of recovery. For instance, Luke was annoyed with the frequency that his trainer asked about how he was feeling when he participated in drills. Luke noted, "Yeah, I was definitely annoyed a little bit. They'd just ask me if my head was okay every ten minutes and I'd just say yeah. It was definitely a little bit annoying to deal with".

Rachel also expressed frustration with how her participation was restricted by her trainer during Stage 3 and Stage 4. "I think I was allowed forty minutes and then [name redacted] came over and stopped me doing anything else." Considering her role as a soccer goalie, Rachel also questioned the restrictions that were being placed on her participation during the rehabilitation process "This was the bit that I questioned the most, why did I have to do two full practices, but I still couldn't dive? Even one I would've understood, but two of them that's taking the piss a little bit now." This left Rachel feeling like her concerns and desires as an athlete were not being considered during her rehabilitation:

> My trainer was more concerned about making sure my head was okay. But I'm not a child. I understand that I need to take my time. They don't care about what I want to do, it's more about making sure that I get better and don't hurt myself anymore.

Despite experiencing frustrations, Rachel did not feel she could voice her frustrations to her trainer:

> I expected if I asked why, I would just… they'd just turn around and say 'Because it's part of the protocol' like what is [trainer name] supposed to say to me really? I didn't want to put her in the position where she thought I was being hostile towards her.

Rachel belief that voicing her questions may create conflict prevented her from sharing these concerns with her trainer. Additionally, she felt that the protocol being used as an explanation for rehabilitation decisions limited the value of having that conversation.

Athletic Therapists. Athletes experienced limited interactions with athletic therapists. For Megan, she received additional treatment from an athletic therapist provided stretching therapy for her neck:

> The main focus going to see her was stretching out my neck and getting that whiplash taken care of and also having the SCAT test conducted various days… The first week I saw her three times, the next week I saw her once.

Megan received stretching for her neck to address whiplash related to her concussion. In addition, opportunities were taken to assess the presence of concussion symptoms using the Sports Concussion Assessment Tool (SCAT). The therapy and assessment she received helped her feel supported by the athletic therapist during her rehabilitation. Athletes were aware that athletic therapists oversaw athletic trainers, and were cleared to

return to sport by therapists. “Then the student trainers would kind of report back to the head physio and say ‘Another practice, he’s still good’ all that. I think it was the head physio who did clear me in the end.”

The Role of Team Members During the Rehabilitation Process.

Coaches influence rehabilitation expectations and modify participation.

Team members were influential during athletes’ concussion rehabilitation. Coaches specifically had a large impact on athletes’ rehabilitation expectations. Shortly following Rachel’s injury, her coach shared expectations of how long the rehabilitation timeline should be. “At the start when I got my concussion, he was like ‘Look, you have this weekend off so you basically have two weeks to get your head into shape, and then you can play [university redacted].’” Not only did Rachel believe that she should be able to return to sport in two weeks following this interaction, she felt she would be to blame if she was unable to meet this expectation. “That in itself put this whole big pressure on me and if I have two weeks and I can’t do it in two weeks, it’s almost my fault that I’m not playing”. In contrast, Julia and Megan were both told by their coaches that their return to sport should be determined by their rehabilitation process. In response, Julia felt she could voice her injury needs to her coach if needed “They were very supportive of me removing myself. The coaches were aware so I would say ‘I can’t do this drill’ and there were no questions asked.” Similarly, Megan’s coach prioritized the rehabilitation process:

> I felt like my coach was supportive in the sense that he didn’t pressure me to come back to practice before I was ready. He was like ‘No, whenever [head therapist] says you’re ready, and when you think you’re ready, come to practice’.

Megan felt supported by her coach because he emphasized that she should follow the rehabilitation process and return to sport when she felt ready.

Athletes also benefited by modifications that coaches made during practices. Practices that were less physically demanding and had reduced risk for physical contact created opportunities for athletes to participate more and alongside their teammates. Modifications meant that Julia's practice "was kind of already structured in a way that I was able to do everything", it also helped improve how Megan was feeling during the rehabilitation process "I was going back to my… yeah, doing everything I would normally do in practice, participating in some ways, and be back with my team and feel normal again. That brought me, I would say joy for sure". Luke also responded positively when he could participate alongside his teammates, "being able to do practically everything the rest of the team was doing was really helpful". Participating in drills alongside teammates had a positive influence on athletes' rehabilitation experiences.

Notably, adaptations were not as beneficial if the athlete felt participation was not relevant to their athletic role. "It was nice to be able to kick again. Although she told me that I can't kick that hard. Which also seemed a bit mind blowing to me". Considering her role as a goalie, Rachel found it difficult to practice drills as a soccer goalie within these restrictions. "I wasn't allowed to dive either. So, that was a little frustrating because that's one of my jobs". These frustrations began to build overtime as she spent multiple days without any development to the skills she could practice:

> The first one I was like 'Okay, I get it. Diving is a little bit risky' but by the twenty-eighth, I thought 'This is so dumb, why am I doing another practice where I'm not even allowed to dive? There's no point to me being here.

While Rachel felt that the modifications she was given during Stage 3 and Stage 4 were less applicable to her role as a soccer goalie, she expressed appreciation for the goalkeeper coaches' efforts to include her in drills. "The goal keeper coaches especially were really good at adjusting what they had planned for the drills so I could still take part. [unintelligible] Feel like I'm there and I'm doing something." Interestingly, Rachel did not attribute these restrictions to her coaches. Rather, she appreciated the coaches' efforts in modifying drills so that she could participate within the restrictions placed by the athletic trainer.

Teammates push athlete to return to sport and sympathize with athletes' desire to return to sport. Teammates also influenced athletes' rehabilitation process. For instance, teammates asked athletes questions about when they would return and how they were feeling in relation to their injury (Rachel, Megan, Julia). Rachel felt that these questions expressed support and showed that her teammates were invested in her return to sport. As she noted, "My teammates are like 'When are you gonna be back? When are you gonna play again?'. So they're on the same page as me, and they care about getting me game time and trying to win as a team". These interactions reflected Rachel's desire to return to sport and compete again with her team. Julia similarly felt that such questions were a supportive gesture by her teammates which acknowledged her injury:

> Asking how I was feeling was a huge thing, acknowledging that it was real. I think a lot of the time concussions could be dismissed because it's not a visual injury. That was really nice and they were very supportive.

Conversely, Megan avoided these conversations with her teammates:

> I didn't want to talk to them about the weekend. I was so disappointed in myself. I didn't want to tell the same story over and over again 'Oh yeah I got a concussion, this is how it happened, oh yeah I'm doing okay' you just have to same repeat conversation and so I tried to isolate myself away from the team.

Megan was disappointed in herself for receiving a concussion. Believing she had let her team down, she avoided conversations about her injury or when she would be able to return to sport. "I kind of passively isolate myself from my team just because I didn't want to have that conversation you always have with teammates when you're injured. 'Oh, what happened? 'Oh, when will you be back?" Rather than encourage her, these questions reminded her of the injury and the negative feelings she associated with the injury.

Athletes also shared unique instances of support from teammates. For example, during games and practices where Rachel could not participate, she spectated alongside other injured teammates. As she recalled, "We have a bench full of injured players, so we just sort of talked to each other about it". Here, they could talk about the challenges of their injuries and the frustrations from not being able to participate. "That was the nice part, I wasn't sat there by myself. There were other people who could sympathize with not being able to play, not being able to do anything, so that helped." This allowed the athletes to sympathize over their shared experience of being an injured athlete, and support each other during rehabilitation.

Teammates also supported athletes outside of the sports setting. For instance, teammates made plans that were considerate of Julia's injured state to include her in social activities. Julia in turn felt that her teammates were understanding of her situation and were aware of the restrictions her injury placed on her:

> I didn't go clubbing or anything like that, so that aspect definitely changed. But most of my friends were on the Rugby team anyways so it was like 'Okay, well let's do a movie night instead'. They understood that I was doing this process, they were very understanding and knew what was going on

The Role of Parents and Friends During the Rehabilitation Process.

Parents Prioritize Athlete's Health and Wellbeing. Parent's prioritized athletes' health and wellbeing over other considerations when they believed the athlete may be at risk of further harm. This was highlighted by Julia's interactions with her parents "It wasn't like 'Well, why aren't you working out today? or 'Why aren't you doing this?' it was like 'No, you have a concussion you need to handle it'." This was not only a priority for the athlete during the rehabilitation process, but also when athletes planned for their anticipated return to sport. For instance, while Luke's parents wanted him to return to sport, they had concerns about his wellbeing:

> I had been talking to my parents the whole weekend, obviously they wanted me to go back home so they could see me play… If anything they didn't want me to come, just so I don't rush anything and hurt myself again.

Parents also made attempts to persuade athletes from behaviours they believed may worsen symptoms. As Julia noted, "I think I had plans to go to a concert or something and my mom was like 'You really should not do that' and kind of weighed out the pros and cons with me about it." Here, Julia's parents used the conversation to help her consider the possible consequences of going to a concert that she wanted to attend, and how the negative consequences may impact her. Similarly, parents referred to these negative consequences when discouraging athletes from ignoring their rehabilitation recommendations. As Rachel said, "My dad and mom were putting in my head 'Don't be

stupid, make sure you get everything done right, because it's really, really dangerous' and my dad was always reminding me how people always die of concussions".

Parents also acted as an important sounding board for athletes to share the challenges they experienced during rehabilitation. For Megan, it was this support that helped her address the academic challenges she was facing:

> I wasn't able to do my schoolwork. I wasn't able to perform at the level that I expected of myself. I wasn't able to go to a social function that I had planned that night because I was so distraught. I ended up going home to my family's house because I was feeling so anxious and so frustrated that I wanted to go home.

Megan sought help from her parents to manage the anxiety and frustration she was experiencing. Here, her mother responded to these concerns by sympathizing with Megan and reframing these challenges:

> She helped get me out of my own head and gain perspective of the problems that I was facing with my concussion. She reminded me that it wasn't the end of the world, that I would be able to get a hold of these things, and that it would be okay.

Megan valued the conversation with her mother for its ability to change her perspective on the challenges she was facing. Coming away from these conversations, Megan felt capable of managing the challenges that had previously made her feel overwhelmed and anxious. The change in perspective that parents could provide was also echoed in Rachel's experience:

> Yeah, it's nice. It's a good way to definitely vent. I do vent to them a lot. It was an annoying time for me, and I don't think there's anyone better than your parents to

> bring you down and say, put things into perspective for ya and just make it [unintelligible] feel a little better.

Rachel valued the ability to express her frustrations about her concussion to her parents. Interestingly, Rachel appreciated that her parents were both sympathetic to her frustrations while also providing a different perspective on her rehabilitation. Like Megan, these conversations persuaded Rachel to view her concussion rehabilitation more positively.

Friends provide emotional support and accommodate athletes' concussion needs. Non-athlete friends were a final social group who provided support for concussed athletes. For example, Megan felt there was an important distinction in her relationship with non-athlete friends and roommates outside the sporting context:

> To have that emotional connection. Knowing that they didn't really, truly understand or appreciate my Rugby life, but knowing that they loved me and cared for me regardless. Knowing that my performance that weekend didn't affect how they looked at me because we already had our relationship based on other things.

The support Megan found in this group of friends felt distinct from her athletic role. Knowing that these friends did not place importance on her ability to perform as an athlete allowed Megan to feel comfortable accessing emotional support from these friends.

Friends also helped athletes manage their unique needs during the rehabilitation process. As Rachel noted, "That's what's going to help me. Helping me avoid fizzy drinks, Caffeine, reduce screen times. Then a couple of my friends were on me for

making sure I'm doing everything properly." Receiving assistance with managing their concussion needs from friends also occurred in the work setting. Julia's friendship with her coworkers allowed her to feel comfortable discussing her concussion and how it affected her:

> I worked with my best friend, so having that support all day was super nice in case I was like 'I can't deal with the kids, you go do it'. Being able to have my friends at work every day was nice to be able to talk about the phases and returning.

This friendship allowed Julia to feel more comfortable expressing when she needed accommodations in the workplace. Additionally, she appreciated being able to comfortably discuss her rehabilitation experience with her coworkers as she progressed through the protocol.

Athletes create time-sensitive rehabilitation goals around sporting events which have negative psychosocial effects when not achieved

Athletes created personal goals for when they desired to return to sport. Julia's focus during her rehabilitation was to return in time for the start of the competitive season. She noted, "I didn't want to push the process so I would be ready for the season. So I went and got cleared to return a day before our training camp started. I waited, that's why it was thirty days". While the timing of her concussion allowed her to take a more gradual approach to her rehabilitation, she was aware of how important the pre-season training camp was for her team:

> Our training camp is two weeks before the season. At that point, we only had four games (a season). So it was like, you're ready for training camp and you're gonna be ready for season or I might as well not play that year.

For Julia, attending this training camp was necessary to be ready for the competitive season. Despite her efforts to be cleared in time for participation, uncertainty about whether she could return in time began to affect her as the beginning of training camp drew closer. “I was a bit anxious because I knew if I didn’t get cleared then I’d be pushed back to start. I think I would’ve been really upset, so I was definitely anxious to go to that.” Indeed, Julia believed she would have prioritized returning in time over following her rehabilitation if she believed she would miss her return to sport goal. As she summarised, “If it had started sooner I would’ve progressed through the stages quicker. I probably would have masked symptoms and would’ve tried to progress through the stages.”

Other individuals also influenced athletes’ return to sport goals. Early on, Rachel’s interactions with her coach influenced how she anticipated her rehabilitation to progress:

> (The coach) said to me when I got my concussion ‘You have this weekend off, so you have two weeks to get your head into shape, then you can play [university redacted]’. That in itself put this whole big pressure on me. If I have two weeks and I can’t do it in two weeks, it’s almost my fault that I’m not playing because I had two whole weeks to fix it, and I couldn’t do it

Following this, the game referenced by the coach became Rachel’s return to sport goal. As her rehabilitation progressed however, Rachel became conflicted with whether she should push herself to meet this goal. “To be honest, it was me fighting with my inner-self. Whether I rush to return faster or take my time, miss more, but then in the long run it would be better.” As a result, Rachel was uncertain with how she should approach her

rehabilitation. The pressure and desire to return to sport became so great that she attempted to hide her symptoms in Stage 2:

> I started having a bit of light sensitivity, but I told [name redacted] it was just because it was sunny. I didn't tell her it was because my eyes were hurting. Then it wasn't until that night, and the next morning that I really started to feel quite terrible.

Though Rachel proceeded to follow her rehabilitation instructions after this incident, she continued to experience frustration in trying to meet her return to sport goal.

While he had similar experiences such as a return of symptoms and a delay in his rehabilitation progression, Luke's experiences relating to his return to sport goal contrasted with the other athletes:

> I was excited that there was a chance I could travel home and play those games. While most of it was sadness, I'd say there was some eagerness inside of me. That there was a chance to go back and be healthy.

The sadness Luke experienced alongside his injury became replaced by his desire to return to sport. Additionally, Luke found himself motivated by the prospect of being able to see his family if he returned in time to participate. Interestingly, Luke ultimately felt this had little influence on his concussion rehabilitation. "Seeing my family was a nice thing but it didn't necessarily make me feel better about returning from a concussion." While Luke used a sporting event as his return to sport goal like the other athletes, Luke uniquely balanced his health alongside his desire to return to sport. "Not to force myself to be healthy but, just making everything as efficient as possible and to go by a healthy rate. Not taking shortcuts but not taking long either."

Notably, Megan's rehabilitation extended beyond the end of the team's competitive season. "That was a little frustrating because we didn't have any other games. That was the end of our season". As a result, it was unclear whether Megan would have created a return to sport goal for herself if she had the opportunity within that season.

Athlete's experiences when failing to meet rehabilitation goals. While return to sport goals provided direction for athletes, there may be negative consequences if athletes are unable to meet these goals. As time passed during her rehabilitation, Rachel began to worry that she may not return to sport when anticipated. "…a goal that I set and I was like 'As long as I'm back by here, I'm gonna be happy' and I was getting closer, closer to the reality that I wasn't going to achieve that." In the days leading up to Rachel's anticipated return to sport, she began to experiencing more frustration trying to make sure she would be ready to compete:

> There is frustration for sure at this point. I'd already taken up so much time doing the rest of the protocol and the rest of the process, I'm like 'It's already the weekend and I'm not even fully ready to go yet'. So it's sort of a disappointment that deep down, I wasn't going to play that weekend.

Cleared to return to sport the day before competition, she also found out the same day that she would not be included on the team's roster for the upcoming game. She expressed her disappointment, "The whole day I psyched myself up. I thought 'Even if I just get on the bench and dress, that's progress'. But I didn't even make it to the bench". Being excluded from the roster for the coming weekend, Rachel was required to spectate those games. In doing so, Rachel experienced a variety of emotions:

> Frustration, definitely. And just envy. Like fuck, I want to be that person out there playing… I was just so angry that I wasn't playing because I felt fine, I should be

> out there. And it's not like anything to do with the other goal keepers. I think they're great, but I'd rather it be me right?

Rachel's negative emotions stemmed from her exclusion to compete despite having been cleared in time for her anticipated return to sport. To help her with these feelings, she called her parents following the game:

> I called my parents after the game and was like 'This is a joke'. I was a little bit angry, and they were just like 'It's fine, it is what it is, nothing you can do about it'. They definitely helped.

Athletes' Perceptions and Experiences of Readiness to Return to Sport During Concussion Rehabilitation and their Return to Competitive Sport

In addition to their qualitative accounts and notations on their timelines, athletes used a readiness dimension to indicate perceived changes in their readiness to return to sport throughout their rehabilitation. Interestingly, athletes related negative changes in perceived readiness to return to sport to worsening symptoms and negative views of their rehabilitation progress. For instance, on day 7 of her rehabilitation (Figure 2.), Megan's headache returned while exercising for her rehabilitation. As she recalled in her interview:

> I did have a headache come and go that was frustrating. I do remember the headache coming and going." Megan proceeded to fault herself for experiencing these symptoms. "… I remember I was really disappointed because I felt totally fine and then I went on that bike ride and then I was like 'Oh, I feel terrible'… And yeah, I remember thinking 'Wow you failed'.

Though Megan did not mark a decrease in her readiness on day 7 of her timeline (Figure 2), she noted a sharp increase in her readiness when she completed this stage without

symptoms returning “The next day I did my second bike ride and then after that I felt fine and I thought, ‘Sweet, this is great’ and I felt like on track after that.” This increased was similar to the one that she noted from days 5 to 6 where she was cleared to begin the RTS.

Rachel also experienced drops in her readiness to return to sport as her rehabilitation progressed. From day 6 to day 8, Rachel was required to spectate her team’s games and practices (Figure 2). During this period, her symptoms worsened as a result of attending as a spectator. Rachel described this experience on Day 7 of her timeline:

> *It was a bright day so immediately light sensitivity was an issue. I did have sunglasses with me but the sun still gave me a headache. We also stayed to watch the men’s which was a lot with the sound, I was out for most of the day.*

The bright light and long periods of time she was required to stay as a spectator made it challenging for Rachel to manage her symptoms. Despite wearing sunglasses, she still experienced difficulties with her light sensitivity which brought on a headache. On days 6 to 8, Rachel noted on her timeline that she was “*completely unready to return to sport*”. Though she was experiencing symptoms, she also noted on her timeline experiencing negative emotional aspects related to not being able to participate:

> *Day 8 - Even though my symptoms have subsided, I still had feelings of frustration because I was watching people on the pitch, wishing that I could be playing too instead of sitting in the stands. My recovery also felt it was slow.*

Rachel shared further frustration on her timeline with her rehabilitation on day 11, when symptoms worsened after a period of stationary cycling the previous day. “*Day 11 - I had pressure in my head and felt slow throughout the day. This day was frustrating as I knew it was back to square 1.”* In both instances, Rachel expressed a drop in perceived

readiness to return to sport on days 6 to 8, as well as on day 11 (Figure 2.). Her perceived readiness increased drastically on days 9 and 12, both days where symptoms had subsided and she felt like she was making progress in her rehabilitation (Figure. 2). "*Day 9 – I had 48 hours with no symptoms! As much as this felt like progress I also felt time pressure with only 10 days until the next game."* While Rachel believed she was making progress in her rehabilitation, she still felt pressure about making sure she could meet her return to sport goal. Such concerns were also expressed on the timeline when Luke's symptoms returned during his rehabilitation:

> *Day 7 – As soon as I did my first weighted squat I felt a huge pain in my head from the rush of blood. Immediately left gym and emailed physio about my head hurting. Got officially diagnosed with a minor concussion. Am currently 50/50 to play the weekend of the 13th-14th*

On this day, Luke reported being "completely unready to return to sport". Feeling "shocked" that his symptoms had returned, Luke also shared skepticism about being able to return to sport for his desired weekend. The importance of meeting this return to sport goal was made more apparent on the timeline on the day following his return of symptoms. "*Day 8 – Want to be cleared ASAP since I'm from [city redacted] and want to see family when we go play [city redacted]. Feeling much better after a full week having passed since the injury."* When using timelines, athletes talked about negative emotions related setbacks in their rehabilitation, concerns about meeting return to sport goals, and the worsening of symptoms, alongside perceived decreases in the readiness to return to sport. Athletes' expanded upon their readiness to return to sport beliefs in interviews.

Athletes' shared their beliefs about what is required to be ready to return to sport. A common view among athletes was that physical and psychological readiness were

distinct, but also both necessary for readiness to return to sport. This was best summarized by Luke's statement "Making sure my body is a hundred percent good to go through the game. But then also mentally preparing for it and making sure in my head I know what I've got to do."

Interestingly, athletes' held opposing views on how athletes' should attain psychological readiness to return to sport. For instance, Megan desired more support for her psychological needs during her rehabilitation. "I wish that someone checked in with me emotionally. I had that support from my family and my roommates but I didn't really view it as important. I guess I didn't recognize the importance of it at the time." Megan expressed concern about her own inability to recognize how she was psychologically affected by her concussion at the time, desiring additional emotional support for her rehabilitation. Indeed, Megan felt she would approach her concussion rehabilitation differently if she experienced it again. "If I was to go through the process again, I would be a lot more aware of my state of mind and my emotional and mental wellbeing than before".

Alternatively, Rachel felt that being mentally prepared was the athlete's personal responsibility. "Physically, he can help with that. But mentally, everyone's looking after themselves and doing their best to be in the best physical position possible." While acknowledging that the coach does help with the physical aspect of performance, Rachel felt that the psychological aspect of preparation was beyond the scope of the coach's role. Rather, she believed being psychologically ready was the responsibility of the athlete:

> In terms of getting yourself fired up and ready for a game, that's something you got to do, what we've playing for all our lives. You know what works and what doesn't work to get ourselves in the right mindset.

Rachel's view supposed that an athletes' personal competition experiences provided the understanding needed for an athlete to recognize what makes them psychologically ready to play. Though she felt psychological readiness was important for competition, she also viewed this as being the athletes' responsibility to achieve. One way that psychological and physical readiness were characterized by athletes was through a desire to achieve a sense of normalcy in their sports participation.

When discussing readiness to return to sport, Luke related psychological and physical states to those prior to his injury. He noted, "Being able to do everything that you could do before. So nothing's hurting, no symptoms. I'd say confidence to be able to do what you did before the injury." Physically and psychologically, Luke believed readiness meant achieving a state that was reflective of his sporting experiences prior to his injury. Later, he labelled this as 'feeling normal':

> If there's any physical hindrance or anything that's gonna be a mental block, then I think you're probably not ready. I think ten out of ten for me would be, concussion almost never happened, you're back to normal, I think that's what it is.

While normalcy was used as a way to characterize athletes' understanding of readiness, athletes also talked about how they experienced feelings of normalcy throughout the rehabilitation process. This offered some insight into what provides athletes with a sense of normalcy, and how that may also contribute to athletes' experiences of readiness. This was most prominent in Megan's description of how returning to practice positively impacted her psychological state:

> The happiness that I felt because I was going back to what I knew, I was going back to my routine, I was going back to the place that I was familiar with. I was going back to doing everything I would normally do in practice, participating in

> some ways, and with my team and feel normal again. That brought me joy for sure.

Megan's feelings of normalcy were borne from a collection of experiences that connected her to memories of her sport participation prior to her injury. This included returning to the practice space, fully participating in practices, and integrating with her team during practices. By accessing these preinjury experiences, Megan found happiness in her rehabilitation progress, and optimism about her ability to recover. While returning to normal was a description used by only two athletes, the ideas that were used to ground this concept were reflected by the experiences of the other athletes. For instance, Julia described the positive effect that returning to pre-injury levels of participation had for her:

> I was frustrated that I couldn't participate in training or practice when I felt like I should have been able to. That transitioned to excitement when I was able to do the stuff that I love, and I could see the hope that I was going to play again.

Athletes' perceived readiness to return to sport during rehabilitation seemed to be determined by the presence or absence of symptoms, their rehabilitation progress, and their return to normalcy during rehabilitation. How athletes viewed their readiness seemed to change however following their clearance to return to sport.

Athletes' perceptions of readiness when cleared to return to sport are distinct from athletes' readiness for their first competitive game. All athletes received their clearance to return to sport from an athletic therapist. While all athletes believed they were ready to return to sport at clearance, their readiness to return to sport seemed to fluctuate following clearance. Rather, social and psychological factors influenced athletes' beliefs about their readiness to perform in the days after clearance as they approached their first competitive game following rehabilitation

As Megan's first competitive game drew closer, social interactions began to focus on her return more frequently. Megan described this experience "The days leading up to it, people asked 'Are you excited to play? Are you excited for your first game?' that, honestly, really set me on edge and I felt really uncomfortable leading up to it." Though Megan knew that these questions were made with good intentions, they began to have a negative effect on her:

> It put more and more pressure on me. Every time someone would say 'Oh, are you excited to play?' I would get reminded 'I have to deliver, I have to perform, I have to do this really really well' because everyone's gonna be there watching, everyone's so excited, you have to do good. Instead of taking those comments as 'Are you excited to play?' I'd take those comments as 'You better perform, everyone's watching'. So I think that had a negative effect on me.

Megan struggled to prepare herself mentally for the coming game. Comments from peers became reminders that she needed to perform for her first game back. She proceeded to internalize this pressure to perform as a necessary outcome of her return to sport. "I had to show my school and show my team that I was worth it and that I belonged, and so I put a lot of pressure on myself to perform." Rather than receiving comments that focused on her readiness to perform, Megan felt comments that focused on supporting her would have better prepared her for the first game back. "If it had been framed more from a position of 'I'm looking forward to cheering you on' that would've been better." While Megan's pressure to perform was rooted in her social interactions, Julia found herself concerned about her lack of preparation before the first game:

> We don't have a lot of time to prepare, so it's a lot of individual preparation. Obviously I didn't get to participate in for about a month right before and so,

> mainly fitness and stuff is like, would be a big stress I definitely had going into that.

Julia experienced stress and concern over her fitness and the training opportunities she missed during rehabilitation. Concerns about her ability to perform were emphasized when discussing unique characteristics about the game she returned to:

> I didn't participate for about a month right before so fitness is a big stress I definitely had going into that. Also our games are eighty minutes long and I typically play the full eighty minutes, so it's a lot. So, having the exhibition games be a little bit less pressure, a little bit more focus on skill and technique and not winning I guess, I didn't really feel as much pressure.

Julia highlighted that pressure to be physically fit enough to perform as expected was a concern for her. In addition, pressure to perform and win were season game expectations that were not as present for the exhibition game she returned in. Interestingly, while other athletes were concerned about their performance, Luke experienced concerns about whether his participation would put his health at risk:

> It affected my confidence, I knew what I was capable of. Add in a little bit of second-guessing myself with quick decisions. 'Should I be doing this? Does this put me at risk? Is this a safer play?' It was really just confidence I think.

Though believing he could perform, Luke found himself uncertain on how he could participate while safely avoiding injury. This influenced Luke's confidence to approach and respond to situations when participating in sport. Not only were athletes' readiness affected prior to competition, some athletes' found themselves impacted by experiences in the moments before they took to the field.

Readiness to return to sport "in the locker room". Rachel felt that her readiness to return changed for her in the locker room:

> I was nervous, I was really nervous. Actually when I walked into the changing room, my head kind of felt weird. The lights were like super bright and I was like 'Fuck' I thought there was something going wrong again…

Rachel began to experience nervousness and became worried that her symptoms may be returning. So intrusive were these experiences that it became difficult focusing on the coming game. Fortunately, her team was able to help her succeed in this task:

> I think the team, energy off the team helped me meet that level of energy as well. I sort of just started talking to myself and making sure I was ready to go and I don't know, it felt good.

Rachel relied both on her team as well as self-talk prior to the game to focus on what she wanted to achieve, and overcome the nervousness she had felt in the locker room. While Rachel was able to use this time to prepare herself psychologically, Luke was still concerned about his injury risks when returning to sport:

> I don't know, I've heard of people doing yoga, I've heard of people meditating, I've just heard of a bunch of different strategies of trying to get yourself hyped up and ready for the game. Yeah, I wish I knew some tools or made use of them, they would have helped.

These concerns made it difficult for Luke to prepare himself mentally for the game, wishing that he had training in psychological skills to help him focus. Despite these experiences prior to the games, both Rachel and Luke felt that these experiences did not affect them during competition. Rather, athletes described other factors that influenced their readiness during competition.

Perceptions of readiness during the competitive game. Athletes reported a variety of elements that influenced them during their return to competition. Julia was reassured by the support she received from her teammates:

> If I had started experiencing any symptoms from stress or pressure, that kind of thing, I could have talked to them about it. I could have said 'Hey, I don't think I should play in the next half, I'm not feeling good.'

Julia found comfort in knowing that her team would take her seriously if she felt she needed to be removed because of symptoms during competition. Not only did she feel that the need to manage her injury would be considered by her team, she also felt supported by how teammates communicated with her on the field. "Lots of communication with my teammates throughout the game, how are you feeling, that kind of thing. That is going on throughout the whole game, so that was nice. It's nice that people were aware." Overall, Julia felt her team mates actions demonstrated consideration and awareness that it was her first competitive game following her injury. Beyond the actions of her teammates, the context of the match reduced the amount of pressure Julia experienced:

> There was less pressure since it was an exhibition. We played in quarters, so I actually didn't have to play as much as I normally would. It was really a nice transition back into full competition and with the competition not being as stressful.

Julia described several elements of the game that reduced her perceived pressure. Such elements included: the game being unable to negatively affect team standing, competition being less difficult than usually, and playing for shorter shifts. This positive perception of

reduced participation time was also experienced by Luke, who gradually received longer shifts over the course of the weekend:

> I got ten or fifteen minutes. Then the day after that I started the game and got seventy minutes, it was nice. From that first game, nothing too much happened. The day after was a much more intense game, and both felt fine.

Interestingly, Luke also expressed uncertainty about his readiness to return to sport at the time, suggesting that his experience may have changed if he participated for a longer period:

> It's hard to tell because I got so little minutes. Obviously, if I'd played forty-five or a full ninety I don't know if it would've been harder to concentrate at the end, so I'm not too sure with such little game time.

The importance that shorter shifts may have played in Luke's return to sport experience becomes more apparent when considering how he related his confidence to his performance. "I remember being pretty happy that it didn't go to shit in the end, because that would've definitely lowered my confidence even more. I think I played pretty well." Experiencing reduced confidence due to his injury concerns, Luke's ability to perform helped him feel he had successfully returned to sport.

Individual performance was a common concern for athletes' when returning to competition. For Julia, it was the uncertainty she felt about performing sport-specific skills that concerned her, "General skills, not having tackled in a full game for a month. I did have some fear going into tackles, not because I was worried about getting re-injured but because I had taken so much time off." During the game, athletes' concerns shifted towards their individual ability to perform, and relied on their performance perceptions to

gauge the success of their return to sport. This was best exampled by Rachel's perception of her return to sport:

> I was really back mentally and physically. I rebounded from it all really really well. I was just so hyped about how I played, I feel like I couldn't really do anything else. I did what I needed to do.

Here, Rachel used her performance as evidence that she was both mentally and physically ready to return. While success on the field benefited athletes' psychologically, the opposite was also apparent if they perceived their performance negatively.

Of the four athletes, Megan did not feel she performed well during her first game following rehabilitation. Leading up to the game, Megan was challenged by the expectations she felt she had to meet. "I felt if I was to go out there and be on that field, I had to show my school, show my team that I was worth it. I put a lot of pressure on myself to perform." Megan experienced a lot of internal pressure to perform for herself and her peers. In addition to this pressure, Megan found it difficult to focus during the game, which affected her ability to perform. "A million thoughts were going through my head. One thing would happen and instead of making the natural decision, I would go make this ugly tackle. I just, I wasn't thinking." Megan's mental state made sport specific skills, such as tackling, challenging to execute. As the game progressed, Megan found herself becoming increasingly critical of her ability to perform. "I put a lot of pressure on myself, it was not good. I would not perform the way that I wanted to, I would just focus on my mistakes and I would do a lot of negative self-talk." By the end of the game, Megan believed she had played the worst game possible. It was by talking to her coach after the game that she gained additional insight on her performance:

> So, after that game I remember going to talk to my coach and him just being like 'Oh, you had a great game last weekend' I was like 'Really?' and we just talked about it a little bit 'Oh, I did do pretty good that weekend'. It was a perspective thing for sure.

After the game, Megan's coach provided feedback on how she performed during the match. Here, the coach emphasized to Megan that she has performed well by listing the ways she succeeded in competition. This contrasted with Megan's belief that she had performed poorly in her role on the team. The feedback Megan received from her coach helped change her perspective, helping her view her performance during the game less negatively. In summary, while athletes believed they were ready to return to sport when cleared, their readiness was a dynamic experience that changed in the moments prior to, and during their competition.

CHAPTER 4: DISCUSSION

The first international conference on concussion in sports occurred in 2001 and was dedicated to addressing issues of concussion in sport. (Aubry et al., 2001). Since this seminal conference, there has been a burgeoning effort to gather empirical evidence for improving sports concussion rehabilitation guidelines, with an emphasis on the use of the return to sport protocol (McCrory et al., 2017). To date, physical aspects of recovery have been studied extensively, yet the study of how psychological (Bloom et al., 2022) and social factors (Caron et al., 2021) can contribute to, or impede, an athletes' concussion rehabilitation and return to sport is still in its infancy. As a result, there is a limited understanding of a) what the psychosocial factors of sports concussion rehabilitation are and b) whether athletes are psychologically ready to return to sport following a concussion. This study aimed to address these gaps in the literature by exploring university athletes' experiences with concussion rehabilitation using a retrospective multiple-case study research design.

Initial concussion response

Initial perceptions of symptoms and how those symptoms related to previous concussion experiences were used by athletes to determine whether they believed they had a received a concussion. Athletes' initial beliefs about whether they had received a concussion were key to how they responded to proper care. Considering that symptoms can take up to 72 hours to present (McCrory et al., 2017), and that athletes can have troubles recognizing the symptoms of concussion (Fedor & Gunstad, 2015), it is not surprising that when athletes in the current study did not believe they had received a concussion, they either continued

to play or resisted accessing healthcare when removed. What's more, when surveying division 1 NCAA collegiate athletes, Conway and colleagues (2020) found 83% of athletes believed that not knowing if an athlete had received a concussion was sufficient reason for hiding symptoms. Additionally, while a separate survey of college athletes found that "I did not want to miss a game" (40.5% male; 32.5% female) and "I did not want to lose playing time" (40.5% male, 30.9% female) were the top two reasons male and female athletes did not want to report a concussion, "I did not think it was a concussion" was the fourth highest reason reported among 242 males (29.3%), and the third highest reason among 123 females (22.0%) for not reporting a suspected concussion (McAllister-Deitrick et al., 2022).

One recommended approach for mitigating injury has been to remove athletes as soon as there is a suspected concussion (McCrory et al., 2017). However, even when trained to see the signs of a concussion, it can still be difficult to identify a concussion within the competitive environment (Echemendia et al., 2018). This is especially true given significant underreporting of sports related concussions (Conway et al., 2020; Ferdinand et al., 2020; Kroshus et al., 2015), and the potential for athletes to evade their removal from competition (e.g., one athlete in this study waved the trainer off and provided disconfirming evidence that a concussion was received).

Another approach has been to educate athletes about concussion in hopes that increased awareness will result in increased concussion reporting (Kneaval et al., 2020). However, researchers have found that educating athletes benefits athletes' knowledge about concussions, but may only lead to raised awareness with no change in concussion reporting intentions (Caron et al., 2018b). Taken together, these findings highlight the challenge of ensuring that athletes are properly removed when they have received a

concussion. Moreover, they suggest more research on the decision making process behind concussion reporting is warranted to understand how SRC reporting can be improved in post-secondary athletics.

Returning to Work and School

Following their initial injury, all of the athletes in this study quickly returned to work and school regardless of whether they were experiencing symptoms. Alarmingly, the athletes' decision to return with symptoms goes directly against the recommendations for Stage 1 of the RTS (i.e., symptom-limited return to school/work; McrCrory et al., 2017). One reason for the discrepancy may be a lack of policy and procedures at the University level when concerning how to accommodate concussed student athletes in their return to school activities. For instance, a survey of community college institutions found that only 31% of athletic trainers had an SRC policy in place for academic accommodations (Paddack et al., 2016). It has been recommended in the past that primary and secondary schools have concussion policies to guide return to school activities for concussed students (Purcell et al., 2019) and that factors such as symptomology, age, and course load should be considered when returning students to school following an SRC. However, these recommendations seem to be absent in the University context.

A lack of policy and procedures for accommodating athletes with concussion is problematic. Findings from a study of grade 8-12 students who experienced a sports-related concussion demonstrated that students missed anywhere from 2-8 days of school due to their injury, and that physical and cognitive rest were the most helpful accommodation (Russell et al., 2017). In this study, when athletes could make accommodations for their symptoms, they were able to engage in their work or school positively. Alternatively, returning to school without accommodations worsened

symptoms and left athletes concerned about how their concussion would affect their school performance. Taken together, these results highlight a need for better return to school policies and accommodations at post-secondary institutions.

Social Agents

Throughout the steps of the return to sport protocol, the athletes of this study identified several stakeholders and noted the important roles they played during their rehabilitation. These stakeholders were categorized into three groups: parents and friends, team members (i.e. coaches and teammates), and healthcare providers (i.e. physicians, athletic trainers, and therapists). To date, the literature on the social aspects of concussion rehabilitation have highlighted aspects of perceived social support from the perspective of youth and adolescent athletes (Hickling et al., 2020; Kita et al., 2020; McGuckin et al., 2016), as well as post-secondary athletes (Bianco et al., 2001; Covassin et al., 2014; Wayment et al., 2020). While this has helped identify social support from the perspective of the injured athletes, data collected solely from the injured athletes, and using quantitative methods, fail to capture the interactions and dynamics of these relationships and interactions. Recently, there has been a shift towards including the perspectives of other individuals (i.e. coaches, teammates) that are part of the rehabilitation process (Caron et al., 2017; Caron et al., 2021). In doing so, researchers have been able to better explore the social dynamics of the concussion rehabilitation experience. Moreover, research on the social factors of concussion rehabilitation have been focused on the concussion knowledge of social agents such as coaches and parents (Beidler et al., 2022; Chrisman et al., 2021; Feiss et al., 2020; Kroshus et al., 2018; 2021a; 2021b), with limited consideration on the roles of various agents during the concussion rehabilitation process for post-secondary athletes.

Healthcare Providers

For our sample of university athletes, health care providers were important for providing informational support to athletes and helping guide them through the RTS protocol. Specifically, physicians diagnosed athletes, while therapists helped with manual therapies for associated musculoskeletal injuries and cleared athletes to return to sport. Alternatively, athletic trainers assessed athletes during their rehabilitation, administered graded exercise during rehabilitation, and monitored athlete exercise engagement. Interestingly, while physicians diagnosed athletes' concussion, the athletes in this study were uncertain about the role that their physicians played in their clearance to return to full contact practice. While athletes believed a physician signed off on their clearance to return to sport, a physician did not directly assess athletes before their received clearance. This is notable, considering the Canadian Guideline on Concussion in Sport recommends that athletes should receive clearance from a medical doctor to return to full contact sport activities (Parachute, 2017). However, it has been previously noted that clinician advice on SRC management can be inconsistent within Canada (Carson et al., 2016). Given that data was not collected from therapists or physicians for this study, nor were athletes' medical histories accessed, it is beyond the scope of this study to speculate whether athletes were properly cleared to return to sport. Nonetheless, it is important to consider that athletes in this study were returning to sport without being cognizant of the role that their physician played in providing clearance.

While under the supervision of an athletic therapist, student athletic trainers monitored, assessed, and guided athletes' exercise participation

throughout their rehabilitation. Athletes had minimal interaction with the athletic therapist but felt that athletic trainers prioritized their health during rehabilitation. With this said, athletes experienced frustration when athletic trainer's activity modifications and rehabilitation decisions did little to consider their desire participate in sport. Some evidence suggests that athletes' beliefs in their rehabilitation program can be influenced by how they perceive the support they receive from healthcare practitioners (Bone & Fry., 2006). Moreover, research has shown that effective communication skills between the healthcare providers and athletes may improve athletes' rehabilitation adherence (Covassin et al., 2015; David & Larson, 2018). Given the sometimes conflicting interests of the athletes we collected data from (i.e., wanting to return to sport and wanting to get better), a greater understanding of how athletes and trainers communicate is needed. Such information may provide insight on ways to improve athletes' rehabilitation beliefs, experiences, and adherence when moving through the RTS protocol.

Team Members

During athletes' rehabilitation, team members occupied additional roles according to their position (e.g., coach or teammate). For instance, whether it was their intention or not, coaches had a large influence on athletes' rehabilitation expectations. When coaches told athletes to focus on rehabilitation and recovery, they felt supported and experienced less pressure to return. However, when coaches emphasized returning by a certain event (training camp or specific game) athletes felt both guilt and pressure. It has been suggested by Kroshus et al., 2015 that coaches may shape reporting behaviors in team members indirectly through communication, or their ability to control commodities in sport (i.e. playing time). Similarly, Caron et al., (2021) found that comments made by coaches to athletes about returning to sport could be internalized by athletes and result in

feelings of pressure. Taken together, these findings suggest that coaches need to be cautious when speaking to athletes about their return to sport and that initial conversations can influence athletes' perceptions and rehabilitation behaviours.

Coaches also played an important tangible role in athletes' recovery as they were responsible for making modifications to practices, accommodating the athlete's concussion recovery. Considering that concussion has the potential to affect athletes' perceptions of their roles and personal identity (Caron et al., 2017; Ronkainen et al., 2016), as well as create feelings of isolation (Caron et al., 2013, 2017; Cassilo et al., 2019), it is beneficial to explore how coaches accommodate and integrate athletes into practices during the rehabilitation process, and whether such accommodations are feasible. In this study, practices that excluded physical contact, and reduced intensity drills allowed concussed athletes to participate alongside teammates. Additionally, coaches adapted sport-specific drills based on exercise restrictions provided by athletic trainers so their athletes could participate. Athletes appreciated these adaptations and felt supported in the rehabilitation process when they were included in practices, especially when adaptations were relevant to their specific role on the team.

Teammates made general efforts to provide emotional support to athletes when they were present at practices. For instance, teammates often asked athletes about how they were feeling, when athletes would be returning to sport, and expressed sympathy for athletes' desire to return to sports participation. How athletes perceive support (Clement & Shannon, 2011) has been shown to play a role on whether they respond positively or negatively, impacting the effectiveness of the support. Likewise, when athletes in this study interpreted teammates'

questioning as acknowledging their injury or being invested in their recovery, they responded positively. Alternatively, when Megan interpreted her teammates questioning as being focused on her injury, she felt disappointed in herself and that she was letting her team down. This would suggest that how an athlete is affected psychologically by their injury plays a role in the athletes' perception of support received by teammates.

To provide effective support, Freeman (2021) recommends that support providers should be aware of the context and stressors that an athlete faces. This may explain why in this study Rachel found comfort and support in other injured athletes who were removed from sport. It is possible that the experiences of the injured athletes allowed them to reciprocate sympathy for her injuries and frustrations towards her removal from sport. Thus, research into social support from teammates during concussion rehabilitation may benefit from considering the recipient-provider interactions and contextual stressors that are present during the concussion rehabilitation process.

Parents and Friends

Outside of the sport environment, athletes relied on support from both parents and friends. In this study, athletes received informational support (e.g., emphasis on negative implications of concussions, further injury, and encouragement to avoid further injuries), emotional support (e.g., listening to athletes' frustrations and challenges during their rehabilitation) and esteem support (e.g., expressing belief that athletes could overcome challenges). Findings from this study parallel those from a large survey (n=419) of parents of youth soccer athletes that showed the vast majority (85%) of parents believed concussion was a serious injury and expressed concern about the long-term impact of concussion (i.e. permanent brain damage) (Kim & Connaughton, 2021). Considering that

Fuller et al., (2020) found that college athletes were more likely to report a suspected concussion if they believed their parents wanted them to report, and athletes in this study also relied heavily on their parents for guidance during rehabilitation, it seems that parents provide an important role in concussion rehabilitation even as athletes progress into post-secondary athletics.

Athletes also sought support from non-athlete friends during their rehabilitation. These friends provided both tangible and emotional support for athletes. Tangible involved helping athletes manage their concussion needs (e.g., managing symptoms, avoid potentially harmful situations), and emotional support involved listening to athletes about the challenges they were experiencing with their concussion, and helping athletes feel cared for. Of interest, Megan noted that because she felt she had let down her team and was disappointed in herself, she preferred talking about her concussion rehabilitation with non-sport friends rather than her teammates near the beginning of her rehabilitation. One explanation may be that teammates can be perceived as an extension and representation of the sport culture in which they inhabit. Thus, athletes who prioritize health related outcomes (i.e. recovery) over outcomes prioritized by the sport culture (i.e. return to sport) may feel that their athletic role is in question when they are reluctant to return or have difficulties returning (Anderson et al., 2021). Such a culture may contribute to the feelings of responsibility and guilt in athletes recovering from concussion (André-Morin et al., 2017). If so, it would suggest that there are support based benefits that non-athlete friends can offer which may not be possible by team members.

Goal-setting and Pressure to Return to Sport

Athletes' rehabilitation was also influenced by the personal goals they created for themselves during the return to sport protocol. Goal setting is a form of psychosocial

intervention that has been used in musculoskeletal sports injury rehabilitation (Gennarelli et al., 2020). Goals within the rehabilitation often focus on process and performance goals, with an emphasis on rehabilitation adherence and return to sport (Evans et al., 2002; Scherzer et al., 2001). Considering that the focus of concussion rehabilitation is mainly on completing steps without symptoms (McCrory et al., 2017), and is less focused on improving athlete performance overtime, goal-setting may be used differently in the concussion rehabilitation setting. For instance, athletes in this study centered their goals on returning in time for a sports specific event (i.e., training camp) or competitive game, and one athlete used the return to sport as an opportunity to see family. Unfortunately, despite acting as an initial motivator, creating event based goals resulted in feelings of anxiety and pressure to meet these goals, and frustration, anger, and envy when they were unable to meet their rehabilitation goal. When considering that the concussion rehabilitation can be non-linear and unpredictable, the use of return to sport goals may not be practical for concussed athletes (McCrory et al., 2017), and considerations should be made on how to make meaningful goals that don't focus solely on the athletes' return to sport.

One suggestion for making meaningful goals is to create a hierarchy of goals (Dekker et al., 2020). Goals can be hierarchical in the time it takes to achieve them, and the abstractness of those goals (Wade et al., 2009). Creating progressive more immediate goals that link to the athletes' long-term aspirations (i.e., return to sport) may help athletes focus on their rehabilitation and reduce pressure to return to sport. For concussion rehabilitation, lower order goals may direct the athlete towards successfully progressing through the stages of the rehabilitation process. Additionally, these lower order goals may highlight how adherence to their rehabilitation can maximize the efficiency with which

they are able to return to sport (i.e., reach their higher order goal). However, future research is needed on the collaboration and communication between the athlete and the healthcare provider in order to better set goals that are relevant to the concussion context.

Athletes' Psychological Readiness to Return to Sport

A final factor that influenced athletes' rehabilitation was whether they believed they were ready to return to sport following concussion. During rehabilitation, athletes desired a sense of normalcy and wanted to return to a physical and psychological state that was similar to how they felt prior to their injury. From a physical standpoint, athletes' feelings of readiness were closely tied with their experience of physical concussion symptoms. Specifically, athletes associated returning or increasing symptoms with lower readiness to return to sport, and subsiding symptoms with an increase in readiness. The link between symptoms and perceived readiness is not surprising, given that the stages of the return to sport protocol are based on symptom limited progression, and that a return of symptoms delays an athletes' return to sport progress (McCrory et al., 2017).

From a psychological standpoint, athletes' feelings of readiness paralleled some aspects of Podlog and colleagues' recent definition of psychological readiness. Podlog et al. (2015) conceptualized psychological readiness within three dimensions: confidence in returning to sport, realistic expectations of one's sporting capabilities, and motivation to regain previous performance standards. In this study, confidence was only referred to by one athlete in association with readiness to return to sport, and it related to having a lack of confidence in their ability to participate in sport due to injury concerns. However, when athletes

talked about readiness, they did believe they were ready to return to full competitive participation, which can infer confidence. While it is likely that athletes rely on confidence as part of their return to sport, it possible that athletes are less aware of the role confidence plays in their readiness if it is unaffected during the rehabilitation process. This would suggest that in the context of readiness to return to sport, it may be beneficial to identify whether an athlete experienced a loss of confidence during their rehabilitation, and then work with the athlete on restoring that confidence prior to their return to competitive sport.

Participation Concerns

Athletes also experienced concerns about their ability to participate without injury, and whether they could perform adequately shortly before their competitive return. Such concerns suggest that athletes were uncertain about what to expect when returning to sport. With musculoskeletal injuries, athletes have highlighted realistic expectations of their sporting capabilities as being important for their psychological readiness to return to sport (Podlog et al., 2015). Interestingly, athletes developed these expectations using patience, accepting one's post-injury limitations, and goal-setting that outlined their rehabilitation steps. In contrast, athletes in this study set time-sensitive return to sport goals rather than rehabilitation goals. Additionally, they had difficulties identifying their exercise limitations post-injury which resulted in symptoms that delayed the rehabilitation process. Given that concussion rehabilitation is a symptom limited progression of exercise (McCrory et al., 2017; Voss et al., 2015) it may be difficult for athletes recovering from a concussion to form accurate expectations during the rehabilitation process. As such, it may be worthwhile exploring whether goal setting, applying patience,

and learning to accept their post-injury limitations can improve the return to sport expectations of athletes recovering from concussions.

Performance when Returning to Sport

Finally, athletes expressed desires and motivation to return to sport, however, it was less clear on how their return was tied to performance standards. Notably, athletes felt held back by their rehabilitation, being continuously monitored, and restricted from certain types of exercise. Thus, athletes were more focused on simply returning to sport, instead of specifying a level of performance. In Podlog et al., 2015, athletes were more specific and used their desire to return to preinjury performance standards as a motivator to work hard during their rehabilitation. This is likely because athletes with musculoskeletal injuries can use progressive therapeutic exercises (e.g., gravity eliminated exercise, body weight exercises, weighted exercises) to improve the strength of the injured body part, while functional assessments (e.g., balance/stability testing, jump testing, reaction time testing) can help them gauge their capacity to perform. Such assessments can then be compared to preinjury functional outcomes to determine their return to preinjury levels of performance. Conversely, our athletes with concussions were limited to avoiding exercise that caused symptoms and had to wait for clearance to return to sport. Given this, it seems that one contrast between athletes with musculoskeletal injuries and athletes with concussions is the amount of performance-based information available to them during rehabilitation. In sum, while these results highlight how the broader definition of psychological readiness given by Podlog et al., (2022) can reflect concussed athletes' experiences,

contextual factors of injury are important in determining the aspects of psychological readiness when returning to sport.

Limitations and Considerations

This study used a combination of interviews and timelining to offer a detailed account of the psychosocial factors that post-secondary athletes perceived to be important in their sports concussion rehabilitation. However, a notable limitation of this study was that data was collected solely from the perspective of the concussed athlete and did not consider other social agents in the rehabilitation process. As such, the behind the scenes role of various social agents may not have been captured in our results. For instance, in this study it is very likely that physicians had a greater role in athletes' rehabilitation, but because they were not on the front line interacting with athletes, their role may have been understated.

Another limitation of the study was that there was a wide range in time between when athletes received their concussion and the beginning of data collection (i.e., one month to four years). As a result, athletes' interpretations of their concussion rehabilitation may have changed since their return to sport. One way to mitigate this issue was the use of timelining (Sheridan et al., 2011). Visual methods of data collection, such as timelining, have been proposed to improve the quality of data collected within the field of qualitative sport psychology research (Smith & Sparkes, 2016). In this study, by having athlete's timeline prior to interviews, we provided opportunities for them to review their rehabilitation experience, allowing them to better orient themselves within their memory of their concussion experience.

While timelining certainly benefited our semi-structured interviews, the retrospective nature of this process still has some limitations. For instance, concussion

rehabilitation can be a lengthy and uncertain process (Steins et al., 2021), which likely impacts athletes' perceptions of readiness. Since athletes in this study had already completed their rehabilitation, they knew when they had successfully returned to sport, and were able to create their timeline and participate in our interviews with that knowledge available. Thus, future studies should consider having athletes create timelines prospectively after receiving a concussion, which may elicit more information on how perceive changes to their rehabilitation process (e.g., return of symptoms, having to repeat a stage of the return to sport protocol) influences their readiness.

Finally, this study collected data primarily from female participants. It has been recognized in the concussion literature that there is an under-representation of female participants in research on clinical concussion care (D'Lauro et al., 2022). Conversely, the majority of results from qualitative research on concussion rehabilitation experiences are overrepresented by female athletes (e.g., André-Morin et al., 2017; Caron et al., 2017; 2021), a trend reflected in this study. Thus, it is important to note that our results may need to be interpreted through a female lens. Specifically, sex differences related to risk of concussion injury and the effects of that injury have been identified in the literature. For instance, Females have been found to be at greater risk of concussion than male counterparts during games (Covassin et al., 2003), and are more willing to report concussion symptoms (Wallace et al., 2017). Suggested explanations for these differences have included biological differences (i.e. Cervical strength; Ryan et al., 2005, Hormone differences; Fountaine et al., 2019) as well as psychosocial differences (i.e. inter-personal factors; Kerr et al. 2016).

Sex differences may indeed play a role in how athletes respond to social aspects of their rehabilitation experiences. For example, a peer concussion education program was found to be more effective for improving return to play knowledge, intention to report and attitudes towards concussions for females (n = 511) over males (n = 1100) (Kneaval et al., 2021). The findings in this study may also indicate sex differences in how athletes perceive their concussion rehabilitation. For instance, Luke (i.e., the only self-identified male participant in this study) was the only participant who felt social factors did not play an important role in his rehabilitation. This contrasted with the female participants, who all felt that social agents were important for their rehabilitation and return to play. Taken together, these results suggest that the social components of rehabilitation may hold a greater importance during concussion rehabilitation for females than males. Thus, researchers would benefit from applying these results when developing studies that have a primary focus on female athletes. Future research should also consider how to improve participation from male athletes in qualitative studies so that their experiences of rehabilitation and return to sport are better understood within the literature.

CHAPTER 5: GENERAL DISCUSSION

The general purpose of this thesis was to explore the psychosocial factors involved in athletes' concussion rehabilitation and their readiness to return to sport. Two research questions guided this dissertation: a) "What psychosocial factors affect athletes' RTS experiences following a sports related concussion?" b) "Do athletes feel psychologically ready to return to sport after completing the RTS protocol?" By addressing the research questions, the results from this thesis make notable contributions to our understanding of university athletes' experiences rehabilitating from a sport related concussion and progressing through the return to sport protocol. Specifically, the results have theoretical implications related to the psychological factors affecting university athletes' concussion rehabilitation and our knowledge of psychological readiness within the university sport context. Our findings also have both theoretical and practical implications for stakeholders who deliver or complete the return to sport protocol. Finally, methodological contributions were based on the procedures applied in the current thesis that are important for researchers to consider when studying concussion rehabilitation.

Psychological Factors Affecting University Athletes' RTS Experiences

To date, the literature on collegiate athletes has largely focused on athletes' concussion knowledge and attitudes (Beidler et al., 2022; Doucette et al., 2021; Ernst et al., 2020) and athletes' concussion reporting behaviours (Pennock et al., 2020; Kroshus et al., 2015). One benefit of this study was the insight provided on how athletes shaped their rehabilitation and return to sport beliefs throughout the course of their rehabilitation process. Based on the accounts of four university athletes, we identified five psychosocial themes related concussion rehabilitation during the return to sport protocol: (a) Initial

concussion responses were influenced by athlete's perception of concussion symptoms, (b) Athletes experienced concussion related challenges returning to work and school, (c) Social agents influenced athletes' experiences and perceptions of their concussion rehabilitation throughout the return to sport process, (d) Athletes created time-sensitive rehabilitation goals around sporting events which have negative psychosocial effects when not achieved, and (e) Athletes' perceptions and experience of readiness to return to sport during concussion rehabilitation and their return to competitive sport. Together the results demonstrated that athletes' perception of their injury is a dynamic process which is influenced by previous concussion experiences, symptoms, the athletic and academic context, and the stakeholders that are part of the rehabilitation process.

Do Concussed Athletes Feel Psychologically Ready to Return to Sport after Completing the RTS protocol?

As research on psychological readiness to return to sport has developed, there has been a broadening of what it means to be psychologically ready to return to sport. Initial research on athletes with musculoskeletal injuries relied on the measurement of individual psychological constructs (e.g., confidence, anxiety, or fear of reinjury) to infer readiness to return to sport (Glazer et al., 2009; Webster et al., 2008). More recently, Podlog and colleagues have made attempts to operationally define psychological readiness and expand our understanding of the factors that influence it. For instance, Podlog et al., (2015) found that confidence in returning to sport, realistic expectations of one's sporting capabilities, and motivation to regain previous performance standards may represent dimensions of psychological readiness. Podlog and colleagues (2022) later broadened the concept of psychological readiness to include cognitive appraisals (i.e. confidence, expectations, motivations, risk appraisals, internal or external pressures), affective

(anxiety, moods), and behavioural components (approach-avoidance behaviours to physical function and sport-specific tasks). Together, Podlog and colleague's work highlights the complexity as well as our limited understanding of what it means to be psychologically ready to return to sport after suffering a musculoskeletal injury.

While Podlog et al. (2022) have made significant contributions to our understanding of psychological readiness pertaining to musculoskeletal injuries (Podlog et al., 2015), it is still unclear whether concepts related to psychological readiness apply as readily to concussed populations of athletes. For instance, while realistic expectations are important for athletes with musculoskeletal injuries, athletes' expectations were less clear in this study. Instead, athletes shared many concerns about their ability to perform and their ability to perform without receiving an injury. In fact, it was only after athletes assessed their own performance during competition that they made judgments on their readiness to return.

One explanation for why realistic expectations may be more appropriate for athletes with musculoskeletal injury is that they have more information about the state of recovery of their injured body part. For instance, athletes with musculoskeletal injuries can be prescribed a progressive program to strengthen the injured body part, may be provided with demonstrations on how to engage in these exercises, and receive functional assessments of the injured body part which can be performed over the course of rehabilitation (Magee et al., 2015; Kvist, 2004; Taberner & Cohen, 2018) – which are more difficult with concussion. Athletes with a musculoskeletal injury are also able to test what level of physical exertion their injured body part can sustain (which may improve confidence and inform performance expectations when athletes see improvements).

Another important consideration is that when athletes with musculoskeletal injuries test their injured body part, the return of symptoms is not seen as a sign of physical dysfunction like it is with a concussion. Indeed, a large body of research in lower-back injuries demonstrates how stopping activity based on experiences of symptoms such as pain can lead to worse functional outcomes (Crombez et al., 2012; Vlaeyen & Linton, 2000). Therefore, one possibility for increasing confidence and setting more realistic expectations would be to put concussed athletes through a graded physical exertion test before returning to sport. The Buffalo Concussion Treadmill Test (BCTT) and Buffalo Concussion Bike Test (BCBT) are two examples of exercise tolerance tests that could be used for concussed athletes (Leddy et al., 2018). For instance, for the BCTT, a treadmill is set at 3.3 MPH with a 0% incline. After 1 minute, the grade is increased to 2.0%, and it subsequently increased by 1% each minute after. During this test, blood pressure, heart rate, and a rating of perceived exertion are assessed every minute. Once the individual experiences an exacerbation of symptoms, the test is concluded (Leddy et al., 2013).

While there is some question as to whether testing should be run until athletes experience symptoms, applying such physical tests (e.g., BCTT) during the concussion rehabilitation process may provide benefits that are reflective of functional assessments tests used in musculoskeletal rehabilitation. For example, instead of simply removing athletes for experiencing symptoms, concussed athletes who use the BCTT could be provided with information about how their capacity for physical exertion has changed (i.e. heart rate, rate of perceived exertion). Athletes in this study reported drops in psychological readiness on their timelines when they experienced symptoms and had feelings of frustration and guilt when they experienced symptoms due to exercise.

Helping athletes develop an understanding of their capacity for exercise during the rehabilitation process may therefore be valuable in reducing rehabilitation setbacks from symptoms induced exercise, as well as psychological factors related to these setbacks.

Given that the onset of symptoms stops athletes from proceeding in their RTS, it's difficult to know whether the current athletes' perceptions of readiness were a product of the RTS design, or whether they were attributed to the experience of symptoms alone. Regardless of athletes' interpretation, one can assume the athletes felt that their symptoms were indicative of them being unfit to return to sport. Taken together, testing whether knowing one's capacity for physical exertion has increased (based on the results of a BCTT or similar test) helps (a) blunt the psychological effects of a return or increase of symptoms and (b) improve athletes' beliefs about their ability to perform without injury is a worthy pursuit for future studies.

Considerations for the Return to Sport Protocol

The current results have practical implications for the return to sport protocol (McCrory et al., 2017). The RTS is a six-stage protocol designed to gradually reintroduce athletes to increasing levels of exertion until they can participate in full-contact practices without experiencing concussion symptoms. Upon succeeding at this level of participation, the protocol assumes athletes are ready to return to competitive sport, with athletes completing the protocol at stage 6. Findings in this study highlight contrasts between athletes' experiences of progressing through the RTS, and the guidelines of the RTS. To explore the implications these findings may have for RTS, this section will consider RTS according to the goals associated with the stages. Specifically, how gradual reintroduction to school and work activities (Stage 1), increased physical and cognitive

exertion (Stages 2-5), and a return to competitive sport (Stage 6) occurred for our sample of university athletes will be discussed below.

Stage 1

The goal for Stage 1 is to gradually reintroduce athletes to school or work at Stage 1 once symptoms have subsided. In this study, none of the athletes reported a gradual reintroduction to school or work, and instead, returned immediately to school or work regardless of their experience of symptoms. Currently, research on athletes' return to school following concussion has focused on the experiences of youth athletes. In a systematic review on factors that should be considered when returning adolescents and children to school, it was suggested that schools should have a concussion policy and offer individualized academic accommodations to students recovering from SRC on RTS (Purcell et al., 2019). Additionally, they recommended that students may require temporary accommodations from school after SRC and that clinicians should assess risk factors that may prolong recovery. Absent from the literature are considerations for how post-secondary athletes return to school.

When considering that post-secondary students are at-risk for chronic stress and poor mental health (Linden & Stuart et al., 2020), it is alarming that research has not considered the impact that concussions may have on athletes in this high-stress environment. Notably, at least one athlete in our study experienced a worsening of symptoms related to her school participation, while another experienced adverse psychological effects related to her concerns about how her concussion may affect her academic performance. Future research is needed to explore how we can better accommodate athletes who suffer from SRC. For instance, when asking general population university students about their lived experiences with academic

accommodations, Prior (2022) found that factors beyond the student's control such as pre-existing barriers (i.e., symptoms worsened by school participation) factors beyond the students' control (e.g., faculty and familial support, financial resources) affected whether athletes felt accommodated, and created discrepancies in the provision of accommodations to students. Determining how university athletes can navigate some of these barriers and learning what supports and resources exist for athletes suffering from a SRC would certainly facilitate a healthier return to school as part of their concussion rehabilitation process.

Stages 2-5, Physical and Cognitive Goals

Stages 2-5 have both physical and cognitive goals for athletes' rehabilitation (McCrory et al., 2017). Physical goals include increasing heart rate, movement, coordination, along with the assessment of an athletes' functional skill at stage 5, whereas cognitive goals include increased thinking at stage 4, and restoring confidence at stage 5. The current results suggest that the psychological goals of the RTS should extend beyond restoring confidence and should include variety of goals pertaining to mental health and wellness. For instance, athletes shared adverse psychological experiences such as feelings of loss and sadness near the beginning of their rehabilitation, frustration during stages 2-5 of their rehabilitation, along with feelings of pressure and anxiety that increased as athletes came closer to their rehabilitation goal. Athletes associated these experiences with their removal from competitive participation, perceptions of the rehabilitation process, concerns about their performance when returning to sport, concerns about being able to perform without receiving further injury, and their desires to return to competitive sport.

Other authors have recognized the importance that psychological factors may play during the entire rehabilitation process. Bloom and colleagues (2022) made a call for post-concussion mood and emotional symptoms to be evaluated in all athletes, and for management to be practiced on an individual basis. For instance, they suggested that the Beck Depression Inventory could be used to profile athletes for anxiety as part of their concussion rehabilitation. Another tool that may assist in understanding the psychological underpinnings of concussion rehabilitation is the Profile of Mood States second edition (POMS 2; Lin et al., 2014), which measures transient and affective states including: Anger-Hostility, Confusion-Bewilderment, Depression-Dejection, Fatigue-Inertia, Tension-Anxiety, Vigor-Activity, Friendliness, and includes a total mood disturbance score. Considering that concussions can result in mood disturbances, sleep disturbances, and feelings of isolation, application of such a tool within a concussion rehabilitation setting may be valuable for understanding athletes' emotional experiences and mood across their rehabilitation. Regardless of the tool used to assess athletes, our results suggest that there is the potential for athletes to experience a variety of complex psychological challenges during their concussion rehabilitation, and that psychological assessment in all stages is warranted.

Stage 6

Stage 6 of the RTS is the return to sport stage and engaging in "normal gameplay" is the goal (McCrory et al., 2017). In this study, athletes viewed their return to sport as the goal of their rehabilitation. Indeed, athletes chose sport specific events (e.g., training, competitive games) to use as return to sport goals. However, the RTS does not provide any guidelines about preparing athletes for their competitive return. Athletes in this study experienced concerns about their ability to perform, and their ability to participate

without receiving further injury when returning at sport in stage 6. This may suggest that while the goals for the return to sport protocol are sufficient for preparing athletes to return to sport in the context of practice, it may not adequately prepare them for the demands of competition.

When athletes receive musculoskeletal injuries, they are given exercises and drills that can strengthen the injured body part with the intention that those drills will help prepare them for competitive sport (Magee et al., 2015). In contrast, athletes in the RTS are progressed through stages based on whether they can participate in increasingly physical exertion without experiencing a return of symptoms. Though the RTS guidelines suggests that coaching staff should assess functional skills at some point, there are no recommendations on what these functional assessments should be, and what they should prioritize. Given the growing body of literature suggesting that athletes are at a greater risk of lower extremity injury following concussion (Avedesian et al., 2020), it may be valuable developing recommendations on how to better assess and prepare athletes functionally for their return to competitive sport at stage 6.

Timelining for Studying Concussion Injury Experiences

In this thesis, several methodological contributions were made based on our procedures that are relevant for studying concussion rehabilitation. First, the use of timelines may have enhanced the quality of our participants' interviews. Individual, semi-structured interviews have found to be a predominant method of data collection within the sport psychology interview (McGannon et al., 2019). While interviews play a valuable role in understanding participant experiences, they can be limited in capturing the complexity of those experiences (Smith & Sparkes., 2014). Timelining is valuable addition because it allows participants to visually represent their experiences in relation to

the passage of time (Sheridan et al., 2011). Moreover, timelining can have an additive effect when used with other data collection methods because it overcomes the time restrictions on interviews that can lead to losses in capturing the complexity of people's experiences (Sparkes & Smith, 2014). For example, timelining was particularly useful in our study for allowing participants to situate events and experiences in the chronological order context of their rehabilitation. Additionally, timelining allowed participants to freely engage with their experiences prior to interviewing, providing time for them to develop their understanding of their experiences, which may have better positioned them when sharing these experiences with researchers. Additionally, timelining allowed individuals to organize events and experiences within a chronological order and add meaning to their experiences using the vertical axis or dimensions afforded.

Second, given that memory dysfunction can be a challenge for athletes who have experienced a concussion (Kutcher & Giza et al., 2014), timelining may help athletes recall the order of events and experiences that occurred during their concussion rehabilitation. In this study, athletes used timelining to recount their concussion rehabilitation experiences prior to interviewing. During this process, athletes consulted sources (i.e., calendars, journals, emails etc.) to assist in recalling events, and organize these events chronologically. Considering that timelining was a participant-led process that allowed athletes to work with their timeline over several days or weeks (Sheridan et al., 2011), it may have facilitated recall by allowing athletes to reflect on their concussion experiences, and understand the chronological order of events, emotions, and thoughts that they had during their concussion rehabilitation.

Third, timelining allowed for a novel method of tracking psychological readiness throughout the stages of the RTS protocol. Specifically, psychological readiness to return

to sport was captured on athletes' timelines through a vertical scale. This scale had "completely ready to return to sport" at the top of the timeline, with "completely unready to return to sport" at the bottom of the timeline. Considering that psychological readiness to return to sport is defined as a "state of mental preparedness to resume sport-specific activities that can shift over the course of one's recovery" (Podlog et al., 2022), the ability for the scale to allow athletes to represent the dynamic nature of readiness is notable.

Currently, other scales have been used to infer psychological readiness which measure singular psychological constructs such as confidence (I-PRRS; Glazer et al., 2009), anxiety (RIAI; Walker et al., 2010), fear of reinjury (TSK; Huang et al., 2019), and self-efficacy (KSES; Baez et al., 2020), and these scales are often used in studies that employ retrospective cross-sectional designs. As such, these scales are limited in their ability to connect psychological constructs with psychological readiness and assessed readiness throughout the course of the rehabilitation process. While the timelining used in this study cannot be considered a longitudinal method of data collection, it allowed participants to situate data within the context of time, and to represent their perceptions of psychological readiness and other psychological constructs over the course of their rehabilitation.

Timelining may also be valuable for data collection in studies that employ a prospective design for understanding concussed athletes' rehabilitation process. A consideration when studying individuals with concussions is that the nature of their symptoms may make some forms of data collection such as journaling or interviews challenging (Caron et al., 2017). Symptoms also have the potential to change unpredictably in response to stimuli such as light and sound, as well as physical exertion. Participant led timelining may allow athletes to account for these characteristics of

concussion that may normally be prohibitive to data collection. In its simplest form, timelining has the potential for concussed individuals to track their experiences during the concussion rehabilitation process by using the visual format of the timeline, rather than requiring athletes to write their experiences. Additionally, a participant-led approach to timelining can allow concussed individuals to engage with the timeline when they are most able according to their symptoms. Finally, the vertical axis of the timeline could be used to track qualitative measures such as the vertical dimension of psychological readiness that was used in this study or could be used to develop quantitative measures of psychological factors (i.e., anxiety, fear, confidence) to gauge how athletes' perceptions of these emotions change prospectively over the course of their rehabilitation. Further consideration therefore should be given with using timelining as a prospective measurement tool within concussion research.

Conclusion

This study explored the psychosocial factors of post-secondary athletes' concussion rehabilitation who used the return to sport protocol, and whether these athletes felt psychologically ready to return to sport. Five themes were developed from the accounts shared by these athletes: (a) Initial concussion response influenced by athlete's perception of concussion symptoms, (b) Athletes experience concussion related challenges returning to work and school, (c) Social agents influence athletes' experiences and perceptions of their concussion rehabilitation throughout the return to sport process, (d) Athletes create time-sensitive rehabilitation goals around sporting events which have negative psychosocial effects when not achieved, (e) Athletes' perceptions and experience of readiness to return to sport during concussion rehabilitation and their return to competitive sport. These findings suggest several considerations for the psychological,

social, and contextual factors that influence the rehabilitation and return to sport experiences of athletes. First, reported psychological factors not only included emotions (i.e. frustration, anxiety, depression) but also included athletes' concussion beliefs and how they can influence the athletes' initial response to injury. Additionally, athletes showed that they desired to use tools such as goal-setting to help guide their rehabilitation process, and the use of psychological tools to prepare for return to competition. As a result, the psychological factors of concussion rehabilitation are multivariate, each playing a diverse role throughout the rehabilitation and return to sport process. Our findings somewhat contradict the recommendations in the return to sport protocol which only address psychological factors in Stages 4 and 5.

Uncertainty remains about how athletes conceptualize psychological readiness to return to sport in the concussion rehabilitation context. While athletes expressed feeling psychologically ready to return to sport at clearance, their experiences of readiness seemed to change as they drew close to, and during, their first competitive game. Improving psychological readiness therefore may be less about attaining an idealized state of readiness, but rather about developing approaches that improve athletes' psychological states so that they can successfully return to sport without further injury or impairment. Developing approaches that can identify which psychological processes an athlete feels were impacted by their injury, and then addressing those specific processes may therefore be a way of helping athletes achieve a sufficient level of readiness when returning to sport.

A wide variety of social agents also influenced athletes throughout the rehabilitation process. Of note, parents played an important role during the rehabilitation process. If it is the case that post-secondary athletes rely on parents for support during

their rehabilitation, understanding what parents provide for these athletes may provide insight into the types of support athletes need when recovering from their concussion. Additionally, athletes' experiences returning school/work highlighted the challenges that can result when returning while symptomatic. This is of particular concern, both because the return to sport protocol suggests athletes should not return to school or work until symptoms have subsided, but also because athletes were not provided with accommodations to help manage their concussion related challenges. This would suggest that greater consideration needs to be made in academic and work environments to improve athletes' rehabilitation experiences and psychological wellbeing.

Finally, it should be stated that while this study explored the psychosocial factors of concussion rehabilitation, there appeared to be context specific factors (i.e. institutional, interpersonal) which affected athletes during their rehabilitation. Institutionally, athletes were not given any accommodations from their academic institutions for their injury when returning to school. This resulted in a worsening of symptoms and difficulties meeting academic demands. Interpersonally, social agents that athletes had pre-established friendships with (i.e. teammates, roommates, coworkers) seemed to provide a foundation for athletes to access support during their rehabilitation. The role of these within this study seem to suggest that the context in which the athlete experiences their concussion is important to athletes' experiences of rehabilitation success.

With this in mind, it should also be considered how an athletes' individual factors interact with their rehabilitation context. For instance, concussed individuals with higher levels of neuroticism have been found to be more likely to report post-concussion symptoms (Summerell et al., 2021), while higher conscientiousness saw lower

endorsement of post-concussion symptoms. Additionally, higher conscientiousness was associated with later return to play in undergraduate students (N = 202), while other personal traits such as sensation seeking and experience seeking behaviours have been associated with earlier return to sport following concussion (Weishaar et al., 2021). More broadly, a large cohort study of adults with a concussion diagnosis (Ontario Concussion Cohort study, 2008 to 2016; *n* = 1,330,336) was able to find strong association of premorbid psychiatric conditions (i.e. bipolar disorder, personality disorders, anxiety and depression) and older age (>61 years) with increased risk of prolonged post-concussion symptoms (Langer et al., 2021). Consideration of personal factors in future research may help improve our understanding of the complex interactions which shape athletes' experiences of rehabilitation and return to sport following a concussion.

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Appendix A: Coach Information Letter

To whom it may concern,

I am contacting you in the hope that you will consider supporting our research project and grant permission for us to recruit participants from your sports team.
Data for this study will be collected for the purposes of a Master's thesis at the University of Lethbridge for Quinn Johnsson under the supervision of Dr. Scott Rathwell and Dr. Claudia Gonzalez. The purpose of this study is to explore the psychosocial factors that play a role in an athlete's rehabilitation from a sports related concussion and the psychological readiness of athletes when returning to sport following concussion rehabilitation. Specifically, we will be asking athletes about their rehabilitation experiences from their most recent sports related concussion, and their return to competitive sport following the completion of the return to play concussion rehabilitation protocol.

For this study, athletes will be asked to participate in two remote interviews over zoom and to create a timeline of their concussion rehabilitation experience. Interviews will be conducted in English, therefore it is important that athletes are able to read, write, and understand English. Each interview will take approximately 60-90 minutes. Up to two weeks will be allotted between each interview, meaning that data collection will take course over the span of ~1 month.

Timelining is a method of data collection that allows a person to create a chronological visual representation of their experiences. This timeline is intended to capture experiences and events during your athletes' rehabilitation that shaped their concussion rehabilitation and return to play. Timelining supplies will be provided to your athletes through mail or delivery. Timelining supplies will be packaged for 7 days prior to mailing to eliminate potential contamination from COVID-19. The researcher will follow all government mandated safety guidelines regarding COVID-19 to ensure that timelining contents do not pose a health risk to participants.

With your permission, we would like to recruit athletes from varsity and club teams that you coach in association with the University of Lethbridge. We are asking for your assistance with recruitment by asking you to send the attached Athlete Recruitment letter by email to your athletes. This Athlete Recruitment letter will invite athletes to contact researchers by email or phone if they would like to participate in this study. Upon indicating their interest in this study, athletes will be contacted to make arrangements for data collection.

If athletes agree to participate in this study, all of the information that they provide will remain completely confidential. Any identifying names including those of individuals, institutions, and organizations will be kept confidential to protect participant anonymity. Pseudonyms will be used in any published findings that result from this research. At no point will data be published or shared that identifies individuals, institutions, or organizations related to this study.

All information and data collected regarding this project will be electronically stored on a password protected computer in a locked location for the full duration of the conservation period. Data will be conserved for 5 years, starting after the completion of data collection. Data collection is expected to be completed by September 2021, and therefore data will be conserved until September, 2026. Following the conservation period, all data will be deleted or destroyed.

The current study has potential to provide a foundation for understanding the psychosocial factors that play a role in an athlete's rehabilitation, and whether athletes feel psychologically ready when returning to sport from a sports related concussion. Results from this study can be used to inform concussion rehabilitation practices, and identify whether current concussion rehabilitation of athletes is sufficient to prepare them psychologically to return to sport.

Thank you in advance for your interest and support for this study.

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Appendix B: Athlete Recruitment Letter

Dear participant,

We have received permission to ask you to consider taking part in a research study, and we thank you for your interest in this research. Data for this study will be collected for the purposes of a Master's Thesis at the University of Lethbridge for Quinn Johnsson under the supervision of Dr. Scott Rathwell and Dr. Claudia Gonzalez. The purpose of this study is to explore the psychosocial factors that play a role in an athlete's rehabilitation from a sports related concussion, and whether athletes feel psychologically ready to return to sport after completing concussion rehabilitation. Specifically, we will be asking athletes about their rehabilitation experiences from their most recent sports related concussion, and their return to competitive sport following the completion of the return to play concussion rehabilitation protocol.

For this study, you will be asked to participate in two remote interviews over zoom and to create a timeline of your concussion rehabilitation experience. Interviews will be conducted in English, therefore it is important that you are able to read, write, and understand English. Each interview will take approximately 60-90 minutes. Up to two weeks will be allotted between each interview, meaning that data collection will take course over the span of ~1 month.

Timelining is a method of data collection that allows you to create a chronological visual representation of your experiences as an athlete. This timeline is intended to capture experiences and events during your rehabilitation that shaped your concussion rehabilitation and return to play. Timelining supplies will be provided to you through mail or delivery. Timelining supplies will be packaged for 7 days prior to mailing to eliminate potential contamination from COVID-19. The researcher will follow all government mandated safety guidelines regarding COVID-19 to ensure that timelining contents do not pose a health risk to participants.

This study is being conducted in accordance with research ethics procedures at the University of Lethbridge. It is important for you to understand that your involvement in the research is entirely voluntary. You are not required to participate. If you choose to participate, your participation in this study will not be disclosed to any individuals by the research team. This includes family members, coaches, team mates, and health practitioners. There will be no negative consequences if you choose not to participate. If you wish to disregard or delete this invitation, you may do so freely without penalty of any kind. If, after completion of the study, you wish to withdraw, you may do so by contacting the researchers and your information will be subsequently destroyed.

If you agree to participate, all of the information that you provide will remain completely confidential. All identifying information will be digitally secured on a password encrypted computer only accessible to the researchers involved in this project. We may publish the findings from this research in the future, but all publications containing the data will contain pseudonyms and non-identifying names. At no point data that includes any personally identifiable information will be published or shared.

All electronic data gathered from this study will be stored on a password protected computer in a locked room for the full duration of the conservation period. Data will be conserved for 5 years, starting after the completion of data collection. This stage is expected to be completed by September, 2021 and therefore the data will be conserved until September, 20261. Following the conservation period all data will be deleted or destroyed.

The current study could provide a foundation for understanding the psychosocial factors that play a role in an athlete's rehabilitation, and whether athletes feel psychologically ready when returning to sport from a sports related concussion. Results from this study can inform concussion rehabilitation practices, and identify whether current concussion rehabilitation of athletes is sufficient to prepare them psychologically to return to sport.

If you would like to take part in this study, contact Quinn Johnsson via email (q.johnsson@uleth.ca) to inform him of your interest in participating in this study. A time and date to begin data collection can be determined after confirmation of participation, and we welcome you to choose a time and date that is most convenient for you.

If you have any questions related to this study, please feel free to contact any of the researchers listed below. If you have any other questions regarding your rights as a participant in this research, you may also contact the Office of Research Services at the University of Lethbridge at 403-329-2747 or research.services@uleth.ca.

Thank you in advance for your interest and participation in this study.
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Appendix C: Letter of Consent

Dear participant,

Thank you for volunteering your time to participate in this research project. This study is being conducted in accordance with research ethics procedures at the University of Lethbridge. It is important for you to understand that your involvement in the research is entirely voluntary. You are not required to participate and there will be no negative consequences if you choose not to do so. If you wish to disregard this, you may do so freely without penalty of any kind. If, after completion of the study, you wish to withdraw, you may do so by contacting the researchers and your information will be subsequently destroyed.

As a participant in this study, you will be asked about your experiences of sports concussion rehabilitation and return to play following completion of your rehabilitation. This study will be conducted in English; therefore, it is important that all participants are able to read, write, and understand English. You will be asked to create a timeline of your most recent sports related concussion rehabilitation experience, and participate in two separate interviews. Timelining supplies will be provided, and will be mailed to you upon agreeing to participate in this study. An initial meeting will be conducted to review timelining instructions, and answer any questions you may have regarding timelining. The first interview will be conducted up to two weeks after the initial meeting. The first interview will ask you questions about your concussion rehabilitation experience, and about the events and experiences that most affected you while you were in rehabilitation for your sports related concussion. A second interview will be conducted up to two weeks after the first interview. The second interview will ask you questions about your return to competitive sport following rehabilitation, what may have challenged your return to sport, and whether you felt ready to return to play. You are free to decline from answering any questions that you may be asked as part of this study. Any decision to decline from answering will not be questioned. During the course of this study, you are encouraged to engage with your timeline whenever possible so that your timeline can most accurately represent your concussion experience. The initial meeting is expected to take a maximum of 30 minutes, while each interview is expected to take approximately 1 hour. Data collection is expected to occur over the course of one month.

If you agree to participate, all of the information that you provide will remain completely confidential. You may also choose to withdraw from the study at any point in the study process without any negative consequences. Any identifying names of individuals, programs, or organizations mentioned in collected data will be kept confidential. For the purposes of published findings, conferences, posters, and presentations that this research may contribute to, any identifying names will be replaced with pseudonyms to protect confidentiality. All meetings that are conducted with participants will be recorded using Zoom video conferencing software which records both audio and video. All Zoom meetings will be password protected. You will be emailed the Zoom meeting I.D. and password prior to any scheduled meetings. Recordings will be stored on a password protected computer accessible only by the primary researcher (Quinn Johnsson) in a password protected file that only the primary researcher will have access to. Participants

are asked to mail their timeline to researchers at the conclusion of this study. Participants will mail timelines back to the primary investigator using a postage paid envelope included in the timelining package. In cases where participants wish to keep their timelines, participants will be asked to email a picture of the completed version of their timeline. Data collected from this study will be kept in a password protected file on a password protected computer for the duration of the conservation period. Identifying information (names, mailing address, pseudonyms, etc.) will be stored in a password protected folder on a password protected computer separate from collected data to protect your anonymity. Data will be conserved for 5 years, starting after the completion of data collection. Data collection is expected to be completed by September 1st, 2021, and therefore the data will be conserved until September 1st 2026. Following the conservation period, all data will be deleted or destroyed. At the conclusion of your participation in this study, you will be given the opportunity to choose to receive the results of this study when available, and opt into future voluntary research.

This study could provide a foundation for understanding the psychosocial factors that play a role in an athlete's rehabilitation, and whether athletes feel psychologically ready when returning to sport from a sports related concussion. Results from this study can be used to inform concussion rehabilitation practices, and identify whether current concussion rehabilitation of athletes is sufficient to prepare them psychologically to return to sport. Questions regarding your rights as a participant in this research may be addressed to the Office of Research Ethics, University of Lethbridge (Phone: 403-329-2747 or Email: research.services@uleth.ca)

By clicking the 'I consent to participate in this study' button below, you indicate that you have read the Letter of Consent and freely consent to participate in all phases of this study. This means that you have been informed of the requirements of the research, understand that you have the opportunity to ask questions and discuss this study, and have been assured that your information will remain confidential. Please keep a copy of the Letter of Consent for your personal records. By accepting this letter of consent, you will proceed to a screening questionnaire which will be used to identify your eligibility as a participant in this study. Following review of your screening questionnaire, you will receive an email from q.johnsson@uleth.ca regarding your eligibility to participate in this study. Eligible participants will be contacted to discuss future data collection, while ineligible participants will be notified that all information provided as part of the screening questionnaire has been destroyed. Regardless of eligibility, we thank you all for your interest in participating in this study.

Appendix D: Online Screening Questionnaire

Q1 Did you compete for a club or varsity sport team at the University of Lethbridge during the 2019-2020 athletic season?

- ○ Yes (1)
- ○ No (2)

Q2 Did you receive a sport related concussion during the 2019-2020 athletic season?

- ○ Yes (1)
- ○ No (2)
- ○ Unsure (3)

Q3 How many sport related concussions did you receive during the 2019-2020 athletic season?

- ○ 1 (1)
- ○ more than 1 (2)
- ○ unsure (3)

Q4 Did you participate in a rehabilitation program for the concussion described in the previous question?

- ○ Yes (1)
- ○ No (2)

Q5 Was this rehabilitation program led by a therapist or a physician?

- ○ Yes (1)
- ○ No 2)
- ○ Unsure (3)

Q6 If you participated in a rehabilitation program, did the rehabilitation provider (i.e. therapist, physician) use the Return to Play protocol?

- ○ Yes (1)
- ○ No (2)
- ○ Unsure (3)

Q7 Following this rehabilitation program, were you cleared to return to competitive sport?

- ○ Yes (1)
- ○ No (2)
- ○ Unsure (3)

Q8 Following rehabilitation, were you cleared to return to competitive sport by a practicing physician?

- ○ Yes (1)
- ○ No (2)
- ○ Unsure (3)

Q9 Please provide the mailing address where you would like to receive timelining supplies for this research project.

_____

Q10 Are you the age of consent within the province of Alberta? (18 years or older)

- ○ Yes (1)
- ○ No (2)

Q11 Have you received a concussion since 2019/2020?

- ○ Yes
- ○ No
- ○ Unsure

Appendix E: Timelining Package and Instructions

Timelining Package

This is a list of the contents that should be contained in your timelining package. Please compare the contents of your package with this list. If there are any items that are missing from this list, please contact Quinn Johnsson (q.johnsson@uleth.ca). Any items that are missing will be replaced by researchers as required. Items used for timelining are yours to keep at the conclusion of this study.

Your timelining package should contain:

5 Labelled A3 (29.7 x 42.0 cm) grid paper sheets.

4 Black Pens

4 Pre-sharpened pencils

1 Pencil Sharpener

4 Highlighters (assorted colours)

1 Postage paid envelope

Timelining Instructions

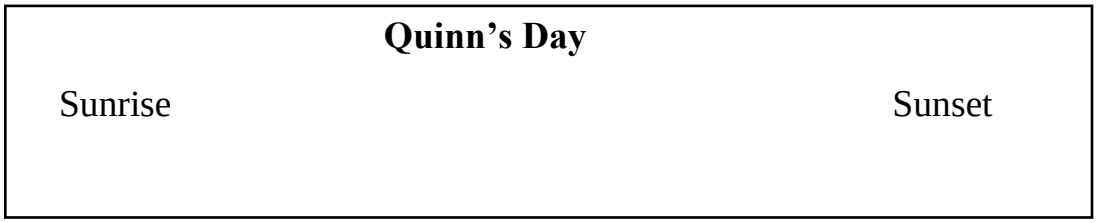
These instructions are intended to help you begin timelining for this study. For this timeline, we ask that you use the materials included in your timelining package. If you have not received your timelining package, or have questions related to timelining, please contact Quinn Johnsson (q.johnsson@uleth.ca) for assistance.

What is Timelining?

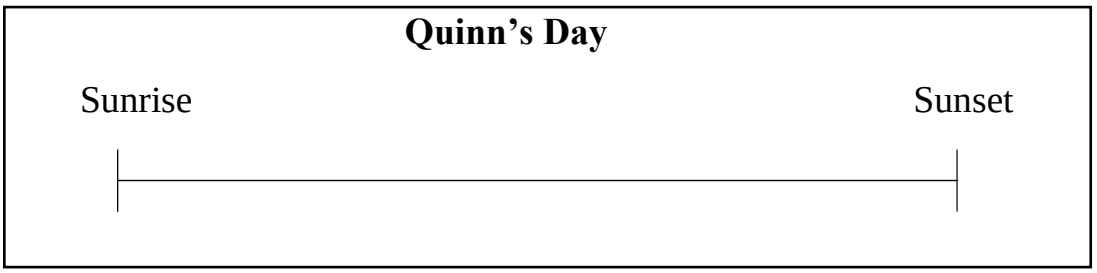
Timelining is a method of creating a visual representation of events in chronological order. It tells us not only **what** happened during a given period, but **when**.

Let us make a timeline of a single day in Quinn's life. This is Quinn.

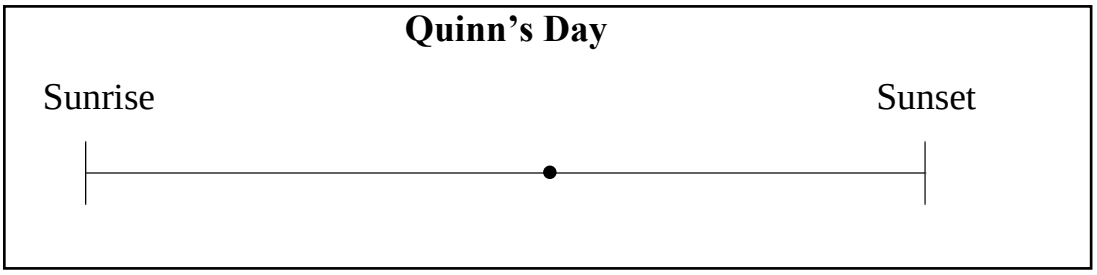
To create a timeline, you must identify when the timeline will begin, and when it will end. In this case, it seems reasonable to begin the day with **sunrise** and end the day with **sunset**. Since English is read from left to right, we will similarly create our timeline to be read from **left to right**.



We've now identified a beginning and end to Quinn's day. But how can we show that these events are related? One way to represent their relationship is by connecting them with a **line**:

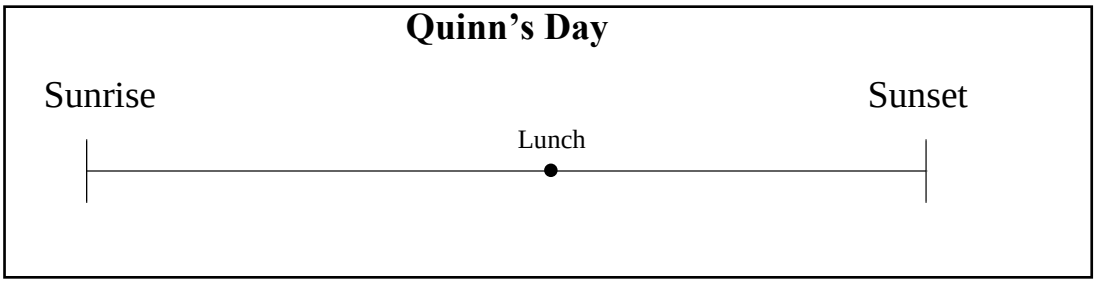


This line can represent all the time that passed during Quinn's day. As a result, it can also contain every event that occurred between sunrise and sunset. What if we want to talk about a specific time of the day? To identify what time we're referring to, we can add a **point**:

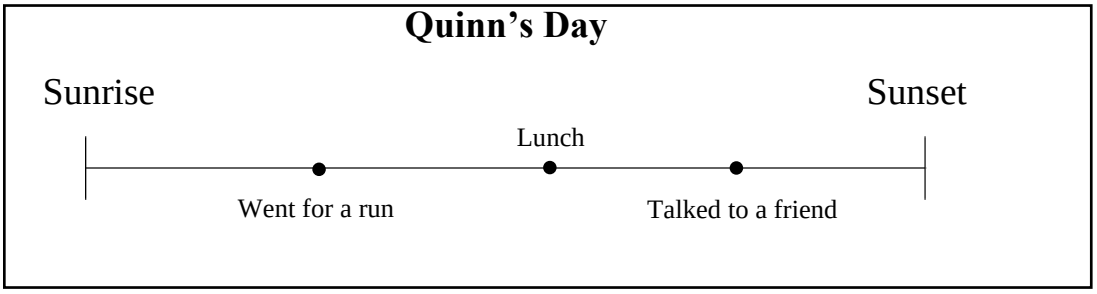


A point on the line identifies a point in time, though it does little to tell us anything else. Did Quinn get married? Did he win the superbowl? Was his name drawn to be the first stick figure on Mars? What could it be?!

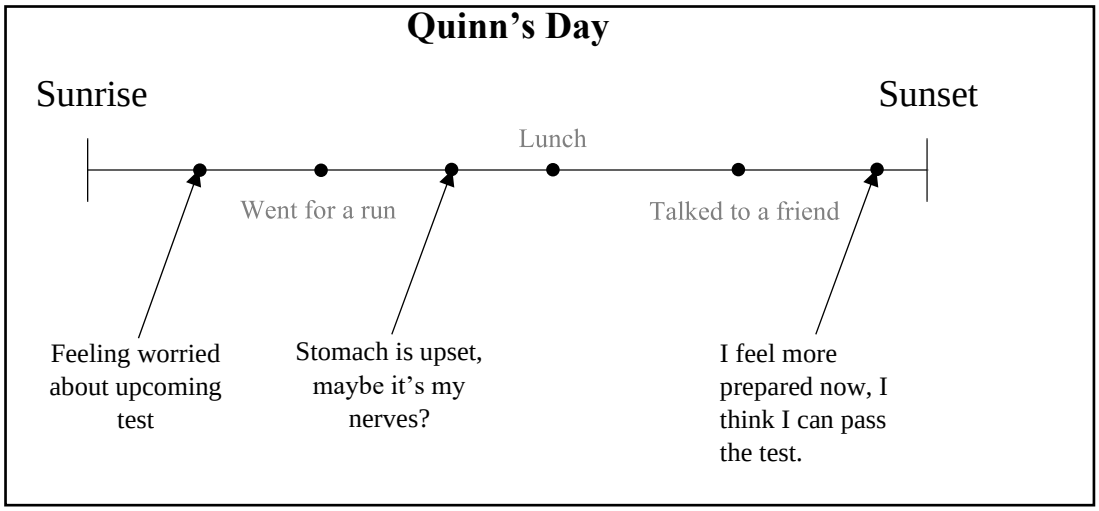
The only way we can know what happened is if further information is provided. Luckily, an easy way to provide this information is through **text:**



Oh, it was just lunch. However, by providing text to describe the point on the line, we were able understand both **what** happened and **when**. In fact, we can add many points on a timeline to better understand Quinn's day:



Not only can we add events to the timeline, we can also add **experiences**:



By adding both **events** and **experiences** to our timelines, we can add detail and depth to the timeline. Successful timelining can help us detail the events of our lives, reflect on our experiences, and create a richer understanding of how we are shaped by events and experiences.

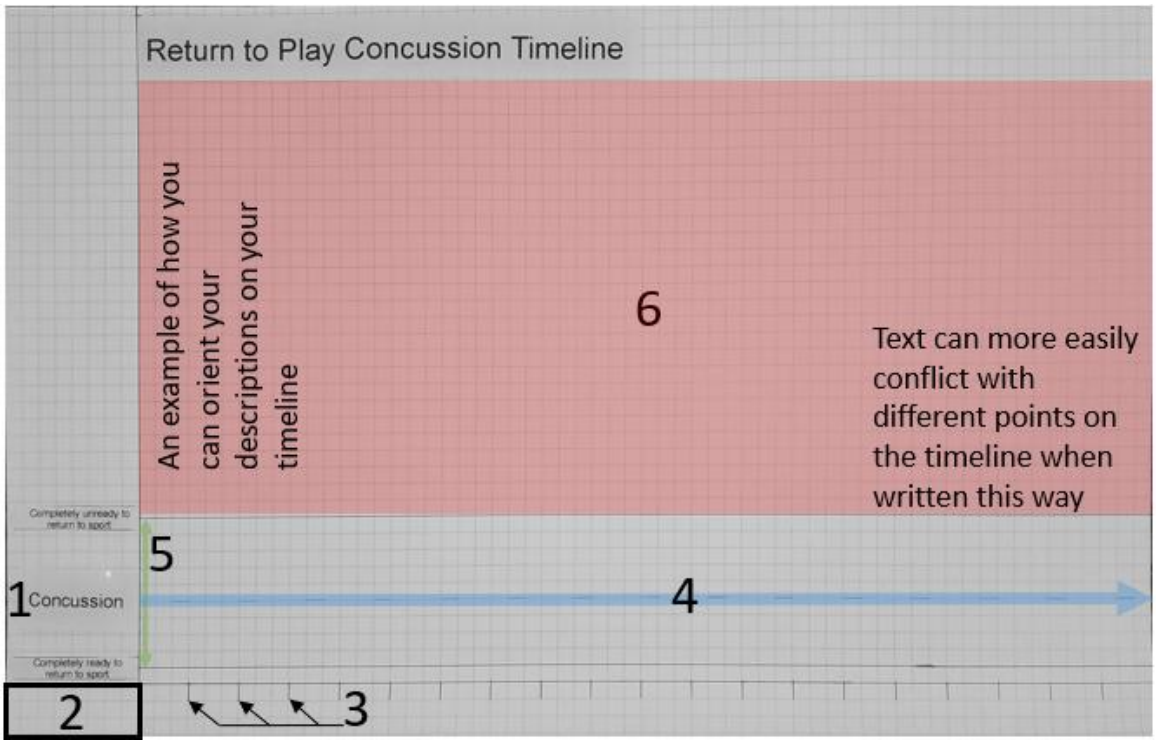
Rehabilitation Timeline Format

For this timeline, we would like you to share the **experiences** and **events** that shaped the rehabilitation of your most recent concussion.

We would like to understand those factors (events and experiences) that either helped or challenged your concussion rehabilitation.

Timelining supplies have been provided. Please check the timelining checklist to ensure that you have received all required supplies.

In the timelining supplies, you should have received timelining paper that looks similar to this:



This picture has been labelled with numbers and colours to help explain each aspect of your timelining paper. Below you will see an explanation for what each number (i.e., 1-6) on the photo above represents on the timeline:

Rehabilitation Timeline Format cont.

1. This represents the day that you received your concussion, and will be the starting point of your timeline.

2. Please use this box to enter the scale of time that you would like to use for your timeline. It is recommended that you use days, however weeks may be useful for longer rehabilitation periods.

3. Dashes that you can number to represent the amount of time (i.e. days, weeks) that had passed **since you received your concussion.**

4. Place events and experiences along the horizontal axis based on when you believe they occurred.

5. Highlighters are included to allow you to provide additional detail for your timeline using colour if you so choose. This could be used to represent emotions, changes in mood, and other aspects of your experience that may not be represented on your timeline otherwise

6. Place events and experiences along the vertical axis based on how ready to return to sport you believe you were at a given time.

7. Use this area to add descriptions to your timeline. While writing as shown in the example can maximize efficient use of writing space, several pages have been included so that you may add descriptions in whatever way is most useful for you.

Creating a Rehabilitation Timeline

To begin timelining, I would like you to start with the progression of your rehabilitation program. If you are able to, please identify on the timeline when these events happened following your concussion:

- Returned to school
- Returned to work
- First began exercising following your concussion
- First began running sports/training drills
- First returned to practice
- Were cleared to return to competitive sports
- Began participating in competitive sports
- Were you held back from progressing through your rehabilitation at any point? Why?

Now that we have a sense of how your rehabilitation progressed, I would like you to begin adding those things that were most important to your rehabilitation. More specifically, whenever you engage with your timeline, I want you to think about those **experiences and events** that you feel played an important role in your concussion rehabilitation. If needed, some questions have been added below to help you engage with your timeline:

- What helped me during my rehabilitation?
- What made my rehabilitation more difficult?
- What emotions did I experience in relation to my injury and rehabilitation?
- What kind of support did I receive during my rehabilitation? How did it affect me?
- What were interactions with my team (coaches, trainers, teammates) like while I was in rehabilitation? How did they affect me?
- What were my interactions with healthcare professionals (Physicians, nurses, therapists) like during my rehabilitation? How did they affect me?

Counselling Services

During the course of this study you will share information regarding your experiences with concussion. Retelling past experiences of injury and rehabilitation can be difficult for some, and the challenges related to those experiences may not easily be overcome. If you feel you are experiencing any distress, emotional or otherwise, in relation to the events discussed during interviews or while timelinening, please find attached the contact information for counselling services. Listed are services available to students at the University of Lethbridge and for individuals within Alberta. If you are not able to access these service, or if you have any questions regarding these services, please contact the researcher listed below and they will assist you wherever possible with accessing counselling services.

Counselling Services:
University of Lethbridge Counselling Services:
Email: counselling.services@uleth.ca
Phone number: 403-317-2845
Alberta Mental Health Help Line (Toll free): 1-877-303-2642

If assistance is required for accessing counselling services, please contact:
Quinn Johnsson
Email: q.johnsson@uleth.ca
Phone number: 403-586-1504

Appendix F: Recent Sports Related Concussion Interview Guide

Before we begin the interview, I would like to refer back to your timeline. This interview is designed to explore your rehabilitation experience in a chronological order from the moment of your concussion to your completion of the Return to Play protocol. For this reason, we may be referring back to your timeline as we discuss the events and experiences surrounding your rehabilitation.

Initial Incident

1. Tell me about the events that resulted in your concussion during the 2019/2020 athletic season.
    - How did this concussion occur?
    - When did you begin experiencing symptoms from this concussion?

2. Describe to me the events between the time you experienced your concussion and when you first met with a physician.
    - Before you met with your physician, what were your thoughts and feelings regarding your concussion?
    - Were there any significant people in your life who impacted you between this time?
    - After meeting with your physician, what were your thoughts and feelings regarding your concussion?

Concussion

2. What symptoms did you experience with your concussion(s) in 2019/20?
    - How long did it take for these symptoms to subside?
      *List each one and ask about duration for each

Stages of Rehabilitation (Ask for each stage)

Instruction: In the next set of questions, I will be asking you about each stage of the return to play protocol. Please feel free to use your timeline if it will help you remember.

***This set of questions will be asked for each stage of RTS, beginning with stage 1. Once all questions have been asked for stage 1, repeat the same questions for stage 2. Proceed in this way until all stages of the RTS have been addressed and identified. Use the checklist on the second page of your interview guide to ensure that you discussed and identified each stage of RTS.**

3. What thoughts did you have during stage X of your rehabilitation?

4. How did you feel starting stage X of your rehabilitation for your concussion?
    - Why did you feel this way?
    - Please describe your relationship with the healthcare providers

5. What challenges did you experience at stage X of your concussion rehabilitation?

6. Was there any point during this stage of rehabilitation where your symptoms returned?
    - How did that affect your rehabilitation progress?

7. What emotions did you experience in relation to your concussion during this stage of your rehabilitation?
    - What caused these?
    - How did these emotions affect you?

8. What or who helped you at stage X of your concussion rehabilitation?

Psychological

9. Have you had any previous injuries?

10. Was your concussion rehabilitation different from your rehabilitation process with any previous injuries you have experienced?
    - (If no previous rehabilitation experience) What was unexpected about your concussion rehabilitation?

Social

11. Did your concussion affect your social life?

12. If so, how?
    - (friends, family, teammates, school etc.)
        i. Teammates? Coach? Friends? Family?
        ii. Was there a positive change? Negative change?
        iii. Was there a stage of rehabilitation where these changes felt most noticeable? If so, please describe.

13. Did people support you while you were recovering from your concussion?
    - If you didn't receive support, did you look for support while you were in rehabilitation?

14. Did people treat you in ways that you feel it negatively impacted your concussion rehabilitation?
    - If so, how?

15. Did your concussion affect you as an athlete?

Concluding questions

16. How do you feel about your rehabilitation experience as a whole?
17. Is there something that you feel may have affected you during your concussion rehabilitation that wasn't covered today?

RTS Checklist

When asking questions about each stage of the Return to Play protocol, please use this checklist to ensure that you have asked questions regarding each stage, and have **identified each stage of RTS on the participant's timeline.** Place a check mark in the final box if you asked questions regarding that stage of RTS.

Rehabilitation Stage	**Functional exercise at each stage**	**Objective of the stage**	**Identified? (✓ or ✗)**
No activity	None	Rest and Healing	
Symptom Limited Activity	Return to work or school	Recovery	
Light aerobic exercise	Walking, swimming, or stationary cycling	Increase heart rate	
Sport-specific exercise	Sport specific drills, no impact activities	Add movement	
Non-contact training drills	Progression to more complex training drills (passing, throwing, etc.)	Exercise, coordination, cognitive load.	
Full-contact practice	Following medical clearance participate in normal activities	Restore confidence and assess functional skills	

List of useful Probing Questions

18. Tell me more
19. How so?
20. Why is that important?
21. Could you give me an example?
22. Tell me about the last time you did that

List of useful Clarifying Questions

23. What's another way you might...
24. It sounds like you were saying… is that correct?

Appendix G: Return to Play Interview Guide

Ask the participant to: "Please identify on your timeline approximately when you returned to competitive participation in your respective sport". This will provide a reference point between when they finished their RTS and their reintroduction to competitive play.

1. How was it decided that it was time for you to return to full competitive play?
    - Who helped make this decision? (physician, coach, family, etc.)
        i. What was their role in this decision (ask for each person mentioned)?
        ii. Do you feel like this was the correct decision? Why or why not?
2. Tell me about your first competitive game following your return to play.
    - Tell me about any thoughts or feelings you may have had leading up to your first competitive game.
    - Was this different from other competitive games? If so, how?
3. Was there anyone or anything that made your return easier?
    - Before the competition
    - During the competition
    - After the competition
4. How do you feel about your performance during that game?
    - What do you think contributed to your performance?
    - What might have affected your performance?
    - Reflecting on the game now, do you believe you were ready to return to competitive play? Why? Why not?

Appendix H: Closing Statements

The value gained from the experiences you have shared during this process cannot be understated, so I sincerely thank you for taking the time to share your story. Moving forward, if you have any questions or concerns regarding this study, please do not hesitate to contact myself, Dr. Scott Rathwell, or Dr. Claudia Gonzalez by email or phone with the contact information that has been provided.

During the course of this study you shared information regarding your experiences with concussion. Retelling past experiences of injury and rehabilitation can be difficult for some, and the challenges related to those experiences may not easily be overcome. If you feel you are experiencing any distress, emotional or otherwise, in relation to the events we discussed during this research study, please find attached the contact information for counselling services available to students at the University of Lethbridge and individuals within Alberta.

Would you like to be contacted to participate in future research projects?

Would you like to receive a copy of any publications resulting from this study?

How confident do you feel that your responses accurately represented your thoughts, feelings, and experiences related to the concussive event discussed during this study? Why?

If there is any need to contact us in the future, we can be reached at:
Quinn Johnsson:
Email: q.johnsson@uleth.ca
Phone number: 403-586-1504

Scott Rathwell:
Email: scott.rathwell@uleth.ca
Phone number: 403-329-5188

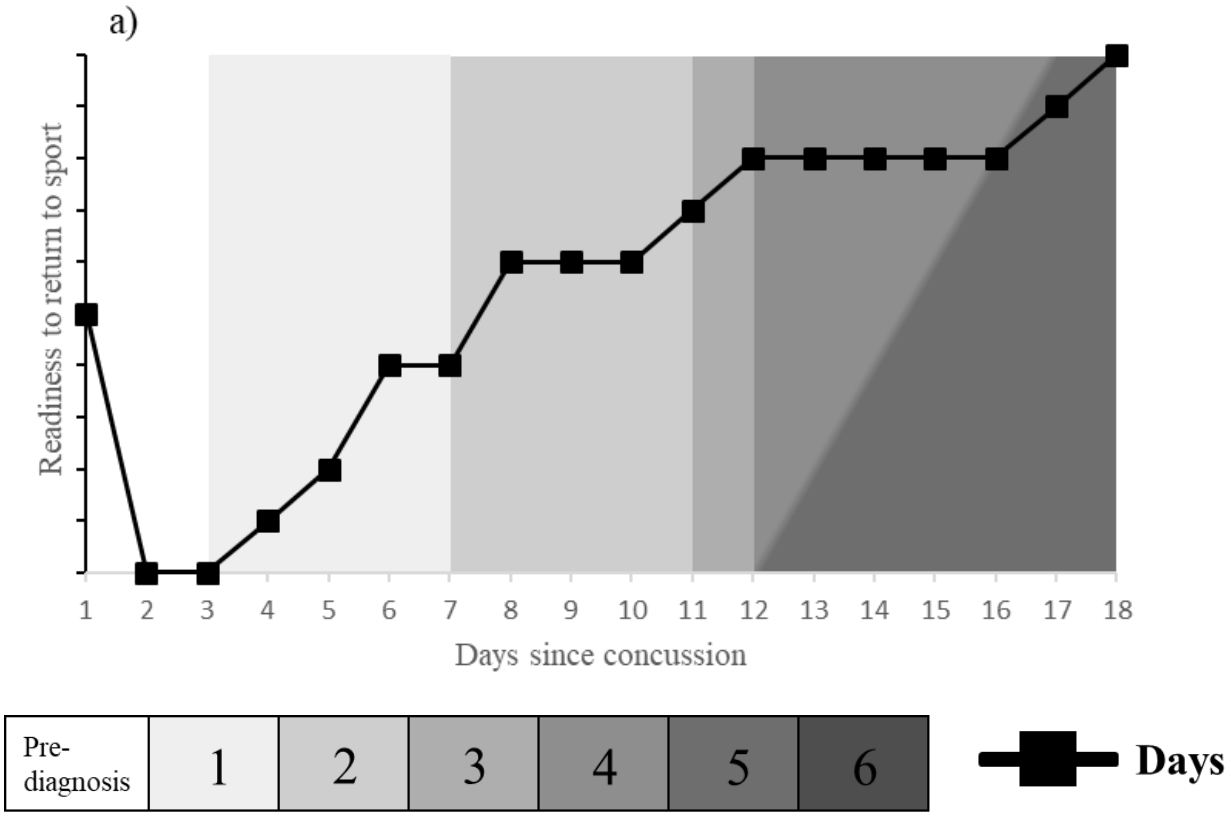
Claudia Gonzalez:
Email: claudia.gonzalez@uleth.ca
Phone number: 403-329-2147

University of Lethbridge Counselling Services:
Email: counselling.services@uleth.ca
Phone number: 403-317-2845

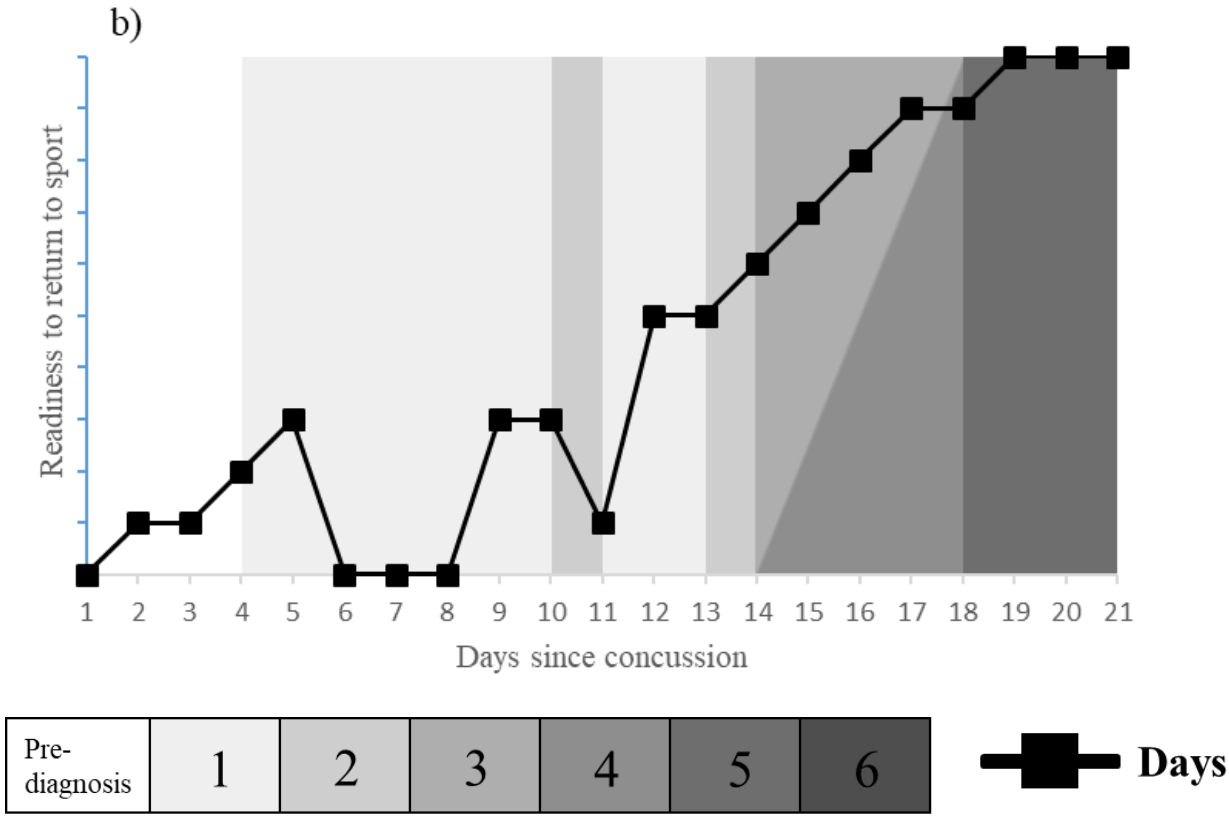
Alberta Mental Health Help Line (Toll free): 1-877-303-2642
Please provide any final comments you would like to add to this study:

We (Quinn Johnsson and Drs. Scott Rathwell and Claudia Gonzalez) once again thank you for your participation in this study.

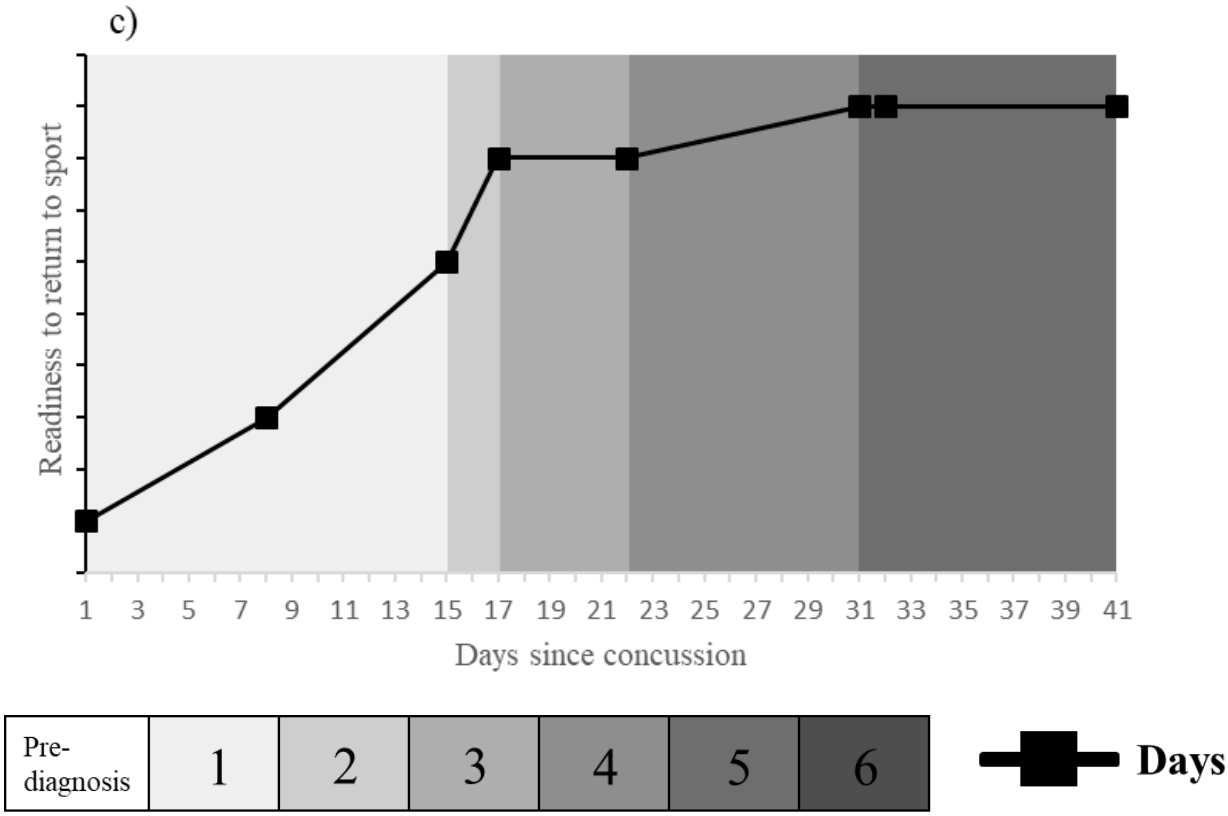
Appendix I: Megan's Concussion Rehabilitation Timeline



Appendix J: Rachel's Concussion Rehabilitation Timeline



Appendix K: Julia's Concussion Rehabilitation Timeline



Appendix L: Luke's Concussion Rehabilitation Timeline