EXPLORING FEMALE UNIVERSITY ATHLETE EXPERIENCES OF COPING WITH PROTRACTED CONCUSSION SYMPTOMS

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Abstract

Concussions present a multitude of somatic, cognitive, and emotional symptoms that may persist for extended periods of time. In response to stressful situations, such as concussion, athletes engage in an appraisal and coping process that results in a coping outcome, and consequent behavioral or emotional responses. The severity of a protracted concussion injury, compounded with daily life stress, has lasting psychological implications that can be mediated through the use of different coping mechanisms (André-Morin, Caron, & Bloom, 2017). The purpose of the current study was to explore the coping process used by female collegiate athletes who suffered concussion symptoms that lasted for longer than 6 weeks. Individual semi-structured interviews were conducted with five female university athletes to identify and describe coping outcomes, as well as factors that facilitated or prevented adaptive coping responses. Interviews were transcribed verbatim and thematic analysis was used to organize data into themes and subthemes, which provided a complete understanding of each participant's experience (Sparkes & Smith, 2014). Results from the analysis suggest athletes in this study experienced a multitude of emotional outcomes that have not previously been explored with the sport concussion literature, including the psychological implications of severe headaches, weight concern, and perceived loss of control. Furthermore, the athletes engaged in emotion-focused styles of coping such as avoidance behaviors and acceptance. Athletes felt that their lack of control over treatment protocol negatively impacted their recoveries, therefore they engaged in avoidance behaviors. However, social support played a key role as a facilitator of effective coping behaviors and helped athletes to accept their injuries. These results add to the growing body of literature on the psychology of protracted concussion. Additionally, this study continues emerging research on coping and sport-related concussion, including identifying what resources athletes need to cope properly.
Résumé

Les commotions cérébrales présentent une multitude de symptômes somatiques, cognitifs, et émotifs qui peuvent persister pour de longues durées. En conséquence de situations stressantes, tel qu’une commotion, des athlètes utilisent différents mécanismes d’adaptations menant à des résultats d’adaptations, et des réactions comportementales et émotionnelles conséquentes. La sévérité d’une commotion prolongée, avec le stress de la vie de tous les jours, a des implications psychologiques qui peuvent être médiées par différents mécanismes d’adaptations (André-Morin, Caron, & Bloom, 2017). L’objectif de l’étude présente était d’observer le processus d’adaptation utilisé par des athlètes collégiales féminines qui ont souffert des symptômes de commotions durant plus de 6 semaines. Des entrevues individuelles semi-structurées ont été conduites avec cinq athlètes collégiales féminines pour identifier et décrire les résultats d’adaptations, en plus des facteurs qui ont facilités ou prévenus des adaptations. Les entrevues ont été transcrites mot pour mot, et une analyse thématique a été utilisée pour organiser les données en thèmes and sous-thèmes, qui a pu fournir une compréhension complète de l’expérience de chaque participante (Sparkes & Smith, 2014). Les Résultats de l’analyses suggèrent que les athlètes de cette étude ont vécues une multitude de résultats d’adaptations émotifs qui n’ont pas encore été observés dans la littérature de commotions cérébrales sportives, incluant les implications psychologiques de migraines, des préoccupations de poids, et une perception de perte de contrôle. En outre, les athlètes ont employées des mécanismes d’adaptations émotionnels tel que l’évitement et l’acceptation. Les athlètes sentaient que leur manque de contrôle envers le protocole de traitement impactait négativement leur récupération, menant à des comportements d’évitements. Par contre, le support social jouait un rôle clé pour faciliter des méthodes d’adaptations efficaces et aider les athlètes à accepter leur blessure. Ces résultats ajoutent à la littérature croissante sur la psychologie des commotions cérébrales prolongées. Additionnellement, cette étude continue la recherche émergente sur les adaptations et les commotions reliées au sport, incluant l’identification des ressources dont un athlète a besoin pour s’adapter sainement.
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Chapter 1

Introduction

Over the past decade, sport-related concussions have received increased attention from both scholars and non-scholars (Bloom & Caron, 2019; Hainline & Ellenbogen, 2017). Recent documentaries and films, as well as magnified media coverage of high profile athletes with severe concussions have increased the public’s awareness of concussion (Hainline & Ellenbogen, 2017; McGannon, Cunningham, & Schinke, 2013). Moreover, growing empirical evidence of the long-term physical, neurocognitive, and psychological consequences of concussion, as well as the possible link to neurodegenerative diseases such as chronic traumatic encephalopathy (CTE) have exacerbated public concern (André-Morin, Caron, & Bloom, 2017; Caron, Bloom, Johnston, & Sabiston, 2013). This has moved the importance of concussions into the public spotlight (McCrorry et al., 2017; Webner & Iverson, 2016). Despite the increased attention, there is still much to learn about concussions, including the psychological symptoms that affect the rehabilitation of this injury.

Following a sport concussion, athletes have reported experiencing a number of cognitive and somatic symptoms, as well as both acute and longitudinal psychological symptoms, such as depression, anxiety, and mood disturbances (André-Morin et al., 2017; McCrorry et al., 2017). While 80-90% of concussion symptoms resolve within 7-10 days, the remaining 10-20% of concussions are termed protracted and are characterized by intense psychological and somatic symptoms that extend beyond the traditional recovery timeline, persisting for weeks, months, or years after the initial injury (André-Morin et al., 2017; Caron et al., 2013). Moreover, female athletes at a greater risk for suffering a concussion and for developing protracted symptoms compared to their male counterparts (Broshek et al., 2005; Kontos, Covassin, Elbin, & Parker,
However, it is important to note that research on the incidence and prevalence of concussion, protracted or not, is largely retrospective and relies on athlete’s voluntarily disclosing their symptoms to the appropriate personnel. Due to a variety of factors, such as being unable to recognize the symptoms of concussion, fear of losing their position on the team, lack of education on the long-term implications of playing while concussed, and not wanting to be perceived as “weak”, many athletes do not disclose their concussions. Therefore, the incidence rate of concussions may be much higher than originally thought (Delaney, Orenstein, & Steins, 2019).

Furthermore, past concussion management recommendations advised athletic trainers and medical staff to prescribe complete cognitive and physical rest for athletes experiencing protracted concussion symptoms (McCrory et al., 2012). Unfortunately, this approach led athletes to feel isolated and unsupported throughout recovery, adding to the psychological distress of the athlete (André-Morin et al., 2017). However, there is insufficient evidence to suggest that rest after the initial 24-28 hours post-injury has any true benefit to recovery. Therefore, the latest recommendations released by the Concussion in Sport Group (CISG) in 2017 included the usage of a graded exercise program during recovery (McCrory et al., 2017). Preliminary results have been promising, suggesting that an exercise regime that is below the symptom threshold may reduce the recovery time (Leddy, Baker, Haider, Hinds, & Baker, 2017). Implementing exercise during the recovery process may also allow athletes to remain near their sport and teammates, thus reducing their perceptions of isolation.

Heightened psychological factors such as depression and anxiety following concussion are of special concern to collegiate athletes, who are forced to balance intense academic, athletic, and social demands on a daily basis (Heller, Bloom, Neil, & Salmela, 2005; Wilson & Pritchard, 2012).
These factors, in conjunction with injury related stress have proven to be detrimental to the athlete’s overall well-being (Putukian, 2016). The combination of the daily life stress of being a college athlete, emotional duress following injury, and somatic symptoms can lead athletes with protracted symptoms to experience intense feelings of depression, anxiety, and even suicidal ideations (André-Morin et al., 2017). Despite this, little is known about how these athletes deal with the psychological fallout following a traumatic injury such as concussion.

To understand how an athlete handles the psychological repercussions of injury, one must first understand the process of coping, which is defined as the “cognitive and behavioral efforts made to master, tolerate, or reduce external and internal demands of stress” (Folkman & Lazarus, 1980 p. 223). Lazarus first proposed a theory of stress and coping in 1966, called the cognitive-phenomenological theory of psychological stress, which was later revised to the cognitive theory of psychological stress and coping. This is a transactional theory where the person and environment are in a dynamic, mutually reciprocal, bidirectional relationship (Folkman & Lazarus, 1984). Though some researchers believe coping style can be determined by dispositional characteristics such as hardiness and self-esteem (Carver, Scheier, & Weintraub, 1989), the theory proposed by Folkman and Lazarus (1984) argues that coping should be viewed as a process that shifts throughout a stressful encounter.

According to Folkman and Lazarus (1980), there are two types of coping styles - problem-focused coping, or efforts the individual makes in attempt to manage or alter the source of stress, and emotion-focused coping, where the person attempts to regulate emotions related to the stress. Though individuals use both problem and emotion focused coping styles when dealing with a stressor, the usage of one form or the other in an inappropriate or excessive manner may lead to maladaptive behavioral outcomes and intensified negative psychological responses to
stress (Carver et al., 1989; Folkman & Lazarus, 1980). This is especially true for emotion-focused coping styles. Though emotion-focused coping efforts may be beneficial immediately after experiencing stress, long-term usage is linked to negative psychological and psychophysiological responses to stress (Carver et al., 1989). Furthermore, coping efforts are determined by primary and secondary levels of cognitive appraisal, or the individual’s perception of threat, harm, and resources available to handle the stressor (Folkman & Lazarus, 1980). The degree of psychological distress felt by a person is largely based on how significant they believe this stressor will be to their well-being and the amount of perceived control they have over this stress (Folkman, Lazarus, Gruen, & DeLongis, 1986). Likewise, moderators such as social support may influence the coping efforts recruited by an individual at both levels of appraisal, which in turn impacts cognitive and behavioral outcomes (Folkman & Lazarus, 1980).

Moreover, women report higher levels of stress, tend to appraise their stress as more threatening, and use more emotion-focused forms of coping, and therefore may be more at risk for implementing more maladaptive coping efforts (Brougham, Zail, Mendoza, & Miller, 2009; Kontos, Elbin, Newcomer Appaneal, Covassin, & Collins, 2013).

Coping has played a large role in the athletic injury literature (e.g., Johnson, 1997; Johnston & Carroll, 2000; Udry, 1997), especially for collegiate athletes (Covassin, Crutcher, Elbin, Burkhart, & Kontos, 2013; Kontos et al., 2013). The emotional responses to injury are largely determined by the coping efforts made by the athlete (Johnson, 1997), and it has been reported that concussed athletes may utilize different coping styles than athletes with other injuries (Kontos et al., 2013). Concussed athletes may not experience the same consistency in coping style or the same decline in coping efforts due to the unique presentation of symptoms and a relatively unknown timeline of recovery (Covassin et al., 2013; Kontos et al., 2013). This
is especially relevant to athletes with protracted symptoms, as research suggests that experiencing prolonged stress that is deemed out of the individual’s control is related to maladaptive emotion-focused coping (Folkman et al., 1986). This in turn is linked to incomplete recovery and more emotional disturbance following traumatic brain injury (TBI) - this relationship has not yet been examined in concussion, a mild form of TBI (Anson & Ponsford, 2006). Athletes with protracted concussion face long-term severe psychological and physical disturbances and have little to no control over their recovery, putting them at a greater risk of utilizing maladaptive coping styles and incurring the subsequent consequences (Caron et al., 2013; Covassin et al., 2013). In fact, concussed athletes who reported a greater usage of emotion-focused coping have higher reported symptomology (Covassin, Elbin, Harris, Parker, & Kontos, 2012) and higher perceived life stress following their injury (Hanson, McCullagh, & Tonymon, 1992). Furthermore, evidence suggests that female athletes with concussions recruit different coping efforts than male comparisons and may be more likely to use emotion-focused coping styles (Covassin et al., 2013; Kontos et al., 2013).

Additionally, social support plays a large role in the coping efforts of injured athletes. More specifically, social support impacts how an athlete appraises their injury (Bloom, Horton, McCrory, & Johnston, 2004), which in turn affects the coping style an athlete uses to minimize their stress (Salim, Wadey, & Diss, 2016). For example, athletes who perceived a supportive environment appraised their injuries as less stressful, leading to the usage of more adaptive problem-focused coping efforts (Salim et al., 2016). On the other hand, athletes who perceived low social support perceived greater loss from their injuries, potentially resulting in the practice of more maladaptive, emotion-focused methods of coping (Salim et al., 2016). Moreover, female athletes rely more on social support throughout recovery, thus low perceived social support may
have serious implications in the ability of the athlete to cope with their injury (Johnston & Carroll, 2000).

**Purpose of the Study**

The purpose of the current study was to explore the coping efforts used by female collegiate athletes who suffered protracted concussion symptoms that lasted longer than 6 weeks.

The research questions guiding this study were:

- How stressful did the athlete perceive their recovery?
- Did the athlete use more problem- or emotion-focused coping styles?
- What specific coping efforts did the athlete use, and how did these effect the athletes experience with recovery?
- How was social support perceived during recovery, who provided this support, and what role did it play in recovery?

**Significance of the Study**

Traditionally, research has focused on the acute cognitive and physical symptoms after an athlete suffered a concussion (Caron et al., 2013). Unfortunately, less empirical research has been delegated to the psychological implications of this injury, especially in a university athlete population (Kontos, 2017). Furthermore, most work done in this area has examined retired professional athletes and university male football players, and has primarily used quantitative methods such as surveys and questionnaires (Rice et al., 2018). These patterns within the literature support the need for research on other at-risk populations, such as female university athletes, and the benefits of implementing other methods, especially those of a qualitative nature.

Despite a large portion of the concussion literature focusing on university athletes, these studies primarily focus on athletes who experienced a typical recovery within the 7-10 day
recovery period. However, there is limited concussion research on university athletes who suffered from protracted symptoms. Evidently, these athletes experience severe psychological sequelae due to the unique nature of their injury (André-Morin et al., 2017; Caron et al., 2013). Although research has begun to identify the psychological implications of protracted concussion, little is known about how an athlete copes with emotional disturbance throughout recovery, a problem the current study hopes to address. Research has found that coping plays an important role in an injured athlete’s recovery process (Crocker & Graham, 1995; Hanson et al., 1992). Most research on coping and athletic injury has focused on athletes with musculoskeletal injuries, such as ACL tears (e.g., Bianco, Malo, & Orlick, 1999; Johnston & Carroll, 2000; Udry, 1997). Yet, evidence suggests that athletes with concussions rely on different coping efforts than athletes with musculoskeletal injuries (Kontos et al., 2013). Despite this differentiation, the role that coping plays in an athlete’s recovery from concussion is still underdeveloped, highlighting a need for research on this topic.

In addition, female athletes have a greater chance of suffering a concussion and report more severe symptoms following their injuries compared to their male counterparts (Kontos et al., 2013). Moreover, female athletes are at a greater risk of developing more severe emotional sequelae following concussion, as well as experiencing protracted symptoms up to a year later (Broshek et al., 2005). However, little research has been delegated to this population. A systematic review on the methodological quality of 349 sport-related concussion studies found that there were no female-only samples and of the 18 that included females, only two reported that females made up over 30% of their sample (Comper, Hutchinson, Magrys, Mainwaring, & Richards, 2010). Moreover, this research largely uses quantitative methods (Rice et al., 2018).
Therefore, the current study will attempt to fill this gap and provide a detailed description of the female athlete experience with concussion through a qualitative methodology.

In sum, there is currently a lack of evidence on the role that coping plays in protracted concussion in female university athletes, especially using qualitative research methods. Therefore, the current research presents a unique opportunity for female athletes to share their personal experiences with this injury. Research has suggested that concussed athletes cope differently (Kontos et al., 2013), and preliminary research has identified some of the specific differences in coping styles (Covassin et al., 2013). However, research is needed to understand how coping effects an athlete’s experience with concussion, as well as further exploring how the female athlete’s experience with this concussion may differ than their male counterparts. Understanding how an athlete copes with protracted symptoms and identifying how this influences recovery is a crucial first step in developing clinical interventions aimed at teaching athletes how to properly cope with their injury, thus improving post-injury recovery of female athletes with protracted concussions.

**Delimitations**

The following delimitations have been outlined for the current study:

1. Participants must be/have been a University female athlete for at least one year.
2. Participants must have suffered a medically diagnosed concussion that kept them out of competition for at least 6 weeks.
3. Participants must have been asymptomatic and medically cleared to return to play at the time of their participation in the study.

**Limitations**

The following limitations have been identified for the current study:
1. Results of this study may only be applicable for University athletes.

2. Results of this study may only be applicable for female athletes.

3. Results of this study may only portray the individualized perception of the participants and may not be generalizable to the rest of the female athlete population.

4. Results of this study rely on retrospective details of events experienced by the participants, which are subject to recall bias (Sparkes & Smith, 2014).

**Operational Definitions**

The following operational definitions will be used in the current study:

*Concussion:* The 2017 Concussion in Sport Group (CISG) defined concussion as “a traumatic brain injury induced by biomechanical forces” caused by a direct hit to the head, face, neck, or body that results in a rapid onset of neurological impairment that typically resolves spontaneously. Changes in the brain are representative of a functional disturbance rather than a structural, and result in a multitude of cognitive, somatic, and psychological symptoms (McCrory et al., 2017).

*Cognitive Symptoms:* Cognitive symptoms following concussion involve deficits in verbal recognition memory, visual working memory, visual processing speed, reaction time, numerical sequencing ability, and learning that can be both acute and longitudinal in nature (Covassin, Schatz, & Swanik, 2007; McCrory et al., 2017).

*Somatic Symptoms:* Following concussion, athletes may experience a multitude of physical-body related symptoms, such as headaches, vision impairment, balance disturbances, and sleep disturbances. These symptoms are present immediately following injury, but can persist for extended periods of time in certain athletes (McCrory et al., 2017).
**Psychological Symptoms:** Athletes with concussions commonly report feelings of sadness, anxiety, and frustration in the acute phase following injury. In the case of persistent symptoms, these emotions may exacerbate into psychological issues such as depression, anxiety, and mood disturbances, as well as subsequent maladaptive behaviors such as substance abuse and eating disorders (André-Morin et al., 2017; Rice et al., 2018).

**Protracted Concussion:** 10-20% of athletes with concussions suffer from symptoms that last beyond the traditional 7-10 day recovery period. These athletes experience long-term physical and psychological symptoms than can last weeks, months, or years (Caron et al., 2013; McCrory et al., 2017).

**U-Sports:** This is the national sport governing body of university sport in Canada, and it is compromised of the majority of degree-earning universities in the country. The name U-Sport replaced Canadian Interuniversity Sport (CIS) in 2016. The purpose of this body is “to promote and develop safety, excellence and wellness in university student-athletes, and to foster lifelong physical and mental development.” There are currently 56 member universities and 12,000 participating student-athletes (U-Sports, 2017).

**NCAA Division II:** This is the second highest division of the National Collegiate Athletic Association (NCAA), the governing body of university sport in the United States. The NCAA separates its member institutions by divisions. Division II colleges are typically smaller and are allocated fewer athletic resources than Division I schools. There are currently 308 active Division II members in 45 different states, with 13,890 participating student-athletes (NCAA.org, 2019).
Stress: “Psychological stress refers to a relationship with the environment that the person appraises as significant for his or her well-being and in which the demands tax or exceed available coping resources” (Lazarus & Folkman, 1986, p. 63).

Coping: Refers to the “cognitive and behavioral efforts made to master, tolerate, or reduce external and internal demands of a stressor” (Folkman & Lazarus, 1980 p. 223). There are two main types of coping styles: problem-focused and emotion-focused. Situated beneath these two styles are specific coping efforts that an individual uses to minimize/alter the stress or emotions regarding the stress, and that can result in adaptive or maladaptive behavioral responses.

Appraisal: The cognitive process through which a stressful event is evaluated with respect to what is at stake (primary appraisal) and what coping resources and options are available to handle the stressor (secondary appraisal). Appraisal is needed to identify individual differences in quality, intensity, and duration of an emotional response to a stressful encounter. Stressors can be appraised as harm-loss, as a threat, or as a challenge (Folkman & Lazarus, 1980).

Social Support: Defined as an “exchange of resources between at least two individuals that is perceived by the provider and/or recipient to be intended to enhance the well-being of the recipient” (Shumaker & Brownell, 1984, p. 13). Because this exchange of support is based on perception of the individual, the actual effects may be positive, negative, or neutral.
Chapter 2

Literature Review

Introduction to Concussion

Sport participation can reduce the risk of cardiovascular disease and obesity, as well as improve the development of social skills and overall psychological well-being (Mannix, Meehan, & Pascual-Leone, 2016). While the benefits are numerous, sport also includes the risk of potential physical injury (Mannix et al., 2016). In fact, due to increased frequency and intensity of training, university athletes are at a higher risk for injury compared to high school and youth populations (Kay et al., 2017). This is concerning as almost half a million athletes annually participate in NCAA university sports (NCAA.org) and 12,000 participate in U-Sports (U-Sports 2017). Subsequently, these high involvement rates, in conjunction with the higher injury risk in this population has led to increased focus on athletic injury and university athletes (Kay et al., 2017).

Lower body extremity injuries such as ankle sprains and anterior cruciate ligament injuries are the most commonly reported injuries for collegiate athletes, followed by lower body injuries and injuries to the head and neck (i.e., concussion; Hootman, Dick, & Agel, 2007). Specifically, rising concussion rates have peaked the interest of the athletic injury research community, leading to an increased focus on concussion prevalence (Hainline & Ellenbogen, 2017). A sixteen-year study conducted by the NCAA Injury Surveillance System found that despite most injury rates remaining stable, concussion rates almost doubled from 1988 to 2004 (Hootman et al., 2007). As of 2006, it is estimated that approximately 1.6 to 3.8 million sport-related concussions occur yearly in the United States (Langlois, Rutland-Brown, & Wald, 2006). The Concussion Assessment, Research and Education (CARE) Consortium, a 23 million-dollar,
28,000 athlete study being conducted by the NCAA and the US Department of Defense found that college athletes suffered approximately 10,500 concussions over the last five years (NCAA.org). Furthermore, the sports with the highest prevalence of concussion were women’s soccer, football, women’s and men’s hockey, and wrestling (NCAA.org). In addition, many researchers have found that female athletes are at a higher risk of suffering a concussion compared to male athletes, especially in women’s ice hockey (e.g., Covassin, Schatz, & Swanik, 2007; Covassin, Swanik, & Sachs, 2003; Zuckerman et al., 2015).

In sum, athletic injuries - including concussions - are a common occurrence in university sport, especially in the female university athlete population. In order to better understand how injuries such as concussions impact the lives of university athletes, the following chapter will cover three main topics. First, an explanation of concussion symptomology, focusing on somatic and cognitive sequelae, will be provided. Second, the psychological implications of athletic injury and concussion will be discussed. Next, Lazarus and Folkman’s (1984) theory of stress and coping will be detailed to examine how coping plays a role in athletic injury and concussion.

**Symptomology**

**Neural mechanisms and somatic symptoms.** Since the early 2000s, a group of concussion experts from around the world (called the Concussion in Sport Group – CISG) has hosted multiple international symposia with the purpose of discussing new ways of improving the health and safety of concussed athletes. The CISG continuously revises the definition of concussion based on new developments in concussion research, and following each symposium, releases a consensus statement highlighting key findings discussed at the meeting (Aubry et al, 2002; McCrory et al., 2017). The 2017 consensus statement released by the CISG after their last symposium in Berlin defines concussion as a traumatic brain injury caused by a force to the
head, neck, face or body that results in a rapid on-set neurological impairment that typically resolves spontaneously (McCrory et al., 2017). The resulting symptoms reflect a functional disturbance rather than a structural injury, and symptoms present themselves as cognitive, somatic, or psychological disruptions in normal functioning (McCrory et al., 2017).

Physiologically, the force of the injury causes the brain to enter neurometabolic dysfunction that can last up to 30 days, potentially longer than the athlete presents acute identifiable symptoms (Leddy, Baker, Haider, Hinds, & Baker, 2017). The pathophysiologic disruption following concussions is characterized by neuronal depolarization, release of excitatory neurotransmitters, ionic shifts, changes in glucose metabolism, altered cerebral blood flow, and impaired axonal functioning (Giza & Hovda, 2001). Research suggests that these impairments in function result in altered neural connectivity, thus impacting executive function (or general cognition), and motor and visual pathways in the brain. Consequently, athletes may experience a multitude of somatic and cognitive symptoms resulting from this neurophysiological dysfunction (McCrory et al., 2017).

Somatic symptoms present themselves both acutely and in more prolonged states (Caron, Bloom, Johnston, & Sabiston, 2013). Acute somatic symptoms such as vision impairment, headaches, sleep disturbance, and postural balance disruptions are typically reported within 24 hours of the injury and tend to resolve themselves within 7-10 days (McCrory et al., 2017). But research suggests that athletes may experience long-term somatic symptoms weeks or months after their injuries (Caron et al., 2013). For example, Caron and colleagues (2013) reported that retired National Hockey League athletes still experienced debilitating physical symptoms years after retirement. These included long-term headaches, vision impairments, and issues with memory and reading that impacted their ability to function in daily life (Caron et al., 2013).
Sex differences may play a role in the specific somatic symptoms an athlete experiences, as well as the number of symptoms he or she reports (e.g., Broshek et al., 2005; Covassin et al., 2007; Covassin & Elbin, 2011; Covassin, Elbin, Harris, Parker, & Kontos, 2012). Farace and Alves (2000) conducted a meta-analysis on post-TBI outcomes that discovered that females experienced more severe symptoms than males on 85% of the identified symptoms. Specifically, females experienced greater memory impairment, dizziness, fatigue, headaches, postural balance disturbances, irritability to light and noise, and concentration difficulties, whereas males reported more auditory symptoms. While this study did not assess post-TBI symptoms in only athlete populations, parallels between the results of the meta-analysis and somatic symptoms reported by athletes suggest similar differences may be found in post-concussion symptoms (Covassin et al., 2007). Furthermore, female athletes reported experiencing a greater number of symptoms and more prolonged symptoms than male athletes (Broshek et al., 2005; Covassin et al., 2012).

Dick (2009) proposed three potential key mechanisms for sex differences in reported symptoms: biomechanical, cultural, and hormonal differences. Biomechanical disparities such as neck musculature and head mass may result in female athletes being at a greater risk for concussion and experiencing more severe symptoms. Cultural differences may play a role as well, such as sport culture “protecting” female athletes from injury through rules and regulations, as well as the athletes themselves being more concerned over the consequences of concussion, thus reporting their symptoms more accurately than males. And finally, it is believed that hormonal differences may influence the severity and timeframe of symptoms an athlete experiences. Though results are still inconclusive, it is believed that estrogen and progesterone may have neuroprotective benefits after brain injury (Broshek et al., 2005; Dick, 2009). Other neuroanatomic dissimilarities between the male and female brain may also influence
symptomology. Specifically, the female brain has a higher glucose metabolic demand and increased cerebral brain flow, thus intensifying the post-concussion metabolic dysfunction, leading to more severe symptoms and exacerbating prolonged symptoms (Broshek et al., 2005). In conclusion, female athletes are a vulnerable at-risk population, where through various proposed mechanisms, female athletes experience more severe somatic symptoms and report a greater number of symptoms.

Cognitive symptoms. Unsurprisingly, concussion can result in persistent deficits in cognitive functioning, with devastating impairment to daily life functioning (Moore, Sauve, & Ellemberg, 2016). Cognitive function following sport concussion is typically measured using the Immediate Post-concussion Assessment and Cognitive Testing (ImPACT) software (Covassin et al., 2007). This test assesses six areas of cognitive functioning: verbal recognition memory, visual working memory, visual processing speed, reaction time, numerical sequencing ability, and learning (Covassin et al., 2007). Traditionally, athletes would perform this test prior to their season beginning in order to establish a baseline. They would perform it again during the season if they acquired a suspected concussion (Covassin et al., 2007). However, the CISG’s latest consensus statement concluded that baseline information does not need to be collected to identify decline in cognitive function (McCrory et al., 2017). After injury, cognitive symptoms improve significantly 1-2 weeks post-concussion, then plateau, and may remain detectable for up to four weeks (Henry, Elbin, Collins, Marchetti, & Kontos, 2016). Research suggests that in the time following a concussion, an athlete may experience deficits in one, multiple, or all of these areas as a result of the neurophysiological disturbance occurring within the brain (McCrory et al., 2017). Moreover, female athletes are 1.7 more likely to experience a greater cognitive decline,
specifically in visual memory, reaction times, and processing speeds (Broshek et al., 2005; Covassin et al., 2007, 2012).

In addition, research suggests that cognitive dysfunction may be present long after acute somatic symptoms subside (Leddy et al., 2017). In fact, one study found retired professional athletes reported cognitive impairment years after leaving their sport (Caron et al., 2013). Moreover, Pearce, Rist, Fraser, Cohen and Maller (2018) reported that retired professional rugby players with a history of concussion performed worse on fine motor control tasks compared to age-matched participants with no history of concussion and had a slower visuomotor reaction time, despite being removed from their sport for a prolong period of time. Furthermore, neurophysiological tests, such as electroencephalography, can detect neurophysiological deficits related to cognitive decline even if the concussed athlete performs normally on standard cognitive assessments, such as the ImPACT (Baillargeon, Lassonde, Leclerc, & Ellemberg, 2011). Therefore, it is believed that the brain undergoes two phases of recovery, the first being the initial rapid functional recovery where mechanisms such as brain plasticity allow the athlete to improve assessment scores, indicating progression in recovery. The second step is much more worrisome, as it is characterized as prolonged neuronal recovery, where deficits in brain functioning can be identified through neurophysiological tests, but not using clinical assessment tools (Baillargeon et al., 2011). Unfortunately, as many protocols use these forms of cognitive assessments as an indication of an athlete’s recovery, this may result in the athlete returning to play before their brain is fully healed (Baillargeon et al., 2011; Covassin et al., 2007).

**Protracted symptoms.** Despite 80-90% of concussion symptoms resolving within 7-10 days, the remaining 10-20% of concussions are termed *protracted* and are characterized by intense psychological and somatic symptoms that extend beyond the traditional recovery
timeline, persisting for weeks, months, or years after the initial injury (André-Morin, Caron, & Bloom, 2017; Caron et al., 2013). For example, a recently published qualitative study on female university athletes found that athletes with protracted symptoms faced feelings of depression and anxiety, as well as physical symptoms such as headaches and vision problems that interrupted their ability to perform basic tasks in school and at home (André-Morin et al., 2017). These findings suggest that the longevity and severity of protracted concussions have implications in daily life functioning and overall wellbeing of the athlete (André-Morin et al., 2017; Caron et al., 2013).

It is currently difficult to determine the reasons why some athletes recover in the usual 7-10 day period while others develop long-term protracted symptoms. Persistent symptoms are not attributed to ongoing, functional neurological injury, but rather believed to be the result of a combination of various biopsychosocial elements and potentially comorbid and confounding factors (McCrory et al., 2017). However, research suggests that pre-existing factors, such as age, gender, and concussion history, as well as physiological elements such as specific blood biomarkers and genetic makeup, may play a role in prolonged recovery (McCrea et al., 2017; McCrory et al., 2017). While this research is still fairly inconclusive, there are promising results suggesting that an athlete’s risk of developing protracted concussion symptom can be predicted by sex, individual concussion history, certain physiological makeup, and the severity of acute post-injury symptoms (i.e., headache, loss of consciousness, oculomotor disturbances) (McCrea et al., 2017; McCrory et al., 2017). Currently, severity of post-concussion symptoms are recognized as the strongest predictor of a prolonged recovery (McCrory et al., 2017), but emerging evidence in female athlete populations suggests that female athletes were at a greater risk of suffering protracted symptoms (Broshek et al., 2005; Henry et al., 2016). More
specifically, female athletes reported significantly greater total symptom scores than male athletes four week following the injury (Henry et al., 2016). Consequently, identifying athletes who are at risk of developing protracted symptoms in the recovery process is crucial for proper management and treatment, especially as these athletes are more likely to experience greater psychological consequences.

In sum, concussions are a complex injury resulting from a blow to the head, neck, face or body and are increasingly common in sport. This injury leads to a functional disturbance within the brain that has a multitude of implications for physical and cognitive functioning, leading to symptoms such as headaches, dizziness, balance issues, memory impairment and vision problems (McCrory et al., 2017). Moreover, female athletes are at a higher risk for suffering more severe symptoms and incurring a greater number of symptoms (Broshek et al., 2005). Finally, despite most concussions resolving themselves within 7-10 days, some athletes develop protracted symptoms that can last for weeks, months, or years. Athletes with protracted concussions are at risk for long-term severe physical and psychological symptoms that can have lasting consequences on daily life functioning (Caron et al., 2013). Though it is believed female athletes are more likely to develop prolonged symptoms, more research is needed to identify other at-risk populations (Broshek et al., 2005). Furthermore, there is a need for research devoted to the psychological sequela of protracted concussion, especially within the female athlete population (André-Morin, et al., 2017).

**Psychological Implications**

When an athlete suffers an injury, they experience a unique form of transition in sport, one in which they are suddenly unable to participate in their sport, potentially distancing themselves from their teammates, and impacting their athletic identity (Grove, Lavallee, &
Gordon, 1997; Stambulova, 2017). Consequently, athletes with a stronger athletic identity tend to have greater difficulties with these sudden transitions, leading to greater perceived stress and greater anxiety responses (Grove et al., 1997). These heightened emotions from sudden loss of sport due to injury are linked to decreases in self-esteem and lasting emotional reactivity (Stambulova, 2017). Subsequently, when an athlete incurs some form of injury, an emotional response is expected, typically pertaining to some aspect of the acceptance, recovery, rehabilitation, and return to play process of the individual injury (Covassin, Elbin, Beidler, LaRevor, & Kontos, 2017; Putukian, 2016). Specifically, injured athletes report feelings of sadness, isolation, anger, frustration, and lack of motivation, as well as behavioral changes such as sleep disturbances and changes in appetite (Putukian, 2016). Yet despite these serious changes in mental state and behavior, most collegiate athletes report being unfamiliar with the psychological repercussions of injury (Covassin et al., 2017).

While emotional reactivity following injury is expected, some of these acute disturbances have the potential to exacerbate into much larger issues (Putukian, 2016). When the psychological responses to injury become persistent over time, become more severe, or become excessive in nature, these emotions turn problematic. Progressing emotional symptoms can potentially lead to larger clinical psychological issues such as depression, anxiety, eating disorders, and substance abuse (Putukian, 2016). Though most emotional sequelae following injury remains at a subclinical level and usually dissipates once the athlete recovers, some athletes develop lasting psychological issues that stem from their injuries (Kontos, Dietrick, & Reynolds, 2015). This is especially pertinent to athletes who suffer a concussion. Although all athletes experience emotional troubles following injuries, concussed athletes may face different
or more severe psychological consequences due to the unique nature of the injury (Covassin et al., 2017; Mainwaring, Hutchison, Bisschop, Comper, & Richards, 2010).

**Concussion and psychological sequelae.** Concussions present themselves uniquely in each athlete in a variety of somatic, cognitive and psychological symptoms (McCrory et al., 2017). Furthermore, because concussions are an invisible injury, the athlete lacks visible evidence of their injury, thus being perceived as healthy by peers, coaches, and teammates (Bloom, Horton, McCrory, & Johnston, 2004). In addition, the lack of a definitive return to play time line proves to be problematic for these athletes, especially since they often remain isolated and unable to partake in normal levels of physical activity throughout their recovery process (McCrory et al., 2017). Because athletes use physical activity as a way to relieve stress, and due to the nature of the concussion recovery process, which favors cognitive rest and limited physical activity, concussed athletes may be unable to cope with their injuries, leading to more severe psychological consequences (Putukian, 2016). Additionally, athletes suffering from long-term protracted concussion symptoms are at a greater risk for emotional sequelae, due to the prolonged nature of both physical and psychological symptoms (Caron et al., 2013). Some of the most reoccurring psychological symptoms in the literature are depression, anxiety, and mood disturbances, as well as maladaptive behaviors (Rice et al., 2018).

**Depression.** Depression is the most commonly reported and researched psychological outcome following concussion (Rice et al., 2018). Symptoms of depression include feelings of sadness, worthlessness, loss of interest in favored activities, fatigue, sleep disturbances, weight changes, and concentration difficulties (DSM-5, 2013). Rates of high depressive symptoms are common following all traumatic brain injuries, therefore it is not surprising that depression is the most reported psychological symptom of concussion (Broshek, De Marco, & Freeman, 2015;
Several studies have quantitatively reported increased depression symptoms in athletes following concussion (e.g., Kontos, Covassin, Elbin, & Parker, 2012; Mainwaring et al., 2004; Vargas, Rabinowitz, Meyer, & Arnett, 2015; Yang, Peek-Asa, Covassin, & Torner, 2015). For example, Yang and colleagues (2015) reported that athletes with symptoms of depression at baseline were 4.59 times more likely to experience depressive symptoms following concussion. While most evidence supports the fact that symptoms of depression typically follow the normal recovery time-line of 7-10 days, other researchers have found that depression is a long-term consequence of concussion (André-Morin et al., 2017; Caron et al., 2013; Guskiewicz et al., 2007; Kerr, Marshall, Harding, & Guskiewicz, 2012; McCrory et al., 2017).

Guskiewicz and colleagues (2007) analyzed the effect of repetitive concussive hits on the long-term risk of depression in retired professional football players. They discovered that athletes with one or two diagnosed concussions were 1.5 times more likely to be diagnosed with depression at some point in their lifetime. Furthermore, athletes with three or more diagnosed concussions were three times more likely to be diagnosed with depression (Guskiewicz et al., 2007). Kerr and colleagues (2012) found similar results, indicating a strong relationship between self-reported concussion history and increased risk of being diagnosed with depression up to nine years later in professional football players. Further supporting this evidence, a qualitative study exploring the impact of protracted concussions on the psychological well-being of retired NHL athletes reported that these athletes discussed intense feelings of depression and despair as a result of the physical, social, and emotional symptoms of their injuries (Caron et al., 2013). To date, most of the research specifically involving long-term depression and protracted concussions has focused on retired professional athletes, with little attention given to other at-risk athletic populations such as female university athletes (Rice et al., 2018). Though female athletes tend to
report greater feelings of depression pre-injury, there is currently no empirical evidence of sex differences for post-concussion depression (Kontos et al., 2012).

One qualitative study has specifically addressed depression and protracted concussions in female collegiate athletes (André-Morin et al., 2017). Among their conclusions, athletes reported this injury significantly impacted their ability to function physically, socially, and academically, leading to increased feelings of isolation and depression. In fact, one athlete reported attempting suicide after failing the semester following her injury, indicating just how impactful protracted concussion and the subsequent depression that follows can be (André-Morin et al., 2017).

Evidently, suicidal ideation following concussion has been reported in other cases as well (Caron et al., 2013; Fralick, Thiruchelvam, Tien, & Redelmeier, 2016). For example, Fralick and colleagues (2016) addressed the long-term risk of suicide following concussion and found those with a history of concussion were three times more at risk for suicide in their lifetime than the normal population (Fralick et al., 2016). Despite this study being conducted in a non-athlete population, the correlation between concussion and suicidal ideation cannot be ignored, especially as more attention is being delegated to CTE and increased risk of suicide in athletes with a history of concussion (Webner & Iverson, 2016). Moreover, collegiate athletes are at a greater risk of committing suicide than non-athletic university students. In fact, suicide is the fourth most common cause of death among NCAA student-athletes (Rao & Hong, 2015).

Therefore, the added psychological distress incurred by concussion in this already vulnerable population places athletes with protracted concussions at an increased risk of suicidal intentions. Coaches and medical staff should be cognizant of this heightened probability and address any signs of developing clinical depression in order to minimize the risk of suicide ideation in athletes with protracted symptoms.
Currently it is difficult to disentangle co-morbid/pre-existing depression symptoms from concussion-related symptoms, as many of them overlap (Covassin et al., 2017). For example, Chen and colleagues (2008) found that athletes with depressive symptoms following concussion had decreased activation and decreased grey matter in the dorsolateral prefrontal cortex and striatum, patterns consistent with major depression. It is suggested that neuronal dysfunction in these areas is due to a reduction of dopamine in the cortico-stratio-thalamic system and has been tentatively linked to depression in athletes with protracted concussion (Chen, Johnston, Petrides, & Ptito, 2008). Though evidence is still emerging, overlapping neural circuitry for depression and concussion may put athletes at greater risk for psychological issues following injury (Broshek et al., 2015). However, it is also believed that psychosocial aspects of concussion may cause depressive symptoms. Researchers have indicated that the athletes’ removal from sport, isolation from teammates, lack of a definitive recovery time-line, and lacking social support may also contribute to depression following concussion, especially in cases of protracted concussion (Àndre-Morin et al., 2017; Bloom et al., 2004; Caron et al., 2013). Evidently, depression is very common following concussion and researchers must address this issue in order to inform the proper treatment of these symptoms in the acute phases of recovery (Covassin et al., 2017). Allowing depressive indicators to remain untreated puts the athlete at risk for developing clinical depression symptoms, which can impact the athlete’s overall well-being (Kontos et al., 2015). As evidenced by the acute and long-term presentation of depression following concussion, an interdisciplinary and collaborative approach is needed to screen for pre-existing depression symptoms, identify these indicators in concussed athletes, and monitor changes throughout the recovery process (Covassin et al., 2017).
Anxiety. Athletes have also reported high feelings of anxiety following concussion (Caron et al., 2013; Covassin et al., 2017; Rice et al., 2018; Yang et al., 2015). Much like depression, symptoms of clinical anxiety and concussion-related anxiety overlap, including restlessness, fatigue, nervousness, and sleep difficulties (Bloom et al., 2004). There are also similar proposed neural mechanisms behind these feelings of anxiety—cortical structures such as the amygdala and insula, as well as subcortical structures such as the hypothalamus are involved in crucial emotional processing. Together, they determine how an individual responds to fear-invoking stimuli. When these systems are not functioning correctly, fear-responses are heightened, and increased feelings of anxiety are experienced by the individual (Broshek et al., 2015). Concussion is related to damage within these areas, thus leading to disruptions in the fear emotion-recognition and behavioral responses of the injured individual (Broshek et al., 2015).

Trait anxiety features, such as heightened anxiety sensitivity (i.e., “fear of fear”) is also linked to increased emotional outcomes in athletes with protracted injuries, especially in females (Albanese, Boffa, Macatee, & Schmidt, 2017). Research indicates that women tend to report greater anxiety sensitivity (Albanese et al., 2017). This plays an important role in concussion recovery, as these individuals may perceive protracted symptoms as more severe and catastrophic, resulting in more injury-related distress. Furthermore, individuals with high anxiety sensitivity and lower distress tolerances may lack an ability to cope with the negative emotions correlated with protracted concussion, leaving them to perceive their symptoms as more dangerous to their well-being. It is proposed that this positive feedback loop may play a role in why women tend to report greater protracted concussion symptoms (Albanese et al., 2017).

Mood disturbances and maladaptive behaviors. Researchers have also identified mood disturbances following concussion (Mainwaring et al., 2004; Moore et al., 2016). Mood is
defined as a set of feelings that vary in intensity and length and may involve more than one emotion (Covassin et al., 2017). While Mainwaring and colleagues’ (2004) findings suggested that athletes experienced this transient state in emotion only within the first three weeks of injury, research also indicated that athletes suffering from protracted concussions may report mood disturbances for months following their injury (André-Morin et al., 2017). André-Morin and colleagues (2017) found that athletes described themselves as not feeling like their usual selves, acting in ways that were uncharacteristic of them before their concussion. Consequently, it is suggested that concussed athletes experience unique and potentially prolonged mood disturbances that are typically uncharacteristic of their pre-injury affect (André-Morin et al., 2017; Covassin et al., 2017).

Concussed athletes may also participate in uncharacteristic maladaptive behaviors such as substance abuse and disordered eating following their concussions (André-Morin et al., 2017; Guskiewicz et al., 2007). Additionally, evidence suggests that athletes who have a history of concussion were more likely to be separated or divorced in their lifetime (Guskiewicz et al., 2007). Athletes with a history of concussion are also more likely to report concerns over their alcohol consumption (Guskiewicz et al., 2007). Seeing as substance abuse is related to depression, it can be hypothesized that depressive symptoms following concussion may result in substance dependency among athletes, especially those who suffer from protracted concussion symptoms (Guskiewicz et al., 2007). Disordered eating has also been observed following concussion (André-Morin et al., 2017). According to André-Morin and colleagues, athletes reported unusual weight gain or loss during their recovery from a protracted concussion.

Evidently, more research is needed to identify the mechanism behind which athletes experience such extreme mood disturbances or participate in harmful behaviors after suffering a concussion.
In conclusion, it is not uncommon for athletes to experience psychological duress following an injury (Putukian, 2016). This is especially evident for athletes with concussions, who experience a unique injury with a relatively unknown recovery timeline (Bloom et al., 2004). Furthermore, negative psychological outcomes such as depression, anxiety, and mood disturbances, as well as maladaptive behaviors, have been reported following concussion (Covassin et al., 2017; Rice et al., 2018). Athletes who suffer from protracted concussions are at a greater risk of these psychological consequences due to the prolonged biopsychosocial symptoms of their injuries (André-Morin et al., 2017; Caron et al., 2013). Moreover, seeing as college athletes, especially female athletes, are at a greater risk of suffering protracted symptoms, research in this specific population is greatly needed to support the cognitive, somatic, and psychological recovery of these athletes (Dick, 2009).

**Stress, Appraisal, and Coping**

Stress is defined as a relationship between a person and their environment that they appraise as having a significant impact on their wellbeing beyond the resources they have available (Lazarus & Folkman, 1986). This taxing relationship is not uncommon amongst the college population. Rather, stress is highly prevalent and at times severe for all college students, but stress is typically exacerbated amongst college athletes (Heller, Bloom, Neil, & Salmela, 2005; Wilson & Pritchard, 2005). Therefore, research is needed to examine how athletes handle injury related stress through the process of coping.

**Lazarus and Folkman’s theory of stress and coping.** Based off *Stress, Appraisal, and Coping* (Lazarus, 1966), Richard Lazarus and Susan Folkman (1984) developed a transactional theoretical framework that explains how an individual perceives and reacts to a stressful environment. They describe this as a relationship between the person and the environment that is
mediated by two processes (Lazarus & Folkman, 1984). The first is appraisal, or the cognitive process through which an event is evaluated by an individual. Furthermore, there are two levels of cognitive appraisal that happen within this framework. Primary appraisal is an evaluation of what is at stake due to the stressor, whereas secondary appraisal is an assessment of coping resources available to handle this stress. Subsequently, their appraisal influences the style of coping they implement (Folkman & Lazarus, 1980).

Coping is defined as the cognitive and behavioral efforts made to master, tolerate, or reduce the demands of a stressor (Folkman & Lazarus, 1980). Folkman and Lazarus (1980) distinguish two main styles of coping: problem-focused and emotion-focused coping. The first pertains to efforts to actively manage or alter the source of stress, whereas the latter refers to attempts to regulate stressful emotions about the stressor (Folkman & Lazarus, 1980). Examples of specific problem-focused coping efforts include seeking information, planning, suppression of competing activities, restraint, and seeking social support, whereas examples of problem-focused coping efforts include focusing on and venting emotions (rumination), behavioral and mental disengagement, positive reappraisal, denial, acceptance, and turning to religion (Carver, Scheier, & Weintraub, 1989). Furthermore, problem-focused coping is linked to better health outcomes and increased positive affect following stress (Brougham, Zail, Mendoza, & Miller, 2009; Stowell, Kiecolt-Glaser, & Glaser, 2001). Conversely, emotion-focused typically results in negative psychological outcomes, except in the cause of acceptance and positive reframing (Brougham et al., 2009; Carver et al., 1989). Moreover, women tend to use more emotion-focused forms of coping compared to men, suggesting that women are at a greater risk of experiencing negative psychological outcomes following stress (Brougham et al., 2009).
Coping and athletic injuries. Though this line of work is limited, a majority of the research regarding coping and athletic injury attempts to understand how an athlete copes throughout the recovery process (Johnson, 1997; Johnston & Carroll, 2000; Udry, 1997). Injured athletes typically rely on active, problem-focused coping efforts, such as learning about their injuries, and seeking out professional support (Bianco, Malo, & Orlick, 1999). When examining the consistency of coping throughout recovery, Johnston and Carroll (2000) found that athletes with orthopedic injuries experienced a decrease in overall coping efforts over time. In support of this, multiple studies discovered that following injury, athletes moved from initial negative emotions, such as anger, denial, and frustration, towards more positive emotions, such as optimism and enthusiasm (Udry, Gould, Bridges, & Beck, 1997; Quackenbush & Crossman, 1994). Athletes experience various emotions throughout recovery, suggesting a need for different coping efforts as recovery progresses (Quackenbush & Crossman, 1994). It is also postulated that athletes typically move from a more emotion-focused coping style to a more problem-focused coping style as recovery progresses, therefore as recovery improves, there is less need for coping in general (Johnston & Carroll, 2000; Udry, 1997). But when researchers compare the coping efforts and subsequent emotions for orthopedic injuries, to that of a more unique injury like concussion, the results begin to differ (Covassin, Crutcher, Elbin, Burkhart, & Kontos, 2013; Kontos, Elbin, Newcomer Appaneal, Covassin, & Collins, 2013)

Coping and concussion. Concussed athletes face a recovery process that is unlike any other athletic injury. Specifically, differences in the recovery timeline, an unknown prognosis, unique symptom presentation, and passive rehabilitation efforts may make it more difficult for concussed athletes to cope with their injury (Bloom et al., 2004; Covassin et al., 2013; Kontos et al., 2013). Due to the prolonged symptoms of protracted concussions, how an athlete copes with
their injury may have serious implications for the psychological and physical well-being (André-Morin et al., 2017). Furthermore, emerging research suggests that concussed athletes engage in more emotion-focused coping efforts such as self-distraction, behavioral disengagement, and self-blame (Covassin et al., 2013; Kontos et al., 2013). Though these researchers did not examine outcome following these coping efforts, TBI literature reports that maladaptive, emotion-focused coping is related to incomplete recovery, greater reported symptomology, and greater emotional disturbance, such as higher anxiety, depression, lower self-esteem, and psychosocial dysfunction following TBI (Anson & Ponsford, 2006; van der Naalt et al., 2017; Woodrome et al., 2011).

Furthermore, female concussed athletes appraise their injury as more threatening, and therefore tend to have a greater emotional response, thus requiring a greater coping response. This has serious implications for the athlete’s well-being if the coping style she recruits is emotion-focused (Kontos et al., 2013).

Researchers have formulated a few hypotheses to explain why concussed athletes differ in coping efforts than athletes with other orthopedic injuries (Covassin et al., 2013; Kontos et al., 2013). First, concussion is related to increased fatigue, thus the athlete may need to recruit passive, more emotion-focused styles of coping such as getting more sleep or restricting activity, while athletes with other injuries use more active forms of coping (Kontos et al., 2013; McCrory et al., 2017). Another proposed thought is that concussed athletes tend to be less informed about their injury, and subsequently experience more frustration and confusion throughout recovery (Covassin et al., 2013). Research suggested that athletes who were more familiar with their injury and had a definitive prognosis, as is the case with most musculoskeletal injuries, tended to cope better (Bianco et al., 1999; Covassin et al., 2013). A third postulate is that athletes who believed they would return to pre-injury performance levels and were able to maintain a positive
perspective throughout recovery remained motivated and were able to cope better with the emotional responses to prolonged injury (Bianco et al., 1999). Unfortunately, due to the long, isolated and relatively inactive recovery process from protracted concussion, many of these athletes cannot maintain these positive outcome beliefs, and therefore use more problem-focused coping efforts (André-Morin et al., 2017; Bianco et al., 1999).

Finally, and perhaps most importantly, researchers believe that the degree of controllability affects an athlete’s ability to cope (Covassin et al., 2013). A majority of maladaptive coping efforts in both concussed and musculoskeletal injuries stems from feeling a lack of control (Bianco et al., 1999; Covassin et al., 2013). Furthermore, Kontos and colleagues (2013) reported that concussed athletes used less coping overall when compared to athletes with orthopedic injuries. Though Kontos and colleagues (2013) suspected this was due to athletes not perceiving their injuries as severe enough, Covassin and colleagues (2013) found that concussed athletes largely used avoidance coping in the acute time after their injury. Avoidance coping is characterized by efforts not to engage in any form of coping, rather the individual simply avoids the stress (Carver et al., 1989). Therefore, the usage of avoidance coping may result in less overall coping efforts being utilized, as was found by Kontos and colleagues (2013). The usage of avoidance coping in the short term is shown to be beneficial in reducing stress and increasing perceived control (Covassin et al., 2013). However, research suggests that long term usage of avoidance coping is linked to higher reported symptoms, negative psychological outcomes, and longer recovery time (Anson & Ponsford, 2006; Covassin et al., 2013). Moreover, if the concussed athlete attempts to use more active forms of coping, such as seeking social support, and that resource is not available due to the nature of the injury, they may find their coping efforts to become less effective overall (Anson & Ponsford, 2006). Seeing as symptoms of
protracted concussion are perceived as relatively unchangeable for an extended period of time, the athlete may begin to feel increased frustration, helplessness, and depression, further exacerbating the psychological sequelae of concussion (André-Morin et al., 2017; Anson & Ponsford, 2006).

**Social support.** Most of the injury coping literature focuses on how an athlete copes, but little research has been done to explore why an athlete copes in a certain manner (e.g., Bianco et al., 1999; Johnson, 1997; Johnston & Carroll, 2000). This is largely due to difficulties in studying how athletes appraise their injuries (Lazarus & Folkman, 1987). Though researchers have struggled to understand appraisal at the primary and secondary level in the coping process, they have begun to understand how an athlete perceives certain moderators like social support (André-Morin et al., 2017; Bloom et al., 2004). In fact, Bloom and colleagues (2004) reported that social support played a large role in how an athlete appraised their concussion.

Social support is defined as any “exchange of resources between at least two individuals that is perceived by the provider and/or recipient to be intended to enhance the well-being of the recipient,” (Shumaker & Brownell, 1984 p. 13). Furthermore, there are two key forms of social support: emotional support and informational support. The first refers to expressions of care, empathy, concern, and sympathy, whereas the latter involves messages that convey valuable knowledge or feedback. The type of support an individual seeks out depends on the demands of the stressor (Folkman & Lazarus, 1985). For example, Folkman and Lazarus (1985) report that emotional support is crucial to coping when the situation is deemed uncontrollable. In a university athletic context, social support is typically first received from the athlete’s family members, followed by friends, teammates, and athletic trainers (Covassin et al., 2014).
Cohen and McKay (1984) proposed the buffering hypothesis of social support, which states that stress will be detrimental to individuals who lack social support, whereas those with high social support will be shielded from the effects of stress. This is attributed to the moderating factor that social support plays in the coping process (Cohen & McKay, 1984). Moreover, social support is said to facilitate coping through four key ways. First, support givers can suggest alternative coping strategies. Second, they can facilitate behaviors that increase the individual’s ability to tolerate or resist the effects of stress. Next, social support givers can help the individual to positively reappraise their stress, which is linked to more adaptive responses to stress. And finally, support providers can give tangible aid, such as financial assistance or material goods (Cohen & McKay, 1984). However, while seeking and obtaining social support is categorized a problem-focused coping effort, it can be both adaptive and maladaptive dependent on the context the individual uses the support (Carver et al., 1989; Cohen & McKay, 1984). Social support is a beneficial way of obtaining reassurance in stressful situations, but individuals may use support givers as an outlet for ventilation of their emotions. Subsequently, venting of emotions may cause the individual to focus and ruminate on feelings, thus exacerbating the stress. This can also distract the individual from actively coping with the source of their stress. Though social support is hugely beneficial in decreasing perceptions of stress and facilitating proper coping, one must be sure that the support they seek is needed within the specific context of their stress (Carver et al., 1989).

Evidently, social support can play a large role within the athletic injury recovery process (Bloom et al., 2004; Covassin et al., 2014; Johnston & Carroll, 2000). Specifically, Johnston and Carroll (2000) reported that athletes seek out emotional support from teammates and parents, as well as informational support from athletic trainers and coaches to cope with their injuries.
Furthermore, this social support remained fairly consistent throughout recovery for most athletes with orthopedic injuries. However, research also suggests that social support wanes over the course of prolonged injuries (Johnston & Carroll, 2000). Furthermore, athletes who perceived a supportive environment appraised their injuries as less stressful, leading to the usage of more adaptive problem-focused coping skills, such as positive reframing (Salim, Wadey & Diss, 2016). On the other hand, athletes who perceived low social support throughout recovery perceived greater loss from their injury. This may result in the practice of more maladaptive, emotion-focused coping efforts such as rumination, suppression of emotions, and emotional outbursts (Salim et al., 2016). Moreover, female athletes tend to seek out social support more when dealing with an injury and are typically content with the amount of support they received (Johnston & Carroll, 2000). Johnston and Carroll (2000) proposed that the evolutionary tendency of females to “tend and befriend” in the face of potentially harmful stress lends female athletes to rely more closely on support givers. Also, female athletes reported smaller but more intensive network of support providers and perceived a higher functional value from obtained support (Johnston & Carroll, 2000).

With respect to concussion, athletes with orthopedic injuries reported greater satisfaction with social support than concussed athletes (Covassin et al., 2014). One proposed reason was the nature of the RTP for concussion which distances the athlete from sport and academics (McCrory et al., 2017). In the case of protracted concussion, this can mean an athlete is isolated away from peers and teammates for extended periods of time, leaving them unable to obtain the social support they need to cope (André-Morin et al., 2017; Covassin et al., 2014). Another proposition is that concussed athletes receive less social support due to the invisible nature of their injury (Bloom et al., 2004; Salim et al., 2016). When an athlete incurs an orthopedic injury,
potential support givers can visibly identify the injury or the athlete’s pain (Salim et al., 2016). This is not the case for athletes with concussions, who show little to no outward symptomology (Bloom et al., 2004). Furthermore, concussed athletes spend less time on average in the athletic trainer’s office than athletes with other injuries, thus are not in an environment that can provide beneficial support (Salim et al., 2016). Moreover, research suggests that lack of understanding regarding concussion on the part of teammates, coaches, and family, in conjunction with increased pressure to return to play, may leave concussed athlete’s feeling misunderstood and unsupported (Caron et al., 2013). The culmination of these reasons, in conjunction with the emotional distress and physical pain incurred by the concussion itself, may make the athlete feel incredibly isolated and unable to cope with their concussion. Consequently, lower social support is related to lessened ability to manage negative emotions and increased rumination, making it less likely for the concussed athletes to be able to positively reframe their injury and utilize more active, problem-focused coping efforts (Salim et al., 2016).

In conclusion, the Lazarus and Folkman (1984) theory of stress and coping, proposes that individuals respond to stress through cognitive appraisal and specific coping efforts. These coping efforts may be problem-focused and emotion-focused and can result in adaptive or maladaptive behavioral and cognitive responses (Folkman & Lazarus, 1980). Furthermore, coping is a continuous, unfolding process that shifts based on the demands of the situation, not unlike the recovery process for athletic injuries (Folkman & Lazarus, 1985; Quackenbush & Crossman, 1994). Moreover, coping plays a large role in how an athlete handles the psychological outcomes of their injuries. Athletes tend to actively attempt to alleviate stress to reduce psychological consequences (Johnson, 1997; Johnston & Carroll, 2000; Udry, 1997). Relevant to concussed athletes, the heterogeneous presentation and unknown recovery timeline
leave them unable to utilize the same coping styles as other injured athletes (Kontos et al., 2013). This, in conjunction with lowered perceived social support, leaves concussed athletes vulnerable to the stress of their injuries, putting them at greater risk of utilizing more maladaptive coping efforts (Covassin et al., 2014; Kontos et al., 2013). This in turn can lead to more negative psychological responses to concussion, exacerbating the symptomology of the injury (André-Morin et al., 2017). Consequently, research is needed to help identify athletes who would benefit from coping interventions and increased social support as ways to limit negative outcomes following their injury (Woodrome et al., 2011).

**Conclusions**

Concussions are a complex, unique injury that results in a multitude of somatic, cognitive, and psychological symptoms (McCrory et al., 2017). Additionally, a small percentage of athletes suffer from protracted symptoms - psychological or somatic symptoms that can last weeks, to even years (Caron et al., 2013). These symptoms can be debilitating, with the potential to impact academic and social functioning (André-Morin et al., 2017). Moreover, college athletes, and more specifically, female university athletes, are at a greater risk of suffering a concussion, as well as developing protracted symptoms (Broshek et al. 2005; McCrory et al., 2013). Psychological outcome following concussion is exacerbated beyond the response to other orthopedic injuries, potentially due to the unknown recovery timeline, heterogeneous symptom presentations, and potentially isolating recovery process (André-Morin et al., 2017; Bloom et al., 2004; McCrory et al., 2017). Following concussion, athletes experience negative psychological and behavioral consequences such as depression, anxiety, mood disturbances, and disordered eating (André-Morin et al., 2017; Covassin et al., 2017; Rice et al., 2018). How an athlete handles the emotional response to injury largely depends on the coping style they use throughout
recovery (Johnston, 1997). Therefore, research in coping is needed on vulnerable populations, such as female university athletes with protracted symptoms, in order to understand how and why these athletes handle the psychological consequences of concussion in manners different than orthopedic injuries (Kontos et al., 2013).
Chapter 3

Methods

This chapter will describe the qualitative methods implemented to answer the research questions for this study. Qualitative methods orient around an individual’s lived experiences, how they view knowledge, and how they construct that knowledge (Sparkes & Smith, 2014). The following chapter will begin with an exploration of the philosophical assumptions driving this research. The second section will address the methodology and methods in place to collect data, including the participant selection, recruiting process, and how data will be gathered in a qualitative framework. The next section will describe how the collected data was analyzed and the procedures put in place to ensure the trustworthiness and quality standards of the analysis. The final section will detail the ethical considerations, such as the potential risks to the participants, the steps taken to address and minimize these risks, and the role of the researcher in the research process.

Philosophical Assumptions

According to Guba and Lincoln (1994), a paradigm is an individual’s worldview, or their basic beliefs of knowledge. A paradigm acts as a guide, informing the methodological decisions made at each step of the research process. Situated under the paradigm are the ontological, epistemological, and methodological questions that drive the research. Ontology is concerned with what knowledge is relative to the individual, epistemology is how this knowledge is created, and methodology is how the researcher goes about discovering this knowledge (Guba & Lincoln, 1994). How a researcher addresses these three areas stems from their personal beliefs and understanding of the world (Sparkes & Smith, 2014).
The current study was framed from a constructivist paradigm (Daly, 2007; Guba & Lincoln, 1994), where subjective knowledge is actively constructed together by both the participants and the researcher. Within the constructivist paradigm, it is stated that knowledge can be interpreted through reflection and dialogue with others who are placed within a certain context. Humans construct their own realities based on their experiences and what they consider to be “real” is contextual to that reality. Furthermore, constructivism has distinct ontological, epistemological, and methodological assumptions that determine what this co-constructed knowledge consists of and how it is formed (Guba & Lincoln, 1994). Ontology is concerned with what the individual believes is real. A relativist ontology supports the idea that there are multiple realities (called constructs) that are specific to the individual and the context which in they create these realities (Guba & Lincoln, 1994). In terms of epistemology, a transactional and subjective epistemology states that knowledge is gained through the researcher and the participant co-constructing the participants’ lived experiences. That is, the formation of knowledge occurs as the researcher and participant investigate a certain phenomenon (Guba & Lincoln, 1994).

The role of the researcher. A constructivist approach was appropriate for the current study because it allowed for the researcher’s own experiences to help inform, through dialogue with the participant, the construction of knowledge on the female athlete’s experiences with a protracted concussion. The lead researcher, Rebecca Steins (RS) was a varsity level University athlete for two years. Within those two years, I (RS) experienced two long-term injuries that left me unable to participate in sport. I was out of sport for three months with multiple stress fractures in my leg, following a four-month recovery process for a torn shoulder muscle. I experienced various stressors from my coaches and teammates, and felt I lacked the ability to cope effectively. This is what originally interested me in study coping and athletic injuries.
Therefore, my (RS) own experience as both a female athlete and an athlete facing prolonged-recovery from a sport injury informed the investigation into the reality of a female athlete with protracted concussion symptoms. I (RS) was able to develop a greater rapport with my athletes, as well as interpret their experiences on a deeper level. However, due to my personal experiences, I (RS) also had to implement strong methods to ensure trustworthiness, that will be discussed in depth later in this chapter.

**Methodology**

Qualitative methodologies aim to “interpret the interpretations of others” through methods that encourage exploration into a topic via interaction between the researcher and the participant (Sparkes & Smith, 2014, p. 12). Typically, qualitative methodologies are hermeneutical and dialectical in nature, where constructions are created through discussion and interpretation of a phenomenon (Guba & Lincoln, 1994). Examples of qualitative methodologies include narrative, ethnography phenomenology, and case study. The current study used a case study methodology, defined as the investigation of a phenomenon within its real-life context (Sparkes & Smith, 2014). Moreover, there are at least three types of case study: intrinsic, instrumental, and collective. The current study utilized a collective case study approach, where multiple cases were studied together in order to investigate a phenomenon. The individual cases of multiple participants who have experienced the same phenomenon were studied together in order to better understand the experience in question (Sparkes & Smith, 2014). Within the context of this study, a collective case study methodology was used to identify common themes within multiple female athletes’ experiences of coping with protracted concussion.

From a constructivist viewpoint, investigating multiple cases of athletes with this injury permitted in-depth exploration of a multitude of experiences with protracted concussion, leading
to rich, detailed information. But this methodology was not without weaknesses. First, case studies are sometimes difficult to generalize to a wider population (Sparkes & Smith, 2014). One athlete’s experience of coping with protracted concussion cannot be generalized to the rest of the athletic community. In addition, results from case studies can lead to verification bias. When a researcher has a pre-conceived notion of what he/she is trying to find in their cases, he/she may choose cases that are more likely to support these notions, or they may unintentionally interpret the data to match their desired results (Sparkes & Smith, 2014).

**Participants and Procedure**

Five university female athletes were purposefully selected via criterion sampling (Braun, Clarke & Weate, 2016; Sparkes & Smith, 2014). We (the study team) selected five athletes based on a predetermined set of criteria, whereas they must a) be/have been a female university Canadian or American athlete for at least one full season, b) been medically cleared to return to play at the time of their participation in the study and, c) have experienced protracted concussion symptoms that kept them out of competition for a minimum of six weeks. Athletes came from various athletic backgrounds, with no preference given to any certain sport as long as they meet the criteria.

After receiving approval from the McGill Research Ethics Board, we (the study team) recruited athletes through email, telephone, or word of mouth using snowball sampling via referrals from athletes, coaches and athletic therapists (Sparkes & Smith, 2014). We sent University coaches a recruitment letter via email with a brief explanation of the study, the expectations of the participant, as well as the lead investigator’s contact information (see Appendix A). The coaches then put the lead investigator (RS) in contact with athlete’s who fit the criteria, and a follow-up email containing a recruitment letter was sent to the athlete (see
Appendix B). We then sent athletes who were interested a consent form (see Appendix C) and an interview date, time, and location were set. This process allowed participants to make an informed decision to take part of the study based on the nature of the study, the purpose, and the potential risks (Sparkes & Smith, 2014). Additionally, we informed participants they could withdraw from the study at any time, and that all participation and information was entirely voluntary. We also gave each participant information on mental health resources at their corresponding university, as well as online sources, in case there is a need for her to discuss emotional distress with a qualified individual. Encouraging an individual to tell their stories with an experience may have brought up difficult emotions, thus a plan was put in place to ensure the proper resources were available to the participant to protect both them and the researcher (Sparkes & Smith, 2014).

**Data Collection**

We (the study team) collected data using semi-structured interviews. This was a flexible method that is often used to study people’s perceptions and opinions on complex or sensitive topics. It allowed for focus on topics that were meaningful to participants, creating diverse responses on a particular phenomenon, while still staying oriented around the research questions. Moreover, the goal of semi-structured interviews was to reach thematic saturation within the data, enough for prominent themes to be created between the researcher and participant. Following each interview, I (RS) made reflexive field notes to identify key responses and potential non-verbal information that contributed to the context of the interview (Smith & Sparkes, 2016). Semi-structured interviews follow an interview guide that is used to direct the conversation through open-ended questions, which allowed myself (RS) to gather important information on the phenomenon while still giving participants the chance to report their
subjective thoughts. Furthermore, this style of interview fit within the social constructivist paradigm and is widely used within case study research (Sparkes & Smith, 2014). Interviews with the lead investigator (RS) lasted 50 to 73 minutes and combined for a total of 308 minutes. The site for the interviews were purposefully selected to ensure confidentiality and that the participants were comfortable. Further, four of the interviews were conducted in person and one interview was conducted via video-conference.

**Interview guide.** The interview guide was a list of questions that direct conversation towards the research topic during the interview (see Appendix D). The aim of an interview guide was to allow the interview to generate detailed and unique responses that reflected the participant’s feelings and thoughts, while still answering the research questions of the study (Kallio, Pietilä, Johnson, & Kangasniemi, 2016). Questions were participant oriented, non-leading, and easily understood. There were two levels of questions: main themes and follow-up questions. Main themes covered the main focus of the research study and probed participants to speak about their experiences. Thus, these questions remained consistent throughout each interview. Moreover, main themes tended to start light, created rapport with the participant, and then moved to more emotional topics (Kallio et al., 2016). For the purpose of this study, the main theme questions attempted to explore female athlete’s experiences with protracted concussion, and the role that coping played in the recovery process, as well as the function of social support in this context. Additionally, follow-up questions were used to expand on responses to the main themes in order to get more detailed and focused answers. These were pre-designed or spontaneously generated based on the participant’s responses. Finally, after the initial interview guide was developed, I (RS) underwent two pilot tests. This allowed for critiques from qualified peers, informed adjustments to the guide, and to ensure the main research questions were
answered. The goal of this process was to leave the research team with a clear and concise final interview guide (Kallio et al., 2016). Please see Appendix D for a copy of the interview guide.

**Data Analysis**

We (the study team) analyzed the data using thematic analysis (Braun et al., 2016; Daly, 2007). Thematic analysis is a flexible form of data analysis that allowed the researcher to pick up complex and nuanced information regarding the participant’s experience with a phenomenon. Further, it is a six-phase process that involved active participation with the data, and continuous, conscious reflexivity in order to identify themes. The first phase was familiarization, where I (RS) transcribed the interviews, immersed myself within the data from an analytical standpoint, re-reading and making broader notes on potentially important fragments in the data. The second phase was coding, which served as a more systematic and thorough attempt to establish patterns. Moreover, the data may be coded at a semantic or latent level. Semantic information is directly stated and coded at face value, whereas latent information is coded on a more interpretive level, attempting to identify underlying factors in the participant’s response (Braun et al., 2016). For the current study, the data was coded from a more inductive, latent standpoint to identify if, and/or how coping played a role in recovery, and 46 initial codes were identified. Following coding, phase three was theme development, where codes were clustered to identify more complex themes based on more interpretative analysis of the data. There were two levels of theme development. First, I (RS) grouped similar codes to form nine lower-order themes, that were then synthesized into three higher-order themes (see Appendix E for more information). Furthermore, the fourth theme was refinement, when I (RS) ensured the themes represented the data correctly, were distinct from one another, and told a coherent story that addressed the purpose of the study. The fifth phase was naming the themes, or when I (RS) defined and named
the themes in an attempt to build a more interpretative and detailed narrative of the data. Finally, the sixth phase was writing up the themes within the narrative and using meaningfully chosen quotes to provide context to my (RS) interpretation of the data (Braun et al., 2016).

**Trustworthiness and quality standards.** Judgments of research quality for quantitative and qualitative research differ due to epistemological and ontological differences (Sparkes & Smith, 2014). That is, where quantitative standards of quality focuses on manners of objectivity, reliability, generalizability, and validity, qualitative measures of quality are based on the idea of trustworthiness. I (RS) implemented two methods to ensure trustworthiness: the use of a ‘critical friend’ (Sparkes & Smith, 2014), and reflexive practices (Sparkes & Smith, 2014).

The ‘critical friend’ was a qualified individual who encouraged the researcher (RS) to reflect on alternate interpretations of the data throughout the research process (Smith & McGannon, 2018; Sparkes & Smith, 2014). The ‘critical friend’ acted to challenge my (RS) construction of knowledge from different levels of experience, theoretical views, and paradigmatic frameworks (Smith & McGannon, 2018). For the current study, the second co-author (GB) acted as a ‘critical friend’ to challenge the researcher’s construction of knowledge from different levels of experience, theoretical views, and paradigmatic frameworks (Smith & McGannon, 2017). The third author (JC) also acted as a critical source of reflection throughout the research process.

Reflexivity was another method used in the current study to address trustworthiness (Sparkes & Smith, 2014). Due to my paradigmatic stance, my (RS) experiences as an athlete and with injury influenced the research process of co-constructing the experiences of the athletes with protracted concussion in this study. In order to remain open and self-aware of how my (RS) previous experiences may have biased my engagement with the data, I (RS) used journaling as a
reflexive practice to identify my own potential biases and how these biases influenced the research process (Sparkes & Smith, 2014). For example, one participant discussed feeling as though her coach did not believe she was being truthful about her injury. I (RS) experienced a similar situation during a shoulder injury while I was a varsity athlete. Therefore, within my reflexive journal, I (RS) discussed how my own experience made me feel, and how it may have impacted my analysis of this athlete. The reflexive journal acted as a point of reference during analysis to ensure that my (RS) own negative biases towards certain situation were not reflected in the way I shared the athlete’s experiences.

**Conclusions**

The methodology and methods for this study were framed from a constructivist paradigmatic framework that encouraged a co-construction of the experience of female athlete’s coping with protracted concussion between the lead researcher (RS) and the participant at all stages of the research process (Guba & Lincoln, 1985). Furthermore, we (the study team) used a case study methodology utilizing semi-structured interviews to allow the participant to explain their experiences with rich detail (Sparkes & Smith, 2014). Lastly, we implemented thematic analysis to identify main themes within the data (Braun et al., 2016; Sparkes & Smith, 2014). This approach allowed for in-depth and detailed responses to the research questions and provided meaningful work to the small body of literature on coping and protracted concussions.
Chapter 4

Results

This chapter presents the results of interviews conducted with five female University athletes who suffered a protracted concussion. Four of the five athletes competed in U-Sports in Canada, while one athlete was involved in Division II NCAA athletics in the United States. The interviews ranged from 50 to 73 minutes and combined for a total of 308 minutes. Further, the interviews were transcribed verbatim to produce 68 single-spaced pages of text. From the total data set, 46 initial codes emerged and were further condensed into nine lower order themes, that were then synthesized into three higher-order themes, that were called: athlete concussion journey, appraisal of resources and support, and concussion coping strategies (see Appendix E). The following chapter will use the participants’ own words and experiences to address each of the three higher-order themes. Moreover, in order to protect the participants confidentiality, pseudonyms (e.g., Sophia) will be used throughout the results section.

Athlete Concussion Journey: “Concussions are a roller coaster.”

Each athletes’ concussion history was different- each athlete described recovery timelines, causes and symptoms unique to their own concussion experience. However, some commonalities between the athlete’s concussion journey existed. This information will be presented in this section, beginning by combining the first two lower-order themes to describe the background of these participants.

Background information and concussion timeline. Although all the participants were a competitive University athlete, their involvement and perhaps skill levels ranged from “I was a top athlete. I was counted on to perform well and help the team win,” (Grace), to participating for their “own personal enjoyment” (Sophia). All but one of the athletes had been diagnosed with
a previous concussion, including an athlete who had suffered a previous protracted concussion. Furthermore, when looking at the cause of their concussions, both rugby players, Beth and Alyssa, suffered their concussions during a match, while Leah (softball) suffered a “freak accident”, slipping on the snow. However, two of the athletes did not know exactly how their concussion happened, as one athlete shared:

\textit{Grace:} That’s the big question because on my end there’s not a lot I could say in terms of when it happened, what exactly happened. I’m thinking that it was probably something over a longer period of time, and then eventually, one hit just kind of ended it. But it was just strange that it all happened after the fact. There was no specific hit I can remember.

In regard to the length of the athletes’ recoveries, they ranged from 7 weeks to over two years, as was the case for Grace:

\textit{Grace:} I was out for the better part of a year. If you count everything... it didn’t end there. That was just the first phase and then I was able to play three months. After that it was, no more. And I was out for another year. So it’s been kind of dragging on and on.

For more information on each athlete’s athletic background and injury history, please refer to table 1 below.
### Table 1

*Participant Pseudonym, Sport History, and Relevant facts*

<table>
<thead>
<tr>
<th>Pseudonym</th>
<th>Sport</th>
<th>Sport history and relevant facts</th>
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| Alyssa    | Rugby *(U-Sports)*                 | • Competed in dance, soccer, basketball, and karate from ages 4-16  
• Member of basketball and cheer team during CEGEP  
• Suffered a broken back, broken elbow, sprained rib, and wrist surgery in CEGEP and University  
• Suffered four diagnosed concussions, two being protracted  
• Identified three undiagnosed concussions |
| Beth      | Rugby *(U-Sports)*                 | • Played club soccer from ages 4-16  
• Competed in high school rugby  
• Suffered knee injury in high school  
• Suffered one protracted concussion that lasted 7 weeks |
| Grace     | Hockey *(U-Sports)*                | • Highly successful University athlete  
• No other athletic injuries besides concussion  
• Suffered one concussion that lasted 2 weeks  
• Suffered one concussion that lasted over a year, with some lingering symptoms |
| Leah      | Softball *(NCAA DII)*              | • Played club softball from ages 4 to 18  
• Transferred to current University 8 weeks into first semester  
• Suffered four concussions, only one protracted  
• Out of sport for 6 months, with some lingering symptoms |
| Sophia    | Synchronized swimming *(U-Sports)* | • Competitive synchro swimmer since age 10  
• Competed in two National competitions in University  
• Suffered shoulder injury at age 15  
• Suffered a one-month long concussion at age 15  
• Suffered an 8-week concussion in University |
Concussion symptomology. The athletes reported a multitude of persistent cognitive and physical symptoms such as nausea, dizziness, eye movement problems, fogginess, and light sensitivity. Further to this, four of the five athletes felt that persistent, severe headaches were the most impactful physical symptom they experienced. When asked what symptoms were the most impactful during recovery, Leah shared:

Leah: Immediately after the diagnosis, it was headaches, 8/10 headache, really bad. For about 3 months it was that bad. And then light sensitivity, neck pain. I was really, really tired. More so than usual. The headache and the dizziness lasted the longest. But f**k was I dizzy. I’d wake up in the morning, like oh yeah, hello headache, good morning how are you. And then I would be like whoa. There were some days when I couldn’t drive my car.

I (RS) noted in my reflective journal following the interview that Leah often laughed and used humor throughout the interview when describing her protracted physical symptoms, which I (RS) interpreted as the athlete’s attempt to minimize the severity of her symptoms. Additionally, Leah disclosed that the pain from her headaches caused her to feel irritable, which we interpreted as her persistent headaches contributing to her emotional response to the concussion:

Leah: A standard symptom for concussion is irritability. And I really don’t believe that is a direct symptom of the concussion. I believe it is a direct symptom of the symptoms of concussion. I was just crabby because I was in pain and nobody understood me… I was just pissed off all the time. Because I was in pain. If you think about, if you cut your finger and it hurts, all you can think about is your finger hurting. And all I could think about was my head hurting all day long.
In addition to the persistent headaches, the athletes also described emotional consequences of their protracted concussion such as anxiety, depression, perceived loss of control, feelings of isolation, weight gain, and fear of sport return. For example, Sophia explained:

_Sophia_: I had a lot more anxiety, but I don’t know if that’s because of the concussion itself or if it’s because I was just so panicked… but I just couldn’t get rid of that feeling that I was a burden or I shouldn’t be there…I didn’t want to be holding my team.

Additionally, three of the athletes felt that their concussion had an impact on their mood stability. Specifically, when asked to compare her emotional response from her non-concussive injury to her protracted concussion, Alyssa described her experience as: “Concussions are a roller coaster…I can feel down, I can feel 20 times more anxious than I usually do, just overall frustrated.”

Another commonly experienced symptom among the athletes was a perceived loss of control over their recovery and body. During her interview, Leah shared:

_Leah_: I felt out of control of my body because I couldn’t work out. I couldn’t do anything my body had been doing since I was 8… I couldn’t run I couldn’t lift weights. And that’s something that for me as a person, that’s an outlet for me. I’m the type of person who needs control. I need it, I crave it…. So being out of control of the only thing I can physically touch in my life, my own body, I couldn’t do it.

Two athletes experienced large changes in their weight, which contributed to their emotional distress. For example, Beth shared that throughout the duration of her recovery:

_Beth_: I was also really mad because over that time period, I didn’t do anything physical activity wise. That was the longest I’d ever not worked out. And I gained like 40 pounds
because I was sad and eating. It was horrible. It was so bad, and I was just getting mad at everything because of it. And then once they said you can start working out soon, I calmed down...But I didn’t look the same, so I was embarrassed to get back out there and get things going physical-activity wise. So that added on to my body image issues… I was just very disappointed.

Another outcome that impacted the athletes, especially once they were cleared to play again, was a fear of suffering another concussion:

*Sophia:* I was scared to get back into synchro after my first concussion. It’s intimidating when you aren’t emotionally prepared to go back and swim because you know that you’re probably going to get hurt again. So, making that conscious decision to put yourself in that position is really challenging. I wish that someone had thought about what kind of emotional issues I was having, or psychological issues with going back into sport. I didn’t care as much about the physical issues for me, but I really wish I had had some more emotional support and someone to really help with my attitude when I got back in the water.

To conclude, this higher-order theme described the athlete’s journey with protracted concussion and the subsequent physical and emotional symptoms they experienced. Each of the athlete’s *background information, concussion timeline, and concussion symptomology* provide a foundation to explore what facilitated athletes to cope with their symptoms and further, what barriers may have preceded their ability to cope.
Appraisal of Resources and Support: “Things need to be improved and personalized in ways that benefits people”

Each athlete experienced a multitude of positive and negative factors that influenced their perceived ability and confidence to handle their concussion symptoms. These included sources of stress, resource availability, concussion education, team environment, and social support. Moreover, the athletes provided recommendations on how to improve resources and education available to athletes, as well as advice regarding social support.

Sources of stress. Even without an injury, being a university athlete is a stressful experience. However, the addition of academic, family, and sport-related stress in conjunction with a prolonged recovery exacerbated the athlete’s perceptions of stress. For example, while two athletes struggled academically due to missing classes for an extended period of time due to their concussion, Grace shared how the return to play protocol impacted her ability to perform during exams:

RS: So you finished nationals, you were coming back, you said it was right around midterms. Did you notice a difference in your academic performance - was that impacted by your concussion at all?

Grace: When the concussion happened, I was in mid-terms so taking a break and doing what they say is ‘doing nothing’ was a no-no for me. I was going to finish that. That was my graduating year. I’ve always been demanding of myself to do well. I just tried to block the concussion out and just focus on ending my university academic career on a high note. I think the adrenaline kind of took over and I just forced myself to study and do as well as I could. It was a little tougher because they put me through a lot. They’d
say, ‘okay go for a test here, do this, do that.’ So, my planning and my regular routine for studying was disrupted.

**Resource availability.** The athletes also experienced both positive and negative feelings towards the resources they perceived to be available to them during their concussion recoveries. Four of the athletes had extensive resources available to them throughout their diagnosis and recovery process, such as concussion professionals, physiotherapy, athletic trainers, and specialized treatment plans. Leah shared that she saw four different doctors, a concussion specialist, and attended concussion-specific physiotherapy appointments during her recovery. Part of her physical therapy consisted of heart-rate variability training, a technique used to monitor the athlete’s recovery process. However, Leah was the only athlete to receive this form of treatment. In comparison, Sophia felt that the lack of resources available to her negatively impacted her diagnosis process:

*RS:* Now where did you go to get diagnosed?

*Sophia:* I got diagnosed at the walk-in clinic at my University. That was the best place to go. There were not really any other places besides the walk-in clinic that my [coach] could recommend…

*RS:* At your appointment, what did you talk about with the doctors?

*Sophia:* They had me do a couple tests, she made me walk with my eyes closed in a line and stuff like that. Stand on one foot, I think. And that was pretty much it. Then she just wrote me a note and sent me off.

*RS:* Yeah. So did she give you any resources, any pamphlets, information, other people to talk to, anything like that?
**Sophia:** No! She gave me two notes. We talked about how it was going to impact me with school and with sports. So basically, the note I got was, it said, that I was excused for a week of studies and then for sports, basically two weeks off sport.

Furthermore, Grace felt that a lack of personalization in treatment protocol was detrimental to her recovery process. When I (RS) asked her about her recovery process, I (RS) noted that she grew solemn, her demeanor more serious, and her body language became closed off as she voiced her story:

*RS:* Do you feel you had enough of a voice in your recovery process?

*Grace:* I think from my recovery experience, the whole process itself was… personally, I was not thrown, but kind of taken in different directions. Nothing seemed to be the right thing for me. And it seemed to be all more experimental than actually tailored for me. That was more of a discouraging part. There were just so many different obstacles and things I wish would have been done differently, that were out of my control. And I think those three points are everything that was out of your control, but you trusting what is best. I don’t feel I had enough voice in my recovery process, not really. I think whenever I disagreed, for some reason it was kind of blocked and in a way ignored. And my doctors saying nope, this is the way that you have to do things and there’s no other way – that’s where I couldn’t understand that… What could have worked for someone else, didn’t work for me. And I just felt there’s different things that could have been done.

Based on Grace’s change in demeanor and the frustration she voiced when describing the lack of individualization in her recovery, I (RS) interpreted that Grace felt her rehabilitation approach was ineffective and had a negative impact on her recovery experience.
Due to their frustrations with their protracted concussion recovery process, the athletes provided recommendations on how to improve their experiences that ranged from improving resource availability and choosing a doctor that fits with the athlete’s individual needs.

RS: How would you have liked to get that information [on concussion education]?

Sophia: From a university perspective, I think they could do more. I 100% think that they need to educate the athletes more, tell them what their resources are, what are available to them…I didn’t know any of that stuff… I would have liked a combination of both someone sharing information during a meeting and a list of resources. Obviously, I would have liked to have this information before I was injured.

When asked to provide some advice for concussed athletes, Leah discussed the importance of finding the right doctor -

RS: What would you go back and tell yourself during your injury?

Leah: Listen to your doctors, but also know when to fight back.

RS: Can you elaborate on that?

Leah: Personally for me, when I went to the neurologist, I just felt like he didn’t go extensive into my recovery process. I felt like he didn’t trust me, he didn’t know me. He didn’t take the time to know me. Finding a doctor that fit better for my recovery was more important to me. And if the doctor that I ended up going to, if he truly would have said, ‘Leah, I think it’s time for you to stop playing’, I probably would have stopped. Because he took the time to get to know me, get to know my personality and talked to my other doctors, talked to my trainers, he called my coaches. He was incredibly research based about what decision he was going to make for me. And I think you have to find a doctor that understands the sports mindset.
Lastly and perhaps most importantly, all five of the athletes discussed the importance of individualizing the recovery process to the needs of each athlete. Sophia, Beth, and Leah felt that personalizing the protocol by sport or by sport position would be beneficial, whereas Alyssa and Grace discussed the importance of doing what is best for the individual athlete, even if it goes against protocol:

*Alyssa:* From the first day you have a concussion till the end... I’d say that protocol is all good and fun, but it’s not tailored to each individual person. Nor individual concussion, because they’re all different. I’d say follow it, but at the same time trust yourself and trust how you feel.

*Grace:* That’s where the research and personalizing things will help. It’s okay to have a standard protocol, because that’s best for the league and the sport. But at the end of the day, we’re talking about a human here. Things need to be improved and personalized in ways that benefits people. And I had a hard time there because I disagreed [with my doctor], and I wasn’t afraid of mentioning that I disagreed, because I knew it wouldn’t work.

**Concussion education.** The athletes also felt that the concussion education they received had positive and negative influences on their recovery process. Three of the athletes had some form of formalized concussion education, such as videos where “you learn what a concussion is, how they happen, what happens during one, how to recover from them,” (Beth) and pre-season testing. In contrast, Grace felt she didn’t receive any concussion education during her athletic career: “The first 4 years, not much was said in terms of concussion education. We weren’t told anything.”
However, all of the athletes expressed concerns over the lack of education they received as it pertained to their recovery process. For example, when I (RS) asked Alyssa about changes in her symptoms overtime, she expressed that she felt uneducated about the symptomology of protracted concussions:

*Alyssa:* The symptoms would fluctuate a lot week to week. So, I would have certain symptoms the first week, then the second one I’d have complete opposite ones. The ones I had the week before were gone, but now I had new ones. I was like what is going on in my head? I just felt kind of shook. I wanted to understand, but there was no explanation for what was going on.

Based off their experiences, the athletes provided recommendations for improvements that can be made to concussion education. For example, when asked about the education they received, Beth stated:

*RS:* So, the first question, for your concussion education - can you talk a bit more about that?

*Beth:* You learn a lot from the concussion education videos, but I think the problem with it is that we do the same one every year and it hasn’t changed since I got there. So now, most people, including myself, don’t even watch the videos anymore. They just do the tests and get it over with because there’s 800 other things to do. I think it would be better maybe if we did it as a group. Because everyone just skips through it. And maybe have someone update it every once in a while, because it’s a pretty old video.

Grace stressed that “hearing someone else’s experience would be the most impactful way of getting concussion education to resonate with athletes. I think you need to scare people and kind
of get them off their seats and saying okay this is something big”. Finally, Sophia also recommended that a concussed athlete seek out extra information during their recovery:

*Sophia:* Do try and find help. Any kind of help. From anyone. Ask questions, ask the right questions and ask a lot of people. That’s what I would say. It’s hard if you’re actually at home trying to recover to do that, but just try and ask anyone because the more information you have, the better off you’re going to be and the easier it’s going to be to recover.

**Provision of social support.** Athletes felt that their main social support providers were their family, friends, athletic therapists, coaches, and teammates. However, the quality of social support from these individuals varied between athletes. Within a sport context, the athletes who had access to an athletic therapist felt they were a large source of positive emotional social support:

*RS:* Can you talk about the support or lack of support you received during your recovery?

*Beth:* The athletic therapist I find was really good, super supportive. It’s really different when you have a concussion compared to like a knee, they’re like, you’re fine, do your rehab. But he was more, “how are you today?” You could tell he really cared, which was really nice to go and talk to him. If I was having difficulties, the AT would take me into his office and he’d ask what’s going on, put the box of tissues. Just so someone was there, because he didn’t know what was going on with my friends, or at home, or anything. I found that was really helpful.

Furthermore, the athletes had differing experiences of support from their coaches. Alyssa felt her coach was very supportive of her prolonged recovery, sharing: “I’ve had to catch up on work, I’ve had to catch up on school. So, I’ve kind of been like [coach], I’m not gonna be around
for a while and, he fully understands everything,”. However, Sara and Beth felt their coaches did not support them.

In terms of teammate support, it depended largely on how much they shared about their concussion. For example, Grace purposefully distanced herself from her teammates during her recovery:

*Grace:* With my teammates, I made sure I was not a distraction. I actually told them that I don’t want to be a distraction, so focus on what you have to do and I’m going to be on the sidelines encouraging you. But I’m not going to be here all the time. Don’t worry about me basically.

Leah also limited how much she shared with her teammates, which in turn impacted how they supported her:

*RS:* Well who would you say your biggest support system was throughout [your recovery]?

*Leah:* My teammates were great supporters too. But your teammates are supposed to support you! They didn’t understand what I felt like when I went home. I didn’t let them in on my secrets about how I was fat, and I was eating cheeseburgers all the time. I didn’t tell them all that stuff…When I started passing tests and starting to get more balance stuff done, I shared that. I was so excited, so they were excited for me. But I didn’t tell them the dark stuff. I just told them the happy stuff.

Moreover, Leah and Sophia felt that the quality and quantity of social support they received from various support providers changed over the course of their prolonged recovery. When asked about how support from her team changed over time, Leah shared:
Leah: Everyone else’s world was moving and mine was not. I couldn’t go to class; I didn’t go to practice until later. I felt really behind. So, I was irrelevant. We were in season – season doesn’t stop. You don’t stop for injured players; you just find a new player who can step in to her role.

Sophia expressed similar feelings about changes in support from her friends outside of sport:

Sophia: After a couple of weeks it was like - I guess the novelty of having a concussion wears off, in the sense that like people will say, oh that’s too bad, but they’re not going to really go out of their way to make sure that they’re checking up on you. Because it gets tiring obviously. You can’t always focus on other people necessarily, especially when you have your own stuff going on.

Again, based on their different experiences and frustrations with social support during their recoveries, the athletes provided recommendations for the support network of a concussed athlete, as well as how the athlete should utilize social support. All five athletes discussed the importance of asking the athlete what they need from the support givers, as Grace explained: “How do I say this. It’s always good to have support. But it’s another thing for the support group, any support group, to understand how to support the person.”

The athlete’s recommendations included specific examples of helpful support, such as “do find ways to support them outside of sport. Maybe help them figure out how to deal with their studies, and how to get all their assignments done without hindering their recovery,” (Sophia). Grace also suggested that social support providers should:

Grace: Find ways to distract me from what I’m feeling. By maybe doing something more fun. I don’t know, playing cards or something. Find activities that are not too strenuous,
are not too stressful, that are fun, and that people can laugh and enjoy. I think just finding ways that don’t remind the person of what they’re feeling.

Further, when asked about what she wanted from her support network, Beth shared how she simply wanted people to talk to during her recovery:

*Beth:* I think if people would have come over more, that would have helped. I knew my closer friends who did care, yeah, they’d text me all the time. But you also live two houses over, just come over, hang out with me for a little bit. We can just talk. That kind of stuff. I feel that maybe would have helped a little more, especially in that sad zone I had.

Sophia also shared the importance of believing the athlete is being truthful about their injury:

*Sophia:* To the people supporting an athlete with a prolonged concussion, do treat the concussed athlete with respect in the sense that they’re being honest and that they don’t like this either, they also want to get better. Don’t act as if it’s an inconvenience on you because that person is injured. That’s a big thing. Find ways to make them feel supported and as if they are still welcome within that community.

Following the interview, I (RS) discussed this moment in my reflexive journal. Sophia’s feelings about not feeling believed or supported by her coach and teammates resonated with my own experiences with injury as a University athlete. By writing my own feelings down, I was able to identify and minimize any bias I had when interpreting Sophia’s words.

Moreover, another recommendation that all five athletes discussed is how it was “so frustrating having people drown you in ‘are you okay’s’,“ (Leah). Grace expressed similar feelings, sharing:
Grace: One of the bigger things was, when either my family or friends or teammates would constantly ask me how I’m feeling. That’s what I had mentioned to [my doctor], I said everyone is always asking how I’m feeling…That’s where I tried to say, okay I’ll let you know when I need help. Or I know you want to help, but I just need for you to just give me some space…But I think having a constant reminder of how I was feeling was quite dreading.

Furthermore, the athletes provided recommendations to concussed athletes on the importance of utilizing quality social support:

Leah: I think it’s important for the athlete to actually use the support network. Because you do feel alone, because you can’t see what’s in your own brain. You’re not an x-ray scanner, you’re not an MRI. You can’t see it. So, use that support system.

The idea of concussions being an invisible injury as it related to social support came up frequently during the interviews, as Grace explained:

Grace: Unlike a broken arm where I think people won’t ask you how you’re feeling because they can see your arm is in a cast, concussions, head injuries, people just don’t know how you are doing. But they want to support you, but they don’t know how. That’s where I could see, because I wasn’t very vocal about it, that a lot of people were unsure as to how they could help me.

Finally, Beth felt that when individuals are being unsupportive, it is important that the athlete focuses on their own recovery in a positive light:

Beth: I’d also tell concussed athletes, don’t take offense if people don’t understand what you’re going through. Don’t let it upset you that people don’t understand what you’re
going through. And don’t think your concussion is going to be the same as everyone else’s! Know it’s going to be different (Beth).

In summary, this theme discussed the positive and negative factors that influenced the athlete’s perceived ability and confidence to handle their concussion symptoms. These factors influenced the athlete’s cognitive appraisal of their protracted concussion symptoms, which impacted their abilities to cope. Therefore, the final theme will discuss the strategies used by the athletes to cope with protracted concussion symptoms.

Concussion Coping Strategies – “It’s a work in progress, it’s going to get better. One day at a time.”

The final higher-order theme stemmed from my (RS) interpretation of the athlete’s cognitive appraisal of the resources and support available to them, based on Lazarus and Folkman’s (1980) theory of stress and coping. This theme included only one lower-order theme, concussio symptom management, which encompasses the techniques the athletes used to manage their protracted concussion symptoms. This section will describe examples of coping methods shared by the athletes in this study.

All five athletes felt that being physically active helped them cope with their prolonged concussion symptoms. When asked what made her feel better physically, Beth said, “It was still nice to be able to get some fresh air, walk around, see there’s life.”

Grace shared similar feelings about being physically active. In addition, she expressed that having a dog was beneficial to her coping process, especially in relation to physical activity.

RS: Were there any things that you personally did outside of the prescribed routine, the process, that you did to make yourself feel better?
Grace: Sit around and do nothing was not something I could do. So I actually stayed active with the dog, I’d go for walks, many walks a day. And tried to relax, especially over the summer. Take it easy but stay active, still go to the gym, keep up with my regular life. For some reason animals, dogs, especially, can sense that we’re frustrated or somethings wrong. The minute that would happen, I get the paw on my lap and the “okay come on let’s do something.” If it wasn’t playing, it was let’s go outside for a walk. Keep you stimulated in a way that was healthy. And I think it allowed me to find peace in that, okay it’s a work in progress, it’s going to get better. One day at a time.

Similarly, Beth felt that exercise helped her overcome the weight concern and body image problems she developed throughout her concussion recovery:

RS: Well what were some things you did immediately to try and get over that disappointment [with your weight changes]?

Beth: I wasn’t on the healthy side during the concussion, so to get over some of my body image issues, I just tried to start eating better…And then when I was finally cleared to go do some exercise - not that I was doing as much as I should have been or could have been doing - but to get that small little bit in helped. And then increasingly over time, that helped me a lot.

Moreover, Grace stressed the importance of tailoring exercise in a way that the individual feel’s is beneficial:

Grace: I personally would try to find something that helped my concussion symptoms. If I figured out that doing a specific thing was actually helping, then I’d keep doing it. I didn’t do the specific training regime that was given to me because I didn’t think it was
very beneficial. So, I kind of altered some of the exercises and did things that would not be strenuous but that would just make me feel good.

Grace further believed that cognitive exercise also allowed her to cope properly:

RS: Can you think of any other examples of the specific things you did [to cope]?
Grace: I think staying mental active was something that helped too. Like reading. I love Sudokus, numbers are kind of my things. So, keeping up with doing that. So not resting but staying active in a way that allows me to relax.

Many of the athletes also used technology to cope throughout their concussion recovery. For example, Sophia used her cellphone to stay engaged with friends through texting or social media, and her laptop to alleviate boredom through Netflix. However, she also used technology to keep up with school work throughout her prolonged recovery, despite it having a negative impact on her symptoms:

RS: Was there anything you did that made you feel worse throughout your recovery?
Sophia: Definitely - trying to keep up with some of my work was hard. I know you’re not supposed to look at screens. Doesn’t mean I did that, you know…But anyone who has ever had a concussion, especially at the university level, would be lying if they said they didn’t look at a screen. Because I had to do my work.

Leah also had to use technology to keep up with school throughout her recovery, however she shared that she “turned [her] phone and laptop onto night mode all the time, so it’s a yellow color instead of blue. Which helped a lot” with the physical symptoms that might have resulted from using technology.

Athletes also felt that doctor-prescribed interventions such as physical therapy and medication facilitated their ability to cope with emotional and physical symptoms of
concussions. For example, when asked about aspects of her rehabilitation helped her most during recovery, Alyssa shared:

RS: What aspects would you say were the most helpful and which ones were the least helpful?

Alyssa: I’d say the massages were the most beneficial part of my rehabilitation. Because it was releasing a lot of tension, and it was that kind of time where I could have a nice conversation without having to think about anything.

I (RS) interpreted this response as Alyssa using these massages with her athletic therapist as a method of coping with both emotional and physical symptoms.

Athletes also discussed using medication such as doctor prescribed painkillers and over the counter ibuprofen to alleviate physical symptoms, especially headaches. When asked what she did to try and reduce the severity of her headaches, Grace shared that over the counter medications were her only option due to her status as a university athlete permitting her to be tested for prescription drugs at any time: “I would just take Advil, Tylenol, because I could still be tested for drugs at that time. I couldn’t take anything that wasn’t prescribed, and I didn’t have anything to relieve the headaches.”

However, Lexi was prescribed painkillers due to her severe headaches preventing her from sleeping. Furthermore, Lexi was previously placed on antidepressants to manage depression and anxiety symptoms unrelated to her concussion. Consequently, she described how her concussion symptoms interacted with her antidepressants and became seemingly less effective, which in turn impacted her ability to cope with her emotional symptoms:
RS: Can we talk a bit about – you said you were diagnosed with depression before coming to university. Can you talk a bit about how that experience co-acted with the concussion itself?

Lexi: Any person who is in pain is going to feel less than themselves. And for me, I was taking an antidepressant, and it didn’t seem like it was working… I just kind of took it… the only reason that I was taking my meds was because I knew that I needed them when the concussion was gone. I felt sad, but I knew that it was from the concussion, it wasn’t because I was depressed again.

Another important coping technique the athletes used was the act of sharing their feelings regarding their concussion with others, which I (RS) interpreted as their implementation of emotional disclosure as a form of coping. However, the method and amount of emotional disclosure differed by athlete. Leah went through various stages of emotional disclosure based on the stage of recovery she was in:

RS: What did you share with your teammates and coaches?

Leah: When recovery was getting better, I wanted to talk about it more because I was excited because I knew it was getting better and I was getting better, and I wanted to share that with my people. When things were not good, because there was a point in time when a doctor said I shouldn’t play anymore, I didn’t tell anyone that. Besides my mom. And my coaches, but they had to know because it was a doctor that the school sent me to.

Nonetheless, Leah used other methods to express her feelings that helped her cope with the loss of control she was experiencing, such as:

RS: Was there anything that was really beneficial for your symptoms, any of them. Some stuff you did outside of treatment that really helped you.
Leah: Crying (*laughs*). Crying helped a lot. I cried a lot. I cried probably every day. I just felt I was so out of control of my own body that I just had to cry. So, I did that a lot. Yeah that helped, it really did help. And any emotional woman is going to say crying makes them feel better, so that made me feel better. Stretching, journaling also helped. Journaling, seeing the therapist, little bit of light yoga, that all helped. I started to see a therapist about how I was feeling and how I felt really out of control.

I (RS) noted that Leah’s use of humor seemed out of place with the seriousness of the story she was telling. I (RS) interpreted this as her way of acknowledging how out of character these feelings were for her and that they were unique to her concussion experience. In contrast, Grace did not disclose her feelings to anyone during the recovery process:

Grace: As much as I tried to deal with the concussion on my own and put that poker face on, you could tell that I couldn’t really control my emotions as much everyone thinks you can. I didn’t really talk about my frustrations with my recovery with anyone. I kind of just took it upon myself to deal with it.

Two other coping strategies that many athletes used were distraction and/or withdrawing from stressful situations. For example, Alyssa discussed the importance of withdrawing herself from sources of emotional stress:

Alyssa: Sometimes just removing myself from people, shutting myself out helped me emotionally. But if I shut myself off for too long – it’s like you have to gauge the right amount of time to shut yourself out for. And if it’s too long, it’s like okay I’m back down... I think just some of the aspects of, if somethings frustrating me, I will step away from it, I will just take myself out of the situation. I’m not dealing with it.
Moreover, Beth discussed the various things she did to distract herself from her symptoms during her prolonged recovery:

*Beth:* I made those string bracelets that you used to make at camp! I tried to read…Listened to some audio books. Sometimes I’d play episodes of shows I’ve seen before, but not watch just listen. Just to hear people talk. Did a lot of baking. A lot of sleeping. I did a lot to keep myself busy... But I was always trying to do something, and if I couldn’t find something to do, I’d go have a nap.

The theme of using sleep as a form of avoidance came up frequently in the interviews. It was used to manage physical symptoms, as Leah explained:

*Leah:* Having my headaches was annoying and I just wanted to get through the day. If I could just get through the day, I would go home, and I could go to sleep, and it would probably go away. And people getting in my way of that was bothering me and I was becoming irritable.

In addition, when I (RS) asked Beth how she handled emotional changes during recovery, she also described using sleep as a way of coping with her emotional symptoms:

*RS:* Can you think of anything you did to handle those emotional changes? Did you notice yourself, when you’d get mad, did you do anything different? Any behaviors that changed?

*Beth:* I found that whenever I got mad, I’d say okay I’m going to have a nap. I need to go by myself. A time-out almost. Get away from everyone, because I’d feel like I was going to freak out if I was here any longer. I slept a lot when I was mad. Because I don’t want to freak out anyone more than I already have.
And finally, four athletes shared that accepting that their injuries were going to take a longer period of time to heal helped them cope. For example, Alyssa suggested, “don’t let the fact that you have prolonged symptoms freak you out…Take it step by step. If it’s taking more time, than it’s taking more time…Allow yourself to accept it.” Similarly, Sophia described the importance of accepting her protracted concussion in coping with her emotional symptoms:

Sophia: I was pretty stressed about my concussion; I was pretty anxious. In my head, I felt stressed and I felt sad about it. But at the same time, I knew that I was going to be fine…I just kind of took as much time as I needed until I was ready.

Lastly, Grace credited her mental toughness in helping her cope:

Grace: I was pretty resilient. I think my mental toughness was pretty key. And probably just overall, being an athlete, we’re more inclined to be very tough. I think just being positive in the way that there is light at the end of the tunnel, and there’s no dead end.

I (RS) felt that the mental toughness she developed as an athlete allowed her to accept, manage, and positively re-frame her prolonged concussion symptoms, in turn improving her ability to cope effectively.

In conclusion, this section discussed the coping techniques that athletes used to manage the cognitive, physical, and emotional protracted concussion symptoms described in theme one. Evidently, these coping approaches were determined by the cognitive appraisal outcomes of theme two. However, the appraisal process as it led to coping, and in turn the adaptive-function of these coping strategies were not presented in this section, therefore the purpose of the discussion will be to describe the effectiveness and outcomes of these coping skills as it relates to the overarching body of literature.
Chapter 5

Discussion

The purpose of this study was to explore the coping efforts used by female University athletes who suffered protracted concussion symptoms that lasted longer than 6 weeks. The following chapter will begin with a brief description of the emotional symptoms these athletes faced in order to extend the limited, yet growing, body of literature on protracted symptomology. Following this, the style of coping the athletes used, as well as the facilitators and barriers to the cognitive appraisal process as it pertains to the athlete’s coping style will be depicted.

Emotional Outcomes of Protracted Concussions

Athletes in this study reported experiencing a multitude of persistent somatic and psychological symptoms throughout their prolonged concussion recovery, such as depression, anxiety, and mood disturbances. These results add to previous research on the severity and duration of protracted concussion symptomology, especially the associated psychological sequelae (e.g., André-Morin, Caron, & Bloom, 2017; Bloom & Caron, 2019; Caron, Bloom, Johnston, & Sabiston, 2013; Caron, Schaefer, André-Morin, & Wilkinson, 2017; Mainwaring, Hutchinson, Bisschop, Comper, & Richards, 2010). Additionally, the current results identified emotional outcomes that are linked to the symptoms of protracted concussion, including the psychological consequences of severe headaches, weight concern, and perceived controllability.

Psychological consequences of severe headaches. Specific to somatic symptomology, severe headaches are the most commonly reported physical symptom of concussions for athletes facing either short or long-term recoveries (Caron et al., 2013; McCrory et al., 2017). Results from the current study also found the athletes experienced intense headaches for weeks and months at a time. For example, one athlete experienced headaches so intense that she began to
rely on doctor-prescribed pain medication to manage her pain. Moreover, another athlete felt that her depressive symptoms and mood disturbances were directly related to the intensity and duration of her headaches. These findings have implications within the chronic pain literature, which found that individuals who experienced extended long-term headaches were at a greater risk of developing depression (Cox & Thomas, 1981; Fishbain, Cutler, Rosomoff, & Rosomoff, 1997). Further, this depression was not a direct result of pain severity, but rather the disabling consequences of the pain itself (Eccleston, 2001). In conjunction with the current findings, these results suggest that severe, protracted headaches incurred from concussion may place an athlete at risk for developing or exacerbating depressive symptoms. Moreover, individual’s experiencing chronic headache pain are at a greater risk for suicidal ideation, suicidal attempts, and suicide completion (Fishbain et al., 1997). This finding is particularly troublesome considering Caron and colleagues (2013) finding that professional athletes experienced daily headaches and/or head pressure so incapacitating that half of the athletes who were interviewed contemplated suicide. Though none of the athletes in the current study reported suicidal ideations, they did feel their headaches were severe enough to disrupt physical and emotional functioning, and therefore may be at risk for progressing towards more dangerous outcomes, such as those reported by Caron and colleagues (2013). Our current results combined with previous research suggest clinicians should be aware of the psychological implications of persistent severe headaches following concussions, and closely monitor athletes to ensure their symptoms do not exacerbate to clinically dangerous levels.

**Weight concern.** Additionally, multiple athletes in this study expressed concern over their weight. Specifically, two athletes described how their excessive weight gain during recovery led to depressive symptoms. Furthermore, many athletes felt that being removed from
sport due to their injuries and a primarily inactive rehabilitation program exacerbated both their depressive symptoms and weight concerns. Though one qualitative study identified similar experiences of weight concern, weight gain, and weight loss in a female University athlete population (André-Morin et al., 2017), research on weight concern as an emotional outcome following concussion is scarce. In fact, a review paper and another systematic review on the psychological outcomes of concussion (i.e., Covassin, Elbin, Beidler, LeFavor, & Kontos, 2017; Rice et al., 2018) failed to mention weight concern, eating behaviors, or body image at any point. Therefore, it would be interesting to conduct research on weight concern, excessive weight gain or loss, and consequent eating and/or exercise behavior modifications following concussion to deeper examine the cause of these reported concerns, as well as how they can be addressed during recovery.

**Perceived control of injury.** Lastly, and perhaps most importantly, athletes in the current study reported low controllability over their recoveries. Specifically, they felt they lacked control over their diagnosis and treatment protocol for their protracted concussion. This outcome is the most concerning when considering the influence of controllability on an athlete’s adherence to rehabilitation protocol and ability to cope in an adaptive manner, both of which have large influences on the psychological outcome of injuries (Bianco, Malo, & Orlick, 1999; Covassin, Crutcher, Elbin, Burkhart, & Kontos, 2013; Levy, Polman, Clough, & McNaughton, 2006; Udry, 1997). Though research in this topic is scarce within the concussion literature, findings in other areas of research, such as chronic pain and traumatic brain injury (TBI), suggest that perception of poor control over one’s experience leads to greater negative psychological outcomes (Eccleston, 2001; Snell, Siegert, Hay-Smith, & Surgenor, 2011). Further, research regarding athletic injury rehabilitation reported that athletes who perceived high controllability
over their recoveries were more motivated, adhered to treatment plans better, reported faster recovery rates, experienced less psychological sequela, and coped better with frustrations and setbacks (Bianco et al., 2001; Levy et al., 2006). This supports responses from the current study, which reported that the athletes suffering from protracted concussions perceived little control over their recovery process, as well as poor rehabilitation adherence, which impeded their ability to cope and intensified psychological symptoms. Taken together, the question arises as to how clinicians can promote perceptions of control that will not only promote rehabilitation adherence, but more importantly, enable the athlete to adaptively cope throughout their recovery.

Coping and Appraisal

Lazarus and Folkman (1984) suggested that when individual’s experience a stressful event, they engage in an appraisal-coping process that results in a multitude of cognitive and behavioral outcomes. There are two types of coping styles - problem-focused and emotion-focused coping. Furthermore, the coping style used is determined by the individual’s cognitive appraisal, or their perception of how significant this stressor will be to their well-being, the amount of perceived control they have over this stress, and the resources available to them to handle it (Folkman & Lazarus, 1980). Coping has played a large role in the athletic injury literature (e.g., Johnson, 1997; Johnston & Carroll, 2000; Udry, 1997), especially for collegiate athletes (Covassin et al., 2013; Kontos, Elbin, Newcomer Appaneal, Covassin, & Collins, 2013). Further, previous research on coping and athletic injuries has focused almost exclusively on musculoskeletal injuries (e.g., Johnson, 1997; Johnston & Carroll, 2000; Udry, 1997; Quackenbush & Crossman, 1994). However, growing interest in concussion has led to increased emphasis on how concussed athletes cope (Covassin et al., 2013; Kontos et al., 2013). As reported by Covassin and colleagues (2013), as well as Kontos and colleagues (2013), concussed
university athletes engaged in more emotion-focused coping efforts such as self-distraction, behavioral disengagement, and self-blame, compared to the problem-focused coping styles reported by athletes with musculoskeletal injuries. However, these studies only utilized quantitative methodologies and did not address the appraisal process, perhaps due to difficulties in assessing how athletes appraise their injuries using quantitative methods (Lazarus & Folkman, 1987). Therefore, results from the current study both support and extend the findings of previous research done on coping and concussion (e.g. Covassin et al., 2013; Kontos et al., 2013). Similar to previous findings, athletes in the current study reported using emotion-focused coping strategies such as avoidance and acceptance to cope throughout recovery. However, the current study also identified the factors that influenced the athlete’s appraisal process, such as the lack of a symptom-specific treatment protocol and social support. Therefore, the following section will discuss how these factors influenced the coping styles of the athletes in this study. First, avoidance coping styles will be discussed, followed by an exploration of how a lack of symptom-specific treatment plans led to avoidant behaviors. Next, the role of social support as a moderator within the appraisal process will be examined. And finally, acceptance-based coping will be addressed.

**Avoidance behaviors.** Results from the current study indicated that the athletes largely engaged in avoidance styles of coping, such as mental and behavioral disengagement, and distraction. Rather than confront or manage their symptoms head-on, the athletes would isolate themselves, sleep, or partake in menial tasks to withdraw from their injuries. While it is proposed that these less active behaviors are reported due to increased fatigue and neurometabolic imbalance following concussion (Kontos et al., 2013; McCrory et al., 2017), the results from the current study suggest the athletes felt they had little control over their recovery process and could
not actively change their situation, therefore leading to these avoidance behaviors. Research suggests that in the face of uncontrollable situations, individuals adopt avoidance styles of coping – essentially, when perceived as powerless, individuals will not acknowledge their stressor and engage in more passive forms of coping (Carver, Scheier, & Weintraub, 1989).

Covassin and colleagues (2013) suggested that concussed University athletes used avoidant coping immediately after injury due to the uncontrollable nature of the injury. It is suggested that avoidance coping is beneficial for acute bouts of stress, such as a traditional 7-10 day recovery period following concussion (Anson & Ponsford, 2006; Carver et al., 1989, McCrory et al., 2017). Further, it is believed that avoidance behaviors during short-term stress events like athletic injury increases perceptions of control and reduces stress (Covassin et al., 2013). However, research suggests that athletes with long-term injuries tend to move from avoidance coping to more active forms of coping as recovery progresses, such as learning about their injury, tracking recovery progression, and seeking out professional help to increase perceived control over their recoveries (Covassin et al., 2013; Johnson, 1997; Quackenbush & Crossman, 1994). Unfortunately, these coping strategies may not be available to athletes with protracted concussions due to heterogeneous symptom presentation, passive rehabilitation efforts, non-delineated recovery timeline, and unknown prognosis. Therefore, the unique experiences of a protracted concussion recovery may prevent the athletes from progressing away from avoidance behaviors, consequently resulting in the long-term use of the maladaptive coping styles such as behavioral and emotional disengagement, and distraction demonstrated by athletes in this study (Bloom, Horton, McCrory, & Johnston, 2004; Covassin et al., 2013; Kontos et al., 2013). This finding is concerning when research has suggested long-term usage of avoidance coping during protracted TBI and concussion recovery was linked to greater cognitive
impairment, greater psychological response, more severe, persistent symptoms, as well as a lowered ability to cope with general life stress (Anson & Ponsford, 2006; Covassin et al., 2013; Woodrome et al., 2011). Therefore, the high level of dependency the athletes in this study placed on avoidant styles of coping such as disengagement and distraction should be addressed in future research. Specifically, the design and implementation of active coping interventions early on in recovery should be explored. Further, clinicians should be aware of patterns of avoidant behaviors during prolonged concussion recovery and should educate and encourage athletes to engage in more adaptive forms of coping, such as acceptance. In order to prevent athletes from exacerbating their injury through avoidant coping behaviors, it is important to understand the processes that may lead to the recruitment of these behaviors. And as Lazarus and Folkman (1984) purported, coping outcomes are a function of the appraisal process – if the athlete perceived they were lacking the resources to adaptively cope with their injury, they perceive less control, and subsequently utilize maladaptive forms of coping such as behavioral and emotional disengagement. Therefore, the appraisal of resources that resulted in avoidant coping behaviors will now be discussed in depth, revolving around what the athlete’s felt was overlooked during their recovery, and more specifically what was missing from their rehabilitation protocols.

**Resource availability.** Coping style is largely determined by the resources the individual deems available to help them cope (Folkman & Lazarus, 1980; Lazarus & Folkman, 1984). In the absence of resources, individuals are more likely to appraise their situations as more stressful and therefore more likely to engage in emotion-focused styles of coping such as avoidance (Folkman & Lazarus, 1980; Lazarus & Folkman, 1984). Results from the current study found that all five athletes reported having little control over their recovery process and lacked the
resources available to cope properly, resulting in avoidance coping behaviors. Specifically, four of the five athletes had various resources available to them, including physiotherapists, concussion specialists, and team physicians. However, they still felt they had no voice in how this treatment team managed their injury. Further, they felt their symptom-specific needs were not addressed by the standardized treatment approach prescribed by doctors and athletic therapists. While concussion symptoms within the first week are fairly homogenous and can be treated with a more standardized method (Wallace, Beidler, & Covassin, 2018), this is not the case for protracted concussion. Specifically, after seven days, homogenous symptoms break down into more heterogenous presentations of symptoms that vary by athlete (Collins, Kontos, Reynolds, Murawski, & Fu, 2014). Therefore, in a review on the treatment and management of sport-related concussion, Elbin, Schatz, Lowder, and Kontos (2014) recommended a more aggressive treatment approach for long-term concussions, including a shift from a more standardized protocol to a more targeted, symptom-specific treatment plan to address the changes in symptomology.

In support of these findings, a review by Collins and colleagues (2014) provided recommendations towards the management of protracted concussions in athletes. Specifically, they recommended that the athlete identify their most troublesome symptoms through a post-injury clinical interview with a qualified clinician (i.e., lead physician, neuropsychologist). Based on the clinical interview, the clinician then manages the athlete’s recovery with a team of other specialists in areas that represent the heterogeneity of the athlete’s symptoms (Collins et al., 2014). These specialists should be able to address vestibular, vision, exertion, and cervical symptoms (Collins et al., 2014), and more recent recommendations include mental health specialists who can treat psychological symptoms, which may involve behavioral therapy and
medication (Kontos, 2019). Moreover, the clinician should repeat these interviews throughout the duration of the recovery in order to address and treat any growing concerns or changes the athlete experiences (Collins et al., 2014). However, Collins and colleagues (2014) primarily addressed the physical implications of the treatment process, which ignores the psychological implications. It is important to note that at the time of their publication in 2014, research on protracted concussions focused almost exclusively on physical symptomology, largely ignoring psychological factors. Recent publications on protracted concussions (André-Morin et al., 2017; Caron et al., 2013, 2017) combined with greater public awareness as evidenced by movies like Will Smith’s *Concussion* (2015), and public laws (such as “Rowan’s Law: Concussion Safety,” 2019) have drawn more attention to athlete’s experiences with concussion, including long-term repercussions and negative psychological outcomes. In turn, new treatment developments may take factors such as the emotional symptoms of concussions into consideration and could be addressed in future studies.

In sum, all five athletes in the current study relied primarily on avoidant coping efforts in order to distract and/or disengage themselves from the lack of control they felt over their recovery process. Initially, avoidant coping is beneficial short term during a stressful event that the individual perceives is out of their control, such as immediately after an athlete suffers a concussion (Carver et al., 1989; Covassin et al., 2013). However, mTBI and sport concussion research suggests that long term usage of avoidance coping during recovery is linked to higher reported symptoms, negative psychological outcomes, and longer recovery time (Anson & Ponsford, 2006; Covassin et al., 2013). In order to prevent these outcomes, more research is needed on avoidant behaviors during protracted concussion recovery, especially regarding how athletes perceive resource availability and its influence on cognitive appraisal throughout this
process. As athletes in the current study shared, when they felt their treatment plan wasn’t effective in enabling their coping capacity, they had to rely on other factors, such as social support, throughout recovery. Therefore, the following section will address the athlete’s perceived social support and the role it plays within the coping process.

**Social support.** Coping is a continuous, unfolding process that shifts and adapts based on an appraisal and re-appraisal process throughout a stressful situation, such as a concussion recovery (Folkman & Lazarus, 1985). Social support acts as an important moderator within this coping process, specifically within the cognitive appraisal process (Lazarus & Folkman, 1987). In fact, Bloom and colleagues (2004) reported that social support played a large role in helping an athlete cope with their concussion. The findings from the current study support and extend these findings by providing one of the first accounts of how athletes suffering from long-term symptoms used social support within the appraisal process. Our athletes’ reported social support network included family, friends, coaches, teammates, and athletic therapists. Moreover, all but one of the athletes in the current study engaged in some form of support outside of their support network, such as writing in journals, and using social media. However, the athletes felt their support providers did not ask the athlete what they needed from them in terms of support, which made them feel as though the quality of the support was diminished, and consequently not as effective. These findings align with Covassin and colleagues (2014) who compared athletes’ with concussion to those with musculoskeletal injuries with respect to their perceived social support during recovery. Covassin et al. reported that while the quantity of support was similar, concussed athletes perceived less value from their social support than athletes with musculoskeletal injuries. Though Covassin and colleagues only addressed athletes with acute recovery timeframes, similar findings have been reported by athletes with protracted
concussions. For example, André-Morin and colleagues (2017) shared qualitative accounts of female University athletes with protracted concussions that suggested these athletes also perceived high quantities of social support, but still felt misunderstood by people in their support network due to their lack of knowledge on protracted concussions. The findings from Covassin et al. (2013) and André-Morin et al. (2017), in conjunction with the results from the current study, suggest that athletes with protracted concussions feel the support they are being given lacks value and utility.

As the athletes in the current study discussed, at times, asking for help or talking about their experiences with support providers was difficult due to the “warrior mentality” that permeates sport culture (Caron et al., 2013; Delenardo & Terriom, 2014). Interestingly, Lynch (1988) produced one of the earliest studies on support groups for athletes with musculoskeletal injuries, where it was reported that these groups acted as a space to share personal experiences with people who the injured athlete could relate to. They reported that sharing these emotions with other injured athletes provided a sense of relatedness and understanding that may be missing from relationships with support providers who have no first-hand experience with concussion (Lynch, 1988). Specific to the context of the current study, early research regarding the provision of social support for concussed athletes suggested support groups with other concussed athletes were largely beneficial during recovery (Bloom et al., 2004; Horton, Bloom, & Johnston, 2002). Specifically, the support groups allowed athletes a venue to disclose their emotions, including injury-related concerns and adaptive coping styles, which in turn reduced feelings of isolation that are commonly reported during recovery (André-Morin et al., 2017; Bloom et al., 2004). Horton and colleagues (2002) reported that athletes in a concussion support group reduced feelings of depression, anxiety, frustration, and isolation. Considering these are
the most commonly reported emotional outcomes following concussion (Rice et al., 2018), encouraging athletes to join support groups with other concussed individuals may reduce psychological distress during recovery, while simultaneously increasing feelings of relatedness that promote acceptance. More recent publications (see Putikian, 2016) further suggested support groups for concussed athletes may help athletes during recovery by destigmatizing mental health issues following injury, promoting the benefits of asking for help, as well as educating athletes about common emotional symptoms. However, considering only 10-15% of athletes suffer from prolonged concussion recoveries (McCrory et al., 2017), the likelihood of locating consistent support groups for athletes with protracted concussions physically near the athlete may be low. Therefore, it may be clinically beneficial to provide athletes with additional avenues to share their experiences with other concussed athletes.

In fact, recent research has emerged on the value of utilizing newer forms of social support outside of the immediate support network, such as online forums and mobile apps that are tailored to concussed athletes (e.g., Bloom et al., 2004; Cassilo & Sanderson, 2018; Horton et al., 2002; Sanderson & Cassilo, 2019; Worthen-Chaudhar, McGonigal, Logan, Brockbrader, Yeates, & Mysiw, 2017). Concussed athlete’s felt that using online forums with other injured athletes allowed them to share feelings and stories throughout their experience, as well as identify gaps in their support needs. Consequently, this promoted feelings of relatedness and control, as well as adaptive coping responses such as positive re-appraisal and acceptance (Cassilo & Sanderson, 2018; Sanderson & Cassilo, 2019). Furthermore, a study conducted by Worthen-Chaudhar and colleague (2017) on the effectiveness of a mobile health app on reducing protracted concussion symptomatology reported that the usage of this app provided an online social network for athletes to share their experiences. In turn, the participants in this study
reported lowered depression symptoms and higher feelings of optimism (Worthen-Chaudhar et al., 2017). In the last ten years, as technology continues to advance, there has been a push to integrate technology into treatment of both physical symptoms (i.e., vestibular ocular eye therapy, heart rate variability monitoring, neuroimaging/neurofeedback; Collins et al., 2014) and psychological symptoms (i.e., Cassilo & Sanderson, 2018; Sanderson & Cassilo, 2019; Worthen-Chaudhar et al., 2017). It is important to note that technology should be gradually re-introduced following a concussion and should not be used if it exacerbates symptoms (McCrory et al., 2017). Moreover, some athletes with protracted concussions may experience more visual symptoms, such as light sensitivity and light-induced headaches, and should minimize excess technology consumption (Collins et al., 2014). However, according to a qualitative study done to assess general practitioners beliefs’ on using online social media sites during concussion recovery, it is safe for concussed individuals to utilize online sources to connect with others, as long as they closely monitor their technology usage and ensure proper cognitive rest (Ahmed, Sullivan, Schneiders, Moon, & McCrory, 2013). As evidenced by our athlete’s use of social media and cellphones during recovery to connect with their support providers, supplying them well-developed online platforms to connect with other concussed athletes may provide more effective social support, and consequently better coping abilities. One such positive coping style athletes used in this study is acceptance, which will be discussed in depth within the next section.

**Acceptance of injury.** Acceptance is another form of emotion-focused coping, as reported by Folkman and Lazarus (1980). Acceptance is defined as actively and consciously acknowledging thoughts of pain, discomfort, or emotions and willingly choosing to co-exist with those feelings in a non-judgmental manner (Mahoney & Hanrahan, 2011). Four of the five athletes in the current study said their coping capacities were helped when they accepted that
their injury recoveries were going to take longer than they expected. In turn, they felt that accepting their injuries provided them with positive psychological benefits, such as feelings of hope and perseverance. These findings are in support of previous research conducted on acceptance, coping, and athletic injuries. For example, athletes with musculoskeletal injuries cited acceptance as one of the most beneficial coping strategies they implemented during recovery (Bianco et al., 1998; Gould, Bridges, Udry, & Beck, 1997). Especially for athletes with long-term injuries, accepting their prolonged recovery period improved their motivation and allowed them to accept and overcome the boredom and frustration that stemmed from long rehabilitation protocols and minimized activity (Bianco et al., 1998; Gould et al., 1997; Mahoney & Hanrahan, 2011).

Specific to concussions, a recent book chapter by Seguin and Durand-Bush (2019) described a psychological skills training program for concussed athletes that included self-acceptance as a key component. Within the program, clinicians should encourage athletes to create short-term, immediate self-acceptance goals to keep them focused on controllable factors, such as “How can I be okay with myself when I am not participating in sport” or “How can I stay committed to myself and remember I am a worthy human being, even when things do not go as planned?” (p. 93). Seguin and Durand-Bush designed these goals to help athletes remain patient and kind to themselves during recovery, a point that becomes more pronounced for athletes with protracted concussions. However, this program has yet to be empirically tested, therefore there are no reported outcomes or clinical recommendations based on promoting acceptance in this manner. Interestingly, programs similar to Seguin and Durand-Bush’s (2019) have been implemented with athletes with other athletic injuries. For example, Mahoney and Hanrahan (2011) conducted an intervention study in which four athletes, who had just had reconstructive
knee surgeries, engaged in a four-week long acceptance-based therapy program designed to educate them on mental skills like mindfulness and cognitive flexibility, and improve psychological flexibility. Each of the four weeks consisted of a one-on-one session that focused on one key component of acceptance therapy and aimed to educate the athlete on mental skill techniques within that domain. For data collection, they had athletes fill out measures such as the *Acceptance and Action Questionnaire-II (AAQ-II)* (Bond et al., 2011), the *Mindfulness Attention Awareness Scale (MAAS)* (Brown & Ryan, 2003), and the *Sport Injury Anxiety Scale (SIAS)* (Rex & Metzler, 2016). Additionally, they conducted pre-intervention and post-intervention interviews to gain deeper insight on the program’s effectiveness. Among their findings, the acceptance-based psychological program helped to provide injured athletes the mental skills to overcome challenges, such as rehabilitation setbacks and re-injury anxiety, during recovery and commit to rehabilitation protocols even when they were bored or it felt too tedious. Perhaps most importantly, the athletes felt the mental skills they learned from the program were beneficial in accepting negative emotions such as frustration and anxiety throughout their long-term recoveries. Despite this, it must be understood that this program only included four sessions and did not include athletes with acute or protracted concussion symptoms.

Due to a lack of research on rehabilitation programs for athletes with protracted concussion symptoms, it may be appropriate to look to other bodies of literature, such as chronic pain, to draw parallels and address the implications of promoting acceptance during an uncontrollable situation, such as chronic pain or protracted concussion. McCracken and Eccleston (2001) studied 230 chronic pain-sufferers, analyzing the relationship between their coping skills, acceptance of their pain, and reported outcomes. They found that higher levels of acceptance were related to less perceived pain, lowered rates of depression and anxiety, and
greater daily functioning. Based off their findings, they concluded that attempts to control an uncontrollable situation or event resulted in negative responses to stress and heightened emotions, such as hopelessness and frustrations. Moreover, they reported a more accepting behavior towards long-term stressors, much like chronic pain or a protracted concussion, led to a higher sense of perceived self-control over a situation, which in turn enabled adaptive coping behaviors (McCracken & Eccleston, 2003). Our athletes felt that accepting their injuries allowed them to positively re-appraise their situation, giving them greater feelings of hope and perseverance. In conjunction with the findings from studies such as McCracken and Eccleston (2003), it is possible that acceptance may be an adaptive coping response during concussion. Subsequently, though research is still needed to provide definitive recommendations, it may be appropriate to encourage athletes to engage in exercises such as those proposed by Seguin and Durand-Bush (2019) in order to promote greater feelings of acceptance.

**Conclusions**

In summary, the current study extends previous research on the severity and duration of protracted concussion symptomology, especially the associated psychological sequelae (e.g., André-Morin et al., 2017; Caron et al., 2013; Mainwaring et al., 2010). Our athletes experienced a multitude of emotional outcomes during their concussion recovery, such as weight concern, negative emotional reactions to severe persistent headaches, and perceived loss of control. Based off the Lazarus and Folkman (1984) theory of stress and coping, when individual’s experience a stressful event, they engage in an appraisal-coping process that results in either problem or emotion-focused coping. Our athletes engaged in a similar process throughout their recovery. Due to a lack of control over their treatment plan, athletes felt they lacked the resources to cope properly, therefore they engaged in avoidant forms of coping. Additionally, the current findings
suggested social support played a large role as a coping facilitator, though more research is needed on how to improve the value and effectiveness of support during recovery. And finally, athletes in this study were able to accept their injuries as recovery progressed, which resulted in more positive psychological outcomes. More research is needed on how to promote acceptance-based coping styles during a protracted concussion recovery, as well as the clinical implications it may have on the athlete’s well-being. In conclusion, our athletes’ experiences of coping with their protracted concussion was complex and consisted of many challenges, and though outside the scope of this study, future research should explore the complexity of appraisal and coping during protracted concussion in order to improve the lives of athletes who suffer this injury.
Chapter 6

Summary

Concussions present a multitude of somatic, cognitive, and emotional symptoms that may persist for extended periods of time (Bloom & Caron, 2019; McCrory et al., 2017). In response to injury, athletes engage in an appraisal and coping process that results in a coping outcome, and consequent behavior or emotional response (Lazarus & Folkman, 1980). The severity of a protracted concussion injury, compounded with daily life stress, has lasting psychological implications that can be mediated through the use of different coping mechanisms (André-Morin, Caron, & Bloom, 2017). Previous research on coping with concussion found athletes relied primarily on emotion-focused styles of coping (Covassin, Crutcher, Elbin, Burkhart, & Kontos, 2013; Kontos, Elbin, Newcomer Appaneal, Covassin, & Collins, 2013), however these studies assessed coping using quantitative methods during short-term recoveries. Therefore, the purpose of the current study was to use qualitative methods to explore the coping process used by female collegiate athletes who suffered concussion symptoms that lasted for longer than 6 weeks.

Upon receiving approval from the McGill Research Ethics Board, five female University athletes were recruited to participate in the study; four were Canadian U-Sports athletes and one was a NCAA II athlete. The five athletes must be/have been a female University athlete for at least one full season. Each athlete must have been medically cleared to return to play at the time of their participation in the study. And finally, they must have experienced protracted concussion symptoms that kept them out of competition for a minimum of six weeks. No preference was given to any sport. For more demographic information on each athlete, please refer to Table 1. Athletes were recruited through email, telephone, or word of mouth using snowball sampling via referrals from athletes and coaches (Sparkes & Smith, 2014). Athletes who were interested and
fit the study criteria then participated in a semi-structured interview based on a pilot-tested interview guide. Interviews were conducted by the lead researcher and lasted between 50 to 73 minutes. The interviews were audio recorded and transcribed verbatim. Data was analyzed using thematic analysis, a flexible form of data analysis that identified themes and patterns within the data (Sparkes & Smith, 2014).

Data analysis resulted in three higher-order themes: a) athlete concussion journey, b) appraisal of resources and support, and c) concussion coping strategies. The theme athlete concussion journey consisted of the athlete’s background, symptoms, and personal experiences with their protracted concussion. Next, appraisal of resources and support consisted of the positive and negative factors influencing an athlete’s perceived ability and confidence to handle their concussion symptoms. And finally, concussion coping strategies included the strategies used by athletes to manage all of their protracted concussion symptoms.

While each athlete had their own experience with protracted concussions, results from the study highlighted key commonalities in the athlete’s recovery. First, athletes in this study experienced a multitude of emotional outcomes including severe headaches, weight concern, and perceived loss of control. This led them to engage in emotion-focused styles of coping such as avoidance behaviors and acceptance. Athletes felt that their lack of control over treatment protocol negatively impacted their recoveries, therefore they engaged in avoidance behaviors. Additionally, social support played a large role as a coping facilitator, however athletes expressed concern over the quality of the support they received. And finally, the athletes were able to accept their injuries as recovery progressed, which resulted in more positive psychological outcomes such as hope and perseverance. In sum, these results add to the growing body of literature on the psychology of protracted concussion. Specifically, this study is one of
the first qualitative accounts of how female University athletes coped with protracted concussion symptoms and the resources they used to cope properly.

**Conclusions**

*Athlete Concussion Journey*

- The length of the athletes’ recoveries ranged from seven weeks to almost two years.
- The athletes reported a multitude of persistent cognitive and physical symptoms such as nausea, dizziness, eye movement problems, fogginess, and light sensitivity, with headaches being the most severe.
- The athletes also described emotional consequences of their protracted concussion such as anxiety, depression, perceived loss of control, feelings of isolation, weight gain, and fear of sport return.

*Appraisal of Resources and Support*

- Academic, family, and sport-related stress, in conjunction with a prolonged recovery exacerbated the athlete’s perceptions of stress throughout recovery.
- The athletes experienced both positive and negative feelings towards the resources they perceived to be available to them during their concussion recoveries, and despite adequate resources being provided, all five of the athletes discussed the importance of individualizing their recovery process.
- The athletes had varying degrees of concussion education, however all of them expressed concerns over the lack of education they received as it pertained to their recovery process and protracted concussions.
- Their main social support providers were their family, friends, athletic therapists, coaches, and teammates. However, the quality of social support from these individuals
varied and all five athletes discussed the importance of being asked what they needed from the support givers.

Concussion Coping Strategies

- All five athletes felt that being physically active helped them cope with their prolonged concussion symptoms.
- Many of the athletes also used technology to cope throughout their concussion recovery, as it allowed them to stay engaged with friends or maintain school work.
- Athletes felt that doctor-prescribed interventions such as physical therapy and medication facilitated their ability to cope with emotional and physical symptoms of concussions.
- Another important coping technique was emotional disclosure regarding their concussion. However, the method and amount of emotional disclosure differed by athlete.
- Two other coping strategies that many athletes used were distraction and/or withdrawing from stressful situations. Sleep was frequently used to avoid stressful situations, as well as cope with emotional and physical symptoms.

Practical Implications

The current study is among the first to explore female university athlete’s experiences of coping with protracted concussion. Through the use of semi-structured interviews, athletes were able to share, in their own words, the things that promoted or prevented them from coping effectively. A unique feature of this study was it provided the athletes an opportunity to share their experiences and recommendations for athletes with this injury, as well as for those who treat concussed athletes and support providers. Many of these recommendations are outside the scope of the current study, such as improving concussion education and changing rehabilitation
protocols, and future research should address these concerns voiced by our athletes. However, the results do suggest a few key practical implications.

First, athletes in this study used a variety of emotion-focused coping efforts such as avoidance and acceptance. Specific to avoidance-coping behaviors, athletes tended to distract or disengage themselves through sleep, watching Netflix, or any number of menial tasks aimed at allowing them to avoid symptoms. These behaviors did not provide any benefits to the athletes’ well-being, rather they further deepened the athletes’ perceived lack of control over their recoveries. It may be important for those around the athlete, such as coaches, family members, friends, or teammates, to watch for an excessive use of these behaviors to ensure they are not engaging in avoidance forms of coping for prolonged periods of time, as this may exacerbate symptoms and impact the athlete’s psychological well-being.

In contrast, our athletes also engaged in acceptance-based coping further on in recovery, which resulted in more positive psychological outcomes. While more research is needed on formal implementation of acceptance-based therapies into concussion recovery, someone working with concussed athletes on a daily basis, such as an athletic trainer, should encourage athletes to maintain a positive mindset and educate them on the benefits of positive coping skills such as positive reframing and acceptance. One example could be to have athletes create weekly acceptance goals, as suggested by Seguin and Durand-Bush (2019). Further, the athletic trainer could also ask the athletes to track their daily symptoms and mood in order to see small progressions in their recoveries that may help with maintaining a positive mindset and allow them to accept their injuries.

A final important practical implication from this study stems from the athletes’ recommendations regarding social support. More specifically, the athletes suggested that support
providers ask the athletes what they need, rather than questioning how they are feeling. One possible way of improving the value athletes’ feel from their support may be to have the concussed athlete write down who their support network consists of, the type of support they need from each of them (e.g., emotional, tangible, informational support), and what kind of behaviors or language the support should entail. Next, the athlete could share their needs with each of their support providers to ensure these needs are met and the athlete can benefit from the support they are being given. As the recovery timeline increases and the athlete’s needs potentially change, the athlete and support provider could adapt this support list in order to ensure the support remains beneficial across the entire duration of a prolonged concussion recovery. This continuing conversation could benefit both the support network and the athlete, as the athlete is getting the personalized support they need, and the support providers are given a specific idea of what is needed from them, allowing them to feel like they are actually making a positive change in the athlete’s recovery.

**Theoretical Implications**

The current study also provides important theoretical implications. Specifically, this study has many implications with the theory of stress and coping proposed by Lazarus and Folkman in 1984. Following their concussion, each athlete went through an appraisal process which in turn resulted in using emotion-focused coping styles, such as avoidance, disengagement, and acceptance. These findings are amongst the first to implement coping theory into the concussion context, and further expand the utility of coping theory within athletic injury populations. This is important to note considering the role that coping plays in a majority of the athletic injury models. Wiese-Bjornstal, Smith, Shaffer, and Morrey (1998) include appraisal, cognitive, emotional, and behavioral coping in their integrated model of psychological response.
to sport injury. They propose that the appraisal of the athlete, in conjunction with the behavioral and emotional responses to the injury, all play a role in the psychosocial and physical outcomes of injury. Additionally, another early sport injury model proposed by Williams and Andersen (1998) also includes the athlete’s coping capacity as a key component in predicting injury risk and prevention. While these models were based broadly in sport injury, without the inclusion of concussion, newer models are being proposed within the concussion context, including Wiese-Bjornstal, White, Russell, and Smith’s (2015) sport concussion-adapted version of the integrated model of psychological response to sport injury and rehabilitation.

The theoretical implication for the current study lies within how each of these models defines coping during sport injury. Research exists on what coping and subsequent emotional outcomes look like during athletic injuries (i.e., Johnson, 1997; Udry, 1997; Quackenbush & Crossman, 1994), which lends depth to the inclusion of coping in both Wiese-Bjornstal et al.’s (1998) integrated model and Williams and Andersen’s (1998) model. However, the concussion specific models proposed by Wiese-Bjornstal and colleagues (2015) includes coping despite limited research on coping and concussion. Their definition of coping within these models is largely based off findings outside of the concussion literature, and consequently may not encompass a holistic understanding of what coping with concussion looks like. Moreover, the implications of suffering a prolonged concussion on coping capacity and styles is not addressed within their current definition. Therefore, the findings from the current study may provide greater depth to Wiese-Bjornstal and colleagues (2015) predicted psychosocial and physical outcomes as they relate to coping.
Limitations and Future Research

The current study is not without limitations. First, five female university athletes were interviewed for this study. Therefore, the current results cannot be generalized to the experiences of other concussed athletes, especially male athletes. It is possible that male athlete’s may receive or need different resources or support during their recoveries due to the culture of hegemonic masculinity that is perpetuated in sport culture. Specifically, male athletes are less likely to disclose their symptoms or seek out help from others (Covassin et al., 2013; Kerr, Register-Mihalik, Kroshus, Baugh, & Marshall, 2015), which in turn may influence their appraisal and coping process. Future research should explore how gender-specific sociocultural factors may impact both male and female athletes’ coping and appraisal processes.

Another limitation was the inclusion of University athletes. While the results provide an understanding of coping in this context, the findings cannot be expanded to other sport populations, such as parasport, youth, or professional sport. The potential differences in resources available to athletes at each of these levels may have a large influence on their coping capacities. For example, diagnostic and treatment resources for a concussed parasport athletes may be lacking in comparison to a concussed professional football player due to budgetary restraints, media attention, and research allocation. As our results suggest, perceiving a lack of resources can have detrimental effects on the individual’s ability to cope, which can result in more negative psychological outcomes following injury. Therefore, it may be important for future research to address the resources available to lesser-researched populations such as parasport, as well as other sport populations with lower budget allocations such as youth and high school sport.
Additionally, only concussed athletes were interviewed. When discussing varying factors during a recovery process, including resources provided by clinicians and support provided by an athletes’ support network, it becomes evident that other people are greatly involved in the coping and appraisal process of an athlete with a protracted concussion. Future research could interview the treatment team of an athlete, as well as potential support providers (i.e., coaches, teammates, family, friends). Finally, future should follow an athlete throughout the entirety of a long-term concussion recovery in order to explore changes in coping styles across the duration of recovery, as well as how appraisal fluctuates over time.

Despite the narrow scope of the current study, the results highlight important avenues for future researchers to consider. First, while research on the psychology of concussions has increased tremendously in the last ten years (Bloom & Caron, 2019), this research focused primarily on a few emotional outcomes, such as depression, anxiety, and mood disturbance (Rice et al., 2018). Little attention has been given to other emotional consequences of protracted concussion like those reported in this study, including weight concerns, the emotional responses to persistent severe headaches, and perceived loss of control. Therefore, it is important for future research to expand beyond the more traditional psychological symptoms and begin to understand other impactful outcomes that athletes with protracted concussions may experience during recovery. Moreover, this research should implement qualitative methods in order to let athletes identify and explain the psychological symptoms that were most impactful to them, rather than use an inventory or survey that may not encompass the entirety of the athlete’s experience.

Further, future research should be done on what constitutes quality support during protracted concussion. It would be interesting to have athletes identify their support needs from key support providers (i.e., family, friends, team, coach, clinicians) on a broader scale than the
current study, perhaps using a mixed methods approach. Furthermore, it may be important for future research to address other support avenues during concussion, such as online forums, social networking sites, and apps. More research is needed on the design, implementation, and effectiveness of these types of technology in increasing athletes’ perceptions of support and reducing psychological outcomes of protracted concussions.

Additionally, despite the large increase in concussion research, a majority of this research focuses on athletes with acute recovery timelines. The limited body of literature specifically on protracted sport-related concussion highlights a need for more research on long-term concussions, using both quantitative and qualitative methods in order to develop a better understanding of this complex injury. Moreover, as evidenced by the athletes in our study, future research should focus on the treatment and rehabilitation protocols put in place for athletes with protracted concussions, as they felt they were treated with a standardized approach that did not fit their individualized injury.

Overall, the results from this study adds to the growing body of literature on the severity and duration of protracted concussion symptomology, especially the associated psychological sequelae (e.g., André-Morin et al., 2017; Caron et al., 2017; Caron, Bloom, Johnston, & Sabiston, 2013; Mainwaring, Hutchinson, Bisschop, Comper, & Richards, 2010). Our athletes described a variety of emotional outcomes during their concussion recovery, such as weight concern, negative emotional reactions to severe persistent headaches, and perceived loss of control. Due to a lack of control over their treatment plan, athletes felt they lacked the resources to cope properly, therefore they utilized avoidant forms of coping during recovery. Additionally, results suggested social support played a large role in the athletes’ coping capacity. However, athletes felt the quality and personalization of the support needed improvement. And finally,
athletes were able to accept their injuries were taking longer than initially believed. This form of coping resulted in more positive emotional outcomes. In conclusion, our athletes experienced a multitude of emotional outcomes and coping styles throughout their protracted concussion recoveries, highlighting the complexity of this injury. There is a need for future research on coping with protracted concussion symptoms in order to further explore facilitators and barriers to the coping process. Most importantly, researchers and clinicians should understand the complex nature of this injury and engage with the athlete on a personal level in order to protect and promote their over-all well-being.
References


symptoms. *Archives of General Psychiatry*, 65, 81-89.

doi:10.1001/archgenpsychiatry.2007.8


doi:10.1016/j.csm.2010.08.001


Appendix A

Coach Recruitment Script

Dear Coach ____________ ,

My name is Becca Steins and I am currently working towards a Master of Arts degree in sport psychology under the supervision of Dr. Gordon Bloom in the Department of Kinesiology and Physical Education at McGill University. My supervisor and I are conducting a research study on the experiences of female athletes who suffered from prolonged concussion symptoms. We would like your assistance in recruiting participants for our study. That is, we request that you forward the names of any athletes who played on your team for at least one year and who suffered a concussion in the last two years, and whose symptoms persisted for at least 6 weeks.

Should you have any questions concerning this study, please contact my supervisor or myself using the information provided at the bottom of the page!

Kind regards,
Becca Steins

Becca Steins
Master’s Candidate, Sport Psychology
Dept. of Kinesiology & PE
Rebecca.steins@mail.mcgill.ca

Or

Gordon A. Bloom, Ph. D.
Professor
Dept. of Kinesiology & PE
Gordon.bloom@mail.mcgill.ca
Appendix B

Athlete Recruitment Script

Dear ___________,

My name is Rebecca Steins and I am currently working towards a Master of Arts degree in sport psychology under the supervision of Dr. Gordon Bloom in the Department of Kinesiology and Physical Education at McGill University. My supervisor and I would like to invite you to participate in our research study. The purpose of this study is to explore how female University athletes cope with long-term concussion symptoms. You have been identified as a potential participant based on the fact that you experienced concussion symptoms that lasted longer than 6 weeks while you were a varsity athlete.

If you chose to participate in this study, you will be asked questions about your recent injury, with particular emphasis on the coping styles you used during your recovery from your concussion symptoms, as well as the support you received during your recovery. If you choose to participate, I will conduct an interview lasting approximately 75 minutes at chosen time and location that is most convenient for you.

This study has been reviewed and accepted by the McGill University Ethics Board, and any information you provide during this study will remain confidential. No identifying information will be used, ensuring your identity will remain anonymous. Only the lead investigator, Rebecca Steins, and the faculty supervisor, Dr. Gordon Bloom, will have access to identifiable data.

Should you have any questions concerning this study, please contact my supervisor or myself using the information provided at the bottom of the page. The McGill Sport Psychology Research Laboratory has a history of producing influential research on concussions. Please visit our website if you would like to learn more about our research: http://sportpsych.mcgill.ca.

Thank you for considering participating in this research project, and I look forward to hearing from you!

Sincerely,
Rebecca Steins

Rebecca Steins, B.A.
Master’s Candidate, Sport Psychology
Dept. of Kinesiology & PE
McGill University, Montreal
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Gordon A. Bloom, Ph. D.
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Appendix C

Informed Consent Form

This study is in partial fulfilment of the requirements for the degree of Master of Arts for Rebecca Steins, a graduate student in sport psychology in the Department of Kinesiology and Physical Education at McGill University. You are invited to participate in our research study titled, “Exploring female university athlete experiences of coping with protracted concussion symptoms”. Should you choose to participate in this study, you will be requested, without payment, to partake in an approximately 75-minute audio recorded interview. During the interview, you will be asked questions about your most recent concussion, with particular emphasis on how you coped with your concussion symptoms, as well as the provision of social support throughout your recovery.

At the end of the interview, you will have the opportunity to clarify any statements made during the interview, offer additional insights and comments, or ask the interviewer (Rebecca Steins) questions. Your identity will remain confidential at all times. The principle investigator, Rebecca Steins, and the faculty supervisor, Dr. Gordon Bloom, will be the only individuals to have access to identifiable data. All data, including the audio file of the recorded interview and the digital copy of the consent form, will be securely stored in an encrypted folder on a password-protected computer for a period of seven years. Any paper copies will be converted to digital files and, promptly, destroyed. Pseudonyms will be used to label all digital files. All data will be destroyed seven years after the study ends. The information disclosed during the interview will remain confidential and will be used for publication purposes and scholarly journals or for presentations at conferences. Your name and identity will not be revealed at any time. The McGill Research Ethics Board has reviewed this study for compliance with its ethical standards. Your participation in this study is completely voluntary and not mandatory. You are free to refuse to answer any questions or withdraw from participation at any time, without penalty, and all information gathered up to that point will be destroyed.

After reading the above statement and having had the directions verbally explained, it is now possible for you to provide consent and voluntarily agree to participate in this research project based on the terms outlined in this consent form. You will be provided with a signed copy of this consent form for your records. You will also be asked to reiterate your consent throughout the study to ensure you wish to continue. You may refuse to continue participation at any time, without penalty, and all information gathered will remain confidential. Please contact the Research Ethics Officer at 514-398-6831, or lynda.mcneil@mcgill.ca if you have any questions or concerns regarding your rights and welfare as a participant in this research study. Please sign on the next page if you agree to participate in this study.
I agree (please check YES ___ or NO ___ and write your initials ______________) to the audio recording of the interviews with the understanding that these recordings will be used solely for the purpose of transcribing these sessions.

Rebecca Steins  
Master’s Candidate, Sport Psychology  
Dept. of Kinesiology & PE  
McGill University, Montreal  
Rebecca.steins@mail.mcgill.ca

Gordon A. Bloom, Ph.D.  
Professor  
Dept. of Kinesiology & PE  
McGill University, Montreal  
gordon.bloom@mcgill.ca
Appendix D

Interview Guide

Pre-Interview Routine

- Introduction
- Consent Form

Opening Questions

1. Briefly describe your athletic career, especially at the University level.
   a. How important has sport been in your life?

2. Have you suffered any other athletic injuries besides your concussion that have kept you out of competition for at least 1 month?
   a. How did you deal with this emotionally?
   b. Who played the biggest role during your recovery?
   c. Describe the ways in which these individuals supported your recovery.

Main Theme Questions

3. Not including your most recent long-term concussion, describe any other injuries to your brain (including diagnosed and non-diagnosed concussions; short- and long-term).

4. How did your recent concussion happen?
   a. When and where was your concussion diagnosed?

5. How did you feel immediately after the injury happened? 24 hours later? A week after diagnosis? And a month after diagnosis?
   a. Can you describe some of the things you did to help yourself feel better in that initial period after your injury? What made you feel worse?

6. Can you please describe the symptoms you experienced throughout your concussion, up to and including when they finally disappeared? Feel free to use the pictures/objects you brought with you to answer this question.
   a. What made you feel better? What made you feel worse?
   b. Did you notice a change in your emotions throughout your recovery? If so, can you please describe this change?
   c. How did you handle these emotional changes? Were there any changes in your thoughts or behaviors based on these emotions?

7. What did your rehabilitation look like?
   a. What parts of your rehabilitation did you find most helpful?
   b. Were there any parts of your rehabilitation that were not helpful?
   c. Were there certain things you felt were missing from this course of treatment?
8. How stressful was your injury? And what part(s) of your life was/were most stressful (athletically, emotionally, socially, academically, etc.)?

9. Can you talk a bit about the support, or lack of support, you received during your recovery?
   a. If they felt supported…
      i. Who played the biggest role in your recovery from your concussion? How?
      ii. Did this support change throughout your recovery?
      iii. How did their support help/hinder your recovery?
   b. If they identified a lack of support...
      iv. What types of support would have been beneficial during your recovery?
      v. How would this support be beneficial?
   c. How did your relationships with those closest to you change during your recovery?

10. If you were asked to provide the support network of an athlete with prolonged concussion symptoms with advice for the athlete’s rehabilitation process in the form of a list of do’s and don’ts, what would your list include?

11. Aside from people, is there anything else that helped you cope the most throughout your recovery?

Summary Questions

12. Aside from issues related to their support network if you were asked to provide an athlete suffering from prolonged concussion symptoms with advice for their rehabilitation process in the form of a list of do’s and don’ts, what would your list include?

13. On a scale of 1-10, how do you feel that you managed your recovery from concussion? Why a (number they say) rather than a (higher or lower number)?

Concluding Question

14. Do you have any final comments you would like to share? Any questions?
Appendix E
Theme development

<table>
<thead>
<tr>
<th>Codes</th>
<th>Lower-order themes</th>
<th>Higher-order themes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. <strong>Background information (41)</strong> - Information regarding the athlete’s career and previous injuries that took place before the protracted concussion that is the focus of this study.</td>
<td>Athlete Concussion Journey (166) The athlete’s background, symptoms, and personal experiences with their protracted concussion.</td>
</tr>
</tbody>
</table>
| 1. Athletic career  
2. Previous injury experience  
3. Previous concussion |   |   |
| 1. Cause of concussion  
2. Recovery – Timeline  
3. Return to sport  
4. Medical clearance  
5. Retiring from sport | 2. **Concussion timeline (56)** – The timeline of the athlete’s protracted concussion from onset to return to sport to retirement. |   |
|   | 3. **Concussion symptomology (69)** – The emotional and physical outcomes the athlete experienced during their protracted concussion. |   |
| Isolation  
2. Symptoms – Emotional  
3. Symptoms – Physical  
4. Weight concern  
5. Fear of sport return |   |   |
| 1. Stress – family  
2. Stress – friend  
3. Stress – school  
4. Stress – work  
5. Negative coach interactions  
6. Pressure  
7. Invisible injury | 1. **Stress-inducing factors (37)** – Aspects of the athlete’s life, both in and out of sport, that contributed to feelings of stress during their recovery. |   |
|   | 2. **Resource availability (62)** – Positive and negative feelings expressed by the athlete regarding the resources they perceived available to them during their recovery. | Appraisal of Resources and Support (232) Positive and negative factors influencing an athlete’s perceived ability and confidence to handle their concussion symptoms. |
| Diagnosis  
2. Resources – Available  
3. Resources - Lack of  
4. Recommendations – Resources  
5. Recovery – frustration |   |   |
| 1. Lack of education  
2. Concussion education  
| 2. Sport culture | |
| 3. Team success | |
| 4. Experiences of others | |

| 1. Support – AT | 5. **Provision of social support** (80) – Factors influencing the athlete’s perceptions of social support throughout their recovery. |
| 2. Support – Academic | |
| 3. Support – Coach | |
| 4. Support - Non-teammate | |
| 5. Support – Family | |
| 6. Support – Teammates | |
| 7. Recommendations - Support | |
| 8. Support – changes | |

| 1. Animal therapy | 1. **Concussion symptom management** (46) – Techniques used by the athlete to manage the cognitive, physical, and emotional symptoms of their concussion. |
| 2. Managing symptoms – Cognitive | |
| 4. Managing symptoms – Physical | |
| 5. Sleep | |
| 6. Use of technology | |

**Concussion Coping Strategies** (46)
The strategies used by athletes to manage all of their protracted concussion symptoms.