The Effects of Career Ending Concussions on Retired National Hockey League Players

Jeffrey G. Caron

A thesis submitted

in partial fulfillment of the requirements

for the degree of

Master of Arts

in the Department of Kinesiology and Physical Education

in the Faculty of Education

McGill University, Montreal

November 17, 2011

Abstract

Concussion diagnoses in sport have been increasing steadily over the past two decades. In North America, the prevalence of concussions in professional sports such as football and ice hockey have recently garnered increased media attention and research due primarily to the serious short and long-term health implications. Commonly reported physical symptoms include headaches, dizziness, blurred vision, and sensitivity to light and sound. Concussed individuals also suffer psychological symptoms such as isolation, anxiety, and depression. In some cases, the combination of physical and psychological symptoms has led to career termination and personal distress. The purpose of this study was to understand the effects of career ending concussions on former National Hockey League (NHL) players. Five participants were interviewed for the current study, and data was analyzed using interpretative phenomenological analysis (IPA) (Smith, Flowers, & Larkin, 2009). Results revealed four higher order categories: (a) *Concussion Experiences* which described participants' physical and psychological symptoms from their concussions, (b) *Environmental Influences* which discussed relationships with key individuals and organizations throughout their careers, (c) *Professional Sport Transition* which described participants' career termination, as well as the transition to their post athletic lives, and (d) *Education and Recommendations* which included participants' insights that were grouped into concussion education and recommendations to improve player safety. These results indicated that physical and psychological symptoms of concussions caused participants challenges in their professional careers, their personal relationships, and with their quality of life. The current results represent the first empirical account of professional athletes who have talked about their experiences with a career ending concussion. These findings are of interest to medical professionals, sport psychology practitioners, coaches, parents, and athletes to gain a more thorough understanding of concussions. In addition, the current study expands career termination literature by including the experiences of professional athletes. Through the use of retrospective interviews, this study presented athletes' experiences with short and long-term effects of concussions which in turn enhanced the overall understanding of concussive injury.

Résumé

Les diagnostics de commotions cérébrales dans le sport n'ont cessé d'augmenter de façon constante depuis les deux dernières décennies. En Amérique du Nord, la fréquence de commotions cérébrales dans les sports professionnels comme le football et le hockey sur glace, a récemment attiré l'attention des médias et de la recherche principalement à cause des effets néfastes sur la santé à court et à long terme. Les symptômes physiques les plus fréquents sont les maux de tête, les étourdissements, la vision floue, et la sensibilité à la lumière et au son. Les individus ayant souffert de commotion cérébrale souffrent aussi d'autres symptômes tels que l'isolement, l'anxiété et la dépression. Dans certains cas, la combinaison de symptômes physiques et psychologiques a entraîné des fins de carrière et des problèmes personnels sérieux. Le but de cette étude était de comprendre les effets des commotions ayant entraîné la fin de carrière chez les anciens joueurs de la Ligue Nationale de Hockey (LNH). Cinq participants ont été rencontrés en entrevue pour la présente étude et les données ont été analysées en utilisant l'IPA "interpretative phenomenological analysis" (Smith, Flowers & Larkin, 2009). Les résultats sont divisés en quatre catégories principales: (a) *Les expériences de commotions cérébrales* décrivent les symptômes physiques et psychologiques du participant, (b) *les influences environnementales* concernent les relations entre joueurs, individus-clés et organisations, (c) *la transition de carrière sportive* décrit la fin de carrière des participants ainsi que la transition à leur nouveau mode de vie, (d) *l'éducation et les recommandations*: les réflexions des participants ont été considérées pour établir un programme d'éducation sur les commotions et des recommandations pour améliorer leur sécurité. Ces résultats ont indiqué que les symptômes physiques et psychologiques ont causé des défis aux participants dans leur carrière professionnelle, leurs relations interpersonnelles et leur qualité de vie. Les résultats de cette recherche représentent les premiers comptes-rendus empiriques d'athlètes professionnels qui ont fait part de leur expérience de fin de carrière causée par une commotion cérébrale. Ces constatations représentent un intérêt pour les professionnels de la santé, les praticiens en psychologie sportive, les entraîneurs, les parents et les athlètes afin de mieux leur faire comprendre les effets de la commotion cérébrale. La présente étude, basée sur des entrevues rétrospectives racontant l'expérience d'athlètes professionnels, complète la documentation et les références scientifiques sur les fins de carrière et accroît la compréhension générale des accidents reliés à la commotion cérébrale et de leurs effets à court et long terme.

Acknowledgements

I would like to thank the following people who were instrumental in the completion of my thesis:

- My supervisor, Dr. Gordon Bloom, who gave me the opportunity to apply my passion for hockey to the academic environment. Thank you for believing in me and giving me the guidance to complete a project that I am very proud of. You have prepared me for the next challenge and the road ahead. I'm also looking forward to many more victories with Team Red.
- Dr. Catherine Sabiston, who offered guidance over the past two years, including but not limited to qualitative methods.
- Dr. Billy Harvey, for the advice and support over the past two years, including pointing out my use (and abuse) of dangling modifiers.
- Dr. Scott Delaney, who shared his expertise as concussion researcher and clinician.
- Bob McKenzie and Pierre McGuire, who helped us gain access to this very unique population.
- The five participants whom I greatly respected as players, and who I now respect more after meeting with them. Thank you for your sharing your stories with me.
- The McGill Sport Psych lab: Holly, Joe, Marc, Scott, and Will, for all the laughs and good times over the past two years.
- Shaner, for two great years on the bus and behind the bench.
- Cam, Eddie, Flinner, Nick, Paul, Rem, Sammy, Willy, and Zack. Cheers les boys!
- Emilie, your warmth and unconditional support throughout this process has been amazing. Merci aussi a Diane, France, et Ginette pour avoir traduit mon résumé!
- Jamie, brother and friend, for knowing when to listen and when to make me laugh. Most importantly, thank you for always being there.
- Mom and Dad, who have supported me in countless ways. The many hockey trips growing up, the countless times you travelled long distances to be in the stands, and now supporting my academic ventures. Your contributions to my athletic and academic careers are priceless, and this thesis is for you.

Table of Contents

List of Tables

Chapter 1

Introduction

Over 500,000 Canadians annually participate in ice hockey, our national winter sport (Brooks, 2007). The popularity of hockey in Canada can be attributed to the fact that it is played by people of all age and skill levels. Despite its popularity, participation in this sport also involves the risk of injury due to the aggressive nature of the game (Brooks, 2007), where players can reach speeds up to 30 mph (Flik, Lyman, & Marx, 2005). As a result, musculoskeletal injuries occur frequently, are normally visible, and follow a predictable rehabilitation timeline. Another type of injury, concussion, is a growing concern in hockey due to its increasing frequency (Benson, Meeuwisse, Burke, & Rizos, 2008; Goodman, Gaetz, & Meichenbaum, 2001; Pelletier, Montelpare, & Stark, 1993). Moreover, the injury is invisible (i.e., no swelling, stitches) (Bloom, Horton, McCrory, & Johnston, 2004) and there is no set timeline for recovery (McCrory et al., 2009). Unlike musculoskeletal injuries, concussed athletes cannot resume activity until their physical symptoms have subsided (McCrory et al., 2009). Thus, while hockey is a popular sport in Canada, the risk and incidence of injuries remain high, with concussions an ever-increasing phenomenon.

As many as 300,000 athletes suffer a concussion each year in the United States (Johnston, Lassonde, & Ptito, 2001), with the sports of football and ice hockey having the highest incidence (Benson, Rose, & Meeuwisse, 2002; Delaney, Lacroix, Leclerc, & Johnston, 2000). According to Goodman et al. (2001), hockey players suffer as many as 5.95 concussions per 1000 hours played – a higher rate than soccer and football combined (Boden, Kirkendall, & Garrett, 1998; Guskiewicz, Weaver, Padua, & Garrett, 2000). Moreover, the incidence of concussions may be higher than reported because athletes may underreport

concussions for fear of being withheld from competition (Delaney et al., 2002; McCrea, Hammeke, Olsen, Leo, & Guskiewicz, 2004). Recently, Echlin et al. (2010) found that the incidence of concussion is 3.3 times higher than previously indicated among Canadian junior hockey players. Therefore, the combination of high concussion incidence in hockey and the underreporting of signs and symptoms make concussions a complex injury.

The study of concussions has also received increased attention due to the severity of post-concussion symptoms. Common physical symptoms of a concussion include headaches, dizziness, blurred vision, and sensitivity to light and sound (McCrory et al., 2009). Research has also indicated that concussions can affect an athlete emotionally (Johnston et al., 2004; Ptito, Chen, & Johnston, 2007). Depression, isolation, and anxiety have been identified as common emotional responses to concussion (Guskiewicz et al., 2005; Johnston et al., 2004). In fact, functional Magnetic Resonance Imaging (fMRI) scans of concussed individuals indicated similar neural responses in brain areas commonly linked with major depression (Chen, Johnston, Petrides, & Ptito, 2008). Therefore, concussed athletes are susceptible to experiencing a combination of physical, emotional, and psychological trauma.

Post-concussion symptoms have led to career termination in some cases. Research has found that athletes who retired voluntarily experienced a less turbulent adaptation to the post-career than those who retired involuntarily (Taylor & Ogilvie, 1994, 2001; Webb, Nasco, Riley, & Headrick, 1998; Werthner & Orlick, 1986). More precisely, Taylor and Ogilvie (1994) noted that involuntary career termination (i.e., injuries) caused the most difficult transition to post-career. Emotional responses of athletes who experienced involuntary career termination have included depression, substance abuse, and suicide ideation (Ogilvie & Howe, 1982; Werthner & Orlick, 1986). Athletes with high athletic

identity (i.e., professional athletes) have also exhibited significant emotional responses due to involuntary career termination (Lavallee, Gordon, & Grove, 1997; Ungerleider, 1997).

Recently, there have been several anecdotal accounts of professional hockey players who discussed their career ending concussions (e.g., Gulli, 2011). Empirical research has focused primarily on identifying the physical symptoms (and outcomes) of concussions (Aubry et al., 2002; Johnston et al., 2004; McCrory et al., 2005, 2009). In contrast, a limited body of research has investigated psychological aspects of a concussion (Bloom et al., 2004; Hutchison, Mainwaring, Comper, Richards, & Bisschop, 2009; Covassin, Swanik, & Schatz, 2007). Furthermore, the majority of research on psychological aspects of concussions has employed a quantitative methodology, while few have used a qualitative framework. Qualitative research in sport psychology has indicated that the use of in depth interviews is an effective method for understanding the experiences of athletes (Culver, Gilbert, & Trudel, 2003; Strean 1998). A qualitative methodology attempts to understand a phenomenon as described by individuals who experienced it (Creswell, 2007). According to Culver and colleagues, interviewing has been the most common method of data collection in qualitative inquiry. Furthermore, Strean noted that by conducting interviews, researchers obtain an in depth understanding of how people make sense of their world. Thus, interviewing athletes who have suffered a career ending concussion provided a greater understanding of the emotional experiences of these athletes.

Purpose of the Study

The purpose of this study was to understand the effects of career ending concussions on former National Hockey League players. Specifically, this retrospective study investigated

the various thoughts, feelings, emotions, and experiences of these participants with respect to concussions.

Research Questions

This study aimed to understand the phenomenon of career ending concussions among retired National Hockey League (NHL) players. Specifically, how does athletic identity play a role in retired NHL players' experiences with career ending concussions? How do NHL players experience involuntary career termination and transitions as a result of a career ending concussion? Are the social relationships (i.e., teammates, coaches, family) of retired NHL players affected by career ending concussions? After suffering a career ending concussion, what type of support do NHL players receive from inside the game (i.e., team, league, agents, medical professionals)? Lastly, how are NHL players affected psychologically by a career ending concussion?

Significance of the Study

Research indicates a high incidence of concussions in hockey (Goodman et al., 2001), and that athletes suffer physical symptoms as a result of this injury (Johnston et al., 2004; McCrory et al., 2009). Although research has begun to investigate psychological aspects of concussions, there are still many untapped areas. For example, how do psychological symptoms interact with the physical symptoms of a concussion? The findings of this study will provide insight to athletes who have suffered a concussion by providing one of the first accounts of athletes' experiences with career ending concussions. This study may also benefit medical doctors and physiotherapists to better understand the psychological effects of concussions, which will allow them to provide better care for concussed athletes. Furthermore, these findings may help improve the classification, management, and

assessment of concussions. This study will also aid sport psychology experts to further understand the role of psychological techniques on their effect on concussion management by investigating the experiences of former athletes (Kontos, Collins, & Russo, 2004). Also, this study will add to previous career termination literature by providing a retrospective analysis of athletes' experiences with a career ending injury (Grove, Lavallee, & Gordon, 1997; Mihovilovic, 1968; Sinclair & Orlick, 1993; Webb et al., 1998; Werthner & Orlick, 1986), thus providing a greater understanding of athletes' experiences with injury-based career termination.

Delimitations

For the purpose of this study the following delimitations have been identified:

1. Participants played a minimum of 10 seasons of professional ice hockey, and played at least one NHL regular season game.
2. Participants suffered a medically-diagnosed concussion that resulted in career termination.

Limitations

The following limitations have been identified for the purpose of this study:

1. Length of NHL playing career may have impacted the participants' experiences with career ending concussions. Furthermore, length of time since career ending concussion varied among participants.
2. Position and player type were not included in selection criteria.
3. Results of this study may only be applicable in the context of professional ice hockey.

Operational Definitions

For the purpose of this study, the following definitions will be used:

Concussion is defined by the Concussion in Sport (CIS) group as "a complex pathological process affecting the brain induced by traumatic biomechanical forces" (Aubry et al., 2002). Furthermore, the diagnosis of a concussion involves a range of five domains: (a) symptoms – somatic (e.g., headache), cognitive (e.g., feeling like in a fog) and/or emotional symptoms (e.g., lability), (b) physical signs (e.g., loss of consciousness, amnesia), (c) behavioural changes (e.g., irritability), (d) cognitive impairments (e.g., slowed reaction times), (e) sleep disturbance (e.g., drowsiness) (McCrory et al., 2009).

Career termination is conceptualized as the process of athletic retirement where an athlete transitions from career to post-career (Taylor & Ogilvie, 1994). Of the four causes of career termination, injury has led to the most difficult adaptation to post-career.

National Hockey League player is defined as a player who competed in the NHL and was forced to retire due to symptoms resulting from a concussion. Furthermore, the NHL is the highest level of professional hockey in North America and is widely regarded as the best professional hockey league in the world.

Chapter 2

Literature Review

This chapter will consist of two main sections. First, concussion and sports will be discussed, focusing primarily on the contributions of the Concussion in Sport group. Furthermore, this section will include concussion incidence and prevalence, as well as common emotional and psychological responses to a concussion. Second, career transitions and termination will be explained with particular emphasis on the effect of involuntary career termination on transition to post-career.

Concussion and Sports

In 2001, the Concussion in Sport (CIS) group was formed as a joint venture with the International Ice Hockey Federation (IIHF), Federation International de Football Association Medical Research Center (FIFA, F-MARC), and International Olympic Committee Medical Commission (IOC). At this time, they organized the first of three International Conferences on Concussions in Sport (Aubry et al., 2002). The CIS group is an assembly of leading experts that specialize in research and clinical aspects of concussive injury, encompassing a non-government, non-advocacy panel to give objective and knowledgeable attention to sport-related concussion (Aubry et al., 2002). The purpose of the first conference in Vienna in 2001 was to revise the existing definition of concussion and to provide recommendations for the improvement of safety and health for athletes who suffered concussive injuries in ice hockey, soccer, and other sports (Aubry et al., 2002). According to Aubry and colleagues, the existing definition of a concussion was proposed by the committee on head injury nomenclature of the Congress of Neurological Surgeons in 1966, and "was recognized to have a number of limitations" (p. 6). Therefore, the CIS group defined a concussion as "a complex pathological process affecting the brain induced by traumatic biomechanical forces"

(Aubry et al., 2002). The CIS group also recommended that neuropsychological testing be used for concussion assessment (Aubry et al., 2002). Neuropsychological tests provide a standardized method to objectively assess the cognitive function of athletes (Echemendia & Cantu, 2003). Specifically, neuropsychological tests revealed that memory (Collins et al., 2003; Erlanger, Kutner, Barth, & Barnes, 1999; Guskiewicz, Ross, & Marshall, 2001; Johnston, McCrory, Mohtadi, & Meeuwisse, 2001) and mood (Covassin, Swanik, & Schatz, 2007) were affected by concussion. Although neuropsychological testing has proven useful, the CIS group acknowledges that it "represents only one piece of the puzzle" with respect to concussion assessment (Lovell, 2002, p. 9).

The second CIS conference was held in Prague in 2004, where research, classifications, and the definition of concussions were debated based on the previous conference (McCrory et al., 2005). The classification for sport-related concussions was altered in favour of a simple vs. complex differentiation. A simple concussion was defined as an injury that progressively resolved without complication over 7-10 days, while a complex concussion encompassed cases where athletes suffered persistent symptoms (McCrory et al., 2005). This negated the original grading systems which served as a means to both classify and manage concussions. One such grading system was the Cantu Concussion Grading System and Return to Play guidelines which rated concussions from grade I (mild) to grade III (severe) (Cantu, 1986). Cantu (2001) stated that a Grade I concussion included no Loss of Consciousness (LOC), less than 30 minutes of Post-Traumatic Amnesia (PTA), and less than 24 hours of Post-Concussion Signs and Symptoms (PCSS). Grade II concussions included LOC of one minute or less, greater than 30 minutes of PTA, or less than seven days of PCSS. Grade III concussions included LOC exceeding one minute, greater than 24 hours of PTA, or

more than seven days of PCSS. Prior to the second CIS conference, the Cantu Concussion Grading System was one of a number of existing methods to classify a concussion. A final recommendation by the CIS group was the creation of the sport concussion assessment tool (SCAT), which served as a standardized assessment tool for patient education or physician assessment (McCrory et al., 2005).

Most recently, in 2008, a third CIS conference took place in Zurich. The simple and complex classification was abandoned as the panel felt that the terminology did not adequately differentiate the classifications (McCrory et al., 2009). However, the group retained the notion that 80-90% of concussions were resolved within a 7-10 day period (McCrory et al., 2009). Also, the SCAT was revised and SCAT2 was created to provide a more comprehensive evaluation tool for concussion assessment (McCrory et al., 2009). SCAT2 delivers a more comprehensive version of the assessment tool by multiplying each current symptom the patient is experiencing (e.g., dizziness) by the severity of each symptom (0=none, 6=severe), giving an overall score out of 132 (McCrory et al., 2009). Unique from the other two conferences which produced guidelines, the third CIS conference produced a consensus document under the National Institutes of Health (NIH) format (NIH Consensus Development Program, 2010). NIH format requires that experts present to a panel consisting of 12-16 members, as well as the general public. This document included the most current and accepted manner to define, classify, and manage a sport-related concussion (McCrory et al., 2009). The definition published in the third conference did not differ from that set forth by Aubry et al. (2002) in Vienna, however the clinical, pathologic, and biomechanical constructs published at the second conference in Prague by McCrory et al. (2005) were

revised, providing new constructs (Table 1) that defined the nature of concussive head injury (McCrory et al., 2009).

Along with these revised constructs, the CIS group also modified the signs and symptoms associated with concussions. The diagnosis of a concussion involves a range of five domains: (a) symptoms – somatic (e.g., headache), cognitive (e.g., feeling like in a fog) and/or emotional symptoms (e.g., liability), (b) physical signs (e.g., loss of consciousness, amnesia), (c) behavioural changes (e.g., irritability), (d) cognitive impairments (e.g., slowed reaction times), (e) sleep disturbance (e.g., drowsiness) (McCrory et al., 2009). If any of these five components are present, a concussion should be suspected and the athlete must be removed from play and medically assessed (McCrory et al., 2009). If the concussed athlete is deemed unfit to continue playing (e.g., SCAT2 test is failed) the Graduated Return to Play Protocol (Table 2) is followed before returning to competition (McCrory et al., 2009). Lastly, the CIS group identified a number of modifying factors (Table 3) influencing concussion management.

Concussion incidence and prevalence. As many as 300,000 concussions are identified each year in the United States (Johnston, Lassonde, & Ptito, 2001) which indicates the need for consensus classification, management, and assessment of sport-related concussions. McCrea, Hammeke, Olsen, Leo, and Guskiewicz (2004) suggested that the true prevalence of concussions was much higher than reported. Between 1990-1999, over 95,000 participants in football, ice hockey, and soccer reported to emergency departments in the United States suffering from concussion symptoms (Delaney, 2004). Delaney, Lacroix, Leclerc, and Johnston (2002) found that 62% of soccer players and 70% of football players experienced symptoms of a concussion during the previous year. Furthermore, they

discovered that 20% of Canadian varsity football and soccer players felt symptoms commonly associated with a concussion (e.g., dizziness, headache etc.) and continued to play without reporting the symptoms, suggesting that athletes may not report concussion symptoms in fear of being removed from competition. Therefore, despite a high prevalence of concussions, there is evidence to suggest that concussions are often underreported in football and soccer.

North American sports that are considered high risk for suffering a sport-related concussion are football and ice hockey (Benson, Rose, & Meeuwisse, 2002; Biasca, Simmen, Bartolozzi, & Trentz, 1995; Buckley, 1988; Cantu & Mueller, 2000; Delaney, Lacroix, Leclerc, & Johnston, 2000; Gillogly & Whaley, 2000; Honey, 1998; Mueller, 1998; Tegner & Lorentzon, 1996). Recently, research has found there are also a large number of head injuries in soccer (Barnes, Cooper, Kirkendall, & Garrett, 1998; Barnes, Cooper, Kirkendall, McDermott, Jordan, & Garrett, 1998; Boden, Kirkendall, & Garrett, 1998; Delaney & Drummond, 1999; Kirkendall, Jordan, & Garrett, 2001), and that the concussion rate in soccer is comparable to football and ice hockey (Delaney, 2004). The incidence of concussions per 1000 athlete exposures (practices and games) for high school and collegiate football players was 1.28 concussions (Guskiewicz et al., 2000), while male collegiate soccer players suffered 0.6 concussions (Boden et al., 1998). In hockey, researchers have found a higher concussion incidence for 1000 hours played, ranging from 1.5 (Pelletier, Montelpare, & Stark, 1993) to 5.95 (Goodman, Gaetz, & Meichenbaum, 2001). Similarly, National Hockey League players between the years 1997-2004 were found to have a concussion incidence of 1.8 per 1000 hours played (Benson, Meeuwisse, Burke, & Rizos, 2008). An average of 1,374 NHL players was observed each season over seven NHL seasons to

determine the common post-concussion symptoms as well as physical and neurological exam findings (Benson et al., 2008). They found that the most commonly reported symptoms of concussion were headache, dizziness, and nausea and that almost 70% of players returned to competition within 10 days (Benson et al., 2008). Although research indicates that concussions are prevalent in all three sports, it appears that they occur more often in hockey.

Echlin et al. (2010) observed 67 Canadian junior hockey players in order to examine the incidence of concussion. Each player's cognitive functioning was measured at baseline using the Sport Concussion Assessment Tool 2 (SCAT2), and Immediate Post-Concussion Assessment and Cognitive Test (ImPACT). Players who were diagnosed with a concussion repeated both tests post concussion in order to determine the extent of their symptoms and when they should be returned to play. Echlin et al. found that the incidence of concussion among Canadian junior hockey players was 21.5 per 1000 athlete exposures. Furthermore, these findings indicated that the incidence of game-related concussions in hockey was 3.3 times higher than previously reported. The findings from Echlin et al. determined that hockey presents a greater risk of suffering concussion than previously thought.

Flik, Lyman, and Marx (2005) determined that the most frequent injury suffered by collegiate men's ice hockey players was concussions and that it was more likely to occur during a game. Hockey players are perhaps more susceptible to suffer a concussion than other sports because players can reach speeds of 30 mph (48 kph) (Flik et al., 2005; Goodman et al., 2001; Honey, 1998). In addition, hockey players collide frequently with other players, impacting both the ice and boards (Flik et al., 2005; Goodman et al., 2001; Tegner & Lorentzon, 1996). This combination poses particular risk for hockey players as the most common mechanisms for concussion was determined to occur from either being struck

in the head by an opponent, or hitting one's head on the ground or ice (Delaney, Puni, & Rouah, 2006). Therefore, the higher incidence of concussions in hockey may result from its unique playing surface that can also increase the speed of collisions.

Despite the statistics available on concussions, not all traumatic brain injuries can be classified as a concussion (McCrory et al., 2009). Due to a wide variety of brain injuries, McCrory and colleagues did not include mild traumatic brain injury (mTBI) in the consensus statement published at the third conference in Zurich. Evidence has suggested that each year, in the United States alone, 1.7 million individuals sustained a traumatic brain injury (TBI) and 75% were classified as mTBI (Center for Disease Control and Prevention, 2010). Furthermore, it is important to stress that the terms mTBI and concussions refer to different injury constructs and should not be used interchangeably, as established by the CIS group at the Zurich conference (McCrory et al., 2009). Presently, concussion is classified as a type of mild traumatic brain injury (Center for Disease Control and Prevention, 2010), making it difficult to distinguish between the two. Currently there are at least three working definitions of mild traumatic brain injury in the United States with no clear consensus, further complicating the issue of head injuries (Granacher, 2008). Thus, this document will use the definition and classification of concussions set forth by the CIS group.

Emotional and Psychological Responses to Concussion

Researchers have noted that common responses resulting from athletic injury have included isolation, pain, anxiety, and disruption of daily life (Bloom, Horton, McCrory, & Johnston, 2004; Brewer, Linder, & Phelps, 1995; Brewer, Van Raalte, & Linder, 1991; Quinn & Fallon, 1999; Weiss & Troxel, 1986; Wiese & Weiss, 1987). Hutchison, Mainwaring, Comper, Richards, and Bisschop (2009) compared varsity athletes who suffered

a musculoskeletal injury versus a concussion. Concussed athletes reported post-concussion symptoms such as increased fatigue, emotional disturbance, and a decrease in vigour more than athletes with musculoskeletal injuries. More specifically, post-concussion symptoms have been found to exacerbate emotional responses which include anxiety, irritability, and depression (Ptito, Chen, & Johnston, 2007). Several researchers have suggested that these emotional responses exacerbated the overall effect of a concussion (Bloom et al., 2004; Hutchison et al., 2009; Johnston et al., 2004; Kontos, Collins, & Russo, 2004; Mainwaring et al., 2004). Thus, the physical symptoms of a concussion (e.g., headaches, dizziness) can be amplified when combined with various psychological factors, such as depression (Bloom et al., 2004; Johnston et al., 2004; Mainwaring et al., 2004). More specifically, depression is an emotional response that has been associated with concussed athletes (Guskiewicz et al., 2005; Johnston et al., 2004). One study found that the functional Magnetic Resonance Imaging (fMRI) scans of concussed individuals with symptoms of depression had similar neural responses in brain areas to those commonly linked with major depression (Chen, Johnston, Petrides, & Ptito, 2008). Covassin et al. (2007) tested the neuropsychological function of 79 collegiate athletes post-concussion, and determined that men reported post-concussion symptoms such as vomiting and sadness with greater frequency and intensity than females. Evidently, the combination of physical and emotional symptoms presents a significant challenge for athletes who have suffered a concussion.

Unlike musculoskeletal injuries that are typically visible (i.e., swelling, stitches), concussion is an invisible injury (Bloom et al., 2004). Also, as opposed to musculoskeletal injuries, concussed athletes must be asymptomatic from all physical symptoms before beginning to exercise (McCrory et al., 2009). Given its unique recovery process, concussed

athletes may experience isolation which has led some researchers to suggest that an athlete's environment following concussion may impact their emotional state (Bloom et al., 2004; Johnston et al., 2004). Horton, Bloom, and Johnston (2002) placed athletes experiencing post-concussion symptoms in an athlete support group, with the goal of improving their psychological state. Results revealed that athletes who participated in the support group reported lower total mood disturbance than the control group. Similarly, Bloom et al. suggested that team sport athletes were less likely to have long term problems with concussions (i.e., post-concussion symptoms) due to the support of team mates. However, Johnston et al. cautioned that while a group setting offers some athletes comfort, teammates may inadvertently pressure injured athletes to return to play. Evidently, post-concussion symptoms can be influenced positively and negatively by the athlete's environment and should be assessed on an individual basis (Johnston et al., 2004).

Career Transitions and Termination

A transition in athletics typically results from one or more events (Lavallee, 2000; Taylor & Ogilvie, 2001) that bring about personal and social instability for an athlete (Wapner & Craig-Brey, 1992). Schlossberg (1981) described a transition as "an event or nonevent [which] results in a change in assumptions about oneself and the world and thus requires a corresponding change in one's behaviours and relationships" (p. 5). There are two types of transitions: normative and nonnormative (Alfermann & Stambulova, 2007; Schlossberg, 1984; Sharf, 1997; Wylleman & Lavallee, 2004). Nonnormative transitions are situation-related, unplanned, and involuntary events, such as a career ending injury, and are often characterized by symptoms related to depression, anxiety, and substance abuse. Nonnormative transitions may lead to the most turbulent post-career transitions for athletes because of the unanticipated change from elite sport to everyday life. In contrast, normative

transitions are inevitable sequences of events during a career, such as moving from elite sport to recreational or playing career to post-career.

A limited body of research has suggested that junior/collegiate athletes may experience normative transitions more often than professional/Olympic athletes (e.g., Curtis & Ennis, 1988; Greendorfer & Blinde, 1985; Grove, Lavallee, & Gordon, 1997). Curtis and Ennis surveyed 139 alumni of a Canadian Junior hockey club to subjectively report on their post-career transition. 75% of former athletes indicated a feeling of loss after their retirement, however the same athlete's also reported being successful in their post-career endeavours. Similarly, Greendorfer and Blinde found that 55% of former collegiate athletes indicated they were very or extremely satisfied with how their career ended. Grove et al. determined that pre-retirement planning such as education was a successful coping mechanism used by elite amateur athletes. Therefore, it is possible that junior and college athletes may be more likely to experience a positive transition out of sport than professional and Olympic athletes. More specifically, collegiate-aged athletes have invested less time in their sport and planned for their retirement by investing more time in education, which may make their transition to post-career less traumatic than professional and Olympic athletes.

Athletes who have invested significant time and resources to their sport, such as professional and Olympic athletes are more likely to have high athletic identity, and may be more susceptible to a nonnormative transition (Alfermann, Stambulova, & Zemaityte, 2004; Brewer, Van Raalte, & Petipas, 2000; Grove, Fish, & Eklund, 2004; Grove et al., 1997; Lavallee, Gordon, & Grove, 1997; Ungerleider, 1997). For example, Ungerleider interviewed 57 Olympic athletes to assess the transition from elite sport to the workplace. 40% of athletes that indicated experiencing serious or very serious problems with their transition to the

workplace had high athletic identity. Furthermore, high athletic identity caused athletes to be concerned with their self-image due to diminished attention after retirement, and some alcohol and drug abuse problems. It was determined that those who based their identity, self esteem, and life satisfaction around their athletic identity had the most difficulty adapting to life without sport. Evidently, athletes with high athletic identity experience a difficult transition to post-career, however it remained unclear how other athletes experienced distress. Therefore, Grove et al. (1997) analyzed 48 retired members of various Australian national or state teams to determine the influence of athletic identity on their transition to post-career. In order to determine their athletic identity at the time of retirement, athletes were required to complete the Athletic Identity Measurement Scale (AIMS). High athletic identity was strongly related to both degree of psychological adjustment needed, and time needed to make the adjustment to post-career. Furthermore, athletes with high athletic identity at retirement experienced denial, mental disengagement, behavioural disengagement, and venting emotions more than those with low athletic identity. Thus, elite amateur and Olympic athletes that have high athletic identity experience a difficult transition to post-career, however, it was not yet understood how professional athletes experienced the transition to post-career.

Webb , Nasco, Riley, and Headrick (1998) surveyed 91 former high school, collegiate, and professional athletes who had competed in a variety of sports to assess three areas of interest; (a) athletic identity, (b) psychological reactions to retirement, (c) other variables related to retirement from athletics. They found that athletes with strong athletic identities experienced difficulties with retirement, however they did not specify which group of athletes experienced the greatest difficulties with transition. Interestingly, Webb et al. also

found that 22% of participants experienced an involuntary transition to post-career. More specifically, these athletes indicated that they suffered a career ending injury which forced them to retire from sport abruptly. Results from this study further indicated that athletes who experienced a career ending injury experienced a more difficult transition when compared to athletes who had more control over their retirement.

Research in both North America (Grove, et al., 1997; McKnight et al., 2009; Sinclair & Orlick, 1993; Werthner & Orlick, 1986) and Europe (Alfermann & Groß, 1998; Alfermann, Stambulova, & Zemaityte, 2004) has found that career termination causes the greatest difficulty with post-career transition. Furthermore, Taylor and Ogilvie (1994) found that the cause of career termination had the greatest effect on post-career transition. Career termination has been described as "perhaps the most significant and traumatic experience encountered by athletes" (Taylor & Ogilvie, 2001, p. 672). Moreover, career terminating injuries have caused the greatest amount of emotional and psychological challenges which have caused athletes to experience a more difficult transition to post-career (McKnight et al., 2009; Taylor, & Ogilvie, 1994, 2001; Webb, et al., 1998; Werthner & Orlick, 1986). Furthermore, athletes commonly displayed symptoms such as social withdrawal, fear, anxiety, and loss of self esteem (Williams, Rotella, & Heyman, 1998), and in some cases more severe symptoms such as depression, substance abuse, and suicide ideation were reported (Ogilvie & Howe, 1982; Werthner & Orlick, 1986).

To further examine career termination, Grove, Lavallee, Gordon, and Harvey (1998) analyzed 11 studies and determined that on average, 20% of athletes experienced significant emotional and psychological distress. One of these studies from Werthner and Orlick (1986) interviewed 28 retired Canadian Olympic athletes from 9 different sports and found that 20%

of these athletes said that they retired due to career ending injuries. One athlete described a career ending injury as an "extremely difficult and traumatic" (p. 344) transition to post-career. Other athletes described "hitting rock bottom" (p. 346) and even suffering "a really bad depression" (p. 347) as a result of their career ending injuries. Evidently, any athlete who suffers a career ending injury is at high risk for suffering a traumatic transition to post-career, but it may be the most difficult for professional athletes. Similarly, Mihovilovic (1968) surveyed 44 former professional soccer players to investigate their experiences with career termination. 32% of participants indicated that injuries were the cause of their career termination. Players who suffered career ending injuries experienced feelings of abandonment, fear of the future, and others reported a serious psychic state. Furthermore, career termination led to decreased concern for personal hygiene and physical fitness in all athletes; 38% started smoking cigarettes and 16% drank more often after their career ended. These findings suggest that professional and Olympic athletes who suffer involuntary career termination may experience the most difficult transition to post-career of any athlete.

In conclusion, the literature suggests that professional/Olympic athletes who transition from sport to post-career have greater difficulty than college-aged athletes. These difficulties may also result from having a higher athletic identity than college-aged athletes. Furthermore, athletes who experience a nonnormative transition, such as a career ending injury, experience significant emotional responses which may complicate the post-career transition. Thus, professional athletes that suffer career ending injuries may experience the most difficult transition to post-career due to a combination of factors.

Chapter 3

Method

This chapter outlines the methodology used in the current study. Specifically, the participants, procedures, data gathering and validation aspects are explained. The data analysis procedure used in this study, Interpretative Phenomenological Analysis (IPA), is also outlined (cf. Smith, Flowers, & Larkin, 2009).

In the past two decades, researchers have begun using qualitative inquiry as a tool in sport psychology to allow participants to describe their experiences using their own language (Strean, 1998). Using a qualitative methodology allows researchers to employ methods of data collection (i.e., in depth interviews) which contain detailed descriptions of a participants' experiences. Culver, Gilbert, and Trudel (2003) analyzed three major journals in sport psychology in the 1990s and found that over 80% of the studies employed a quantitative methodology, which led them to call for increased qualitative research in the field. Qualitative inquiry benefits sport psychology researchers because participants are able to provide an in depth understanding of how they make sense of their world (Strean, 1998).

The purpose of this interpretative phenomenological study was to understand the experiences of former National Hockey League (NHL) players who were forced to retire due to symptoms from a concussion. Phenomenology is a type of qualitative inquiry that is interested in uncovering the lived experiences of individuals who have experienced the same phenomenon (Creswell, 2007; Giorgi & Giorgi, 2003, 2008; Morse & Richards, 2002; Patton, 2002; Smith et al., 2009; Tesch, 1990). Smith and colleagues described one type of phenomenology, IPA, which encourages the researcher to interpret participants' lived experiences. More specifically, IPA provides "an account of how the analyst thinks the

participant is thinking" (p. 80). Data analysis will be discussed in greater detail later in this chapter.

Participants

The number of participants required to conduct a phenomenological study has been discussed among authors (Creswell, 2007; Padgett, 2008; Riemen, 1986; Smith et al., 2009; Smith & Osborn, 2003, 2008; Wertz, 2005). Specific to IPA, Smith and colleagues noted that while "there is no right answer to the question of sample size, three to six participants is an ideal sample size for a Masters-level IPA study" (p. 51-52). The current study included five participants who played professional hockey for a range of 10–15 seasons. More specifically, one played parts of two NHL seasons, two played 10–12 NHL seasons, and two others played between 13–15 NHL seasons. At the time of the interviews, the participants were retired from professional hockey between 4–14 seasons. All participants suffered a medically-diagnosed career ending concussion from a medical professional. Subsequently, each player retired from professional hockey due to symptoms from their concussion. Finally, all participants were able to communicate in written and spoken English, and were currently living in north-eastern Canada and the United States.

Procedure

Upon receiving approval from the McGill University Research Ethics Board, a list of eligible participants were identified by the research team and contacted via phone or e-mail (Appendix A). Through personal contacts, the research team gained access to NHL administrators, members of professional sports media, as well as current and former NHL players. Those interested in participating in the study were contacted by phone and sent information describing the purpose of the study and method of data collection. Then, each

participant completed a consent form (Appendix B) in compliance with the McGill University ethics policy, and demographic questionnaire (Appendix C). After giving verbal consent to participate in the study, participants provided a time and location for the face-to-face interview. Interviews were conducted in line with IPA guidelines (Smith et al., 2009), and each participant was interviewed individually for a period of 45–90 minutes. Each participant was verbally explained their rights as a research participant, and prior to the interview each player voluntarily signed an informed consent form. All interviews were audio recorded using a Panasonic RR-US591 recording instrument. Interviews were transcribed verbatim, and stored using the Nvivo 7 software package.

Data Gathering

According to Culver et al. (2003), interviewing has been the most common method of data collection in qualitative inquiry. Moustakas (1994) also described interviews as being the primary means of acquiring data in phenomenological research. When conducting qualitative interviews, phenomenological researchers are encouraged to use their experiential knowledge in addition to theoretical knowledge (Wolfenden & Holt, 2005). The following section will describe the interviewer as well as the interview guide.

Interviewer. The primary researcher is a former elite level hockey player (Canadian Major Junior, and Canadian University) who suffered multiple concussions throughout his career. Rapport was established given the primary researcher's background, experience and ability to understand basic jargon or terminology commonly used by hockey players. Prior to interviewing the participants, the primary researcher gained knowledge on interview techniques by reading the work of different authors (i.e., Lincoln & Guba, 1985; Mason, 2002; Moustakas, 1994; Patton, 2002). A pilot interview with a former professional hockey

player was video recorded and discussed with a member of the research team who has expertise in conducting interviews. This procedure ensured that the primary researcher was confident and asking questions appropriately (Sampson, 2004; Yin, 2003) and validated the effectiveness of the interview guide. Lastly, the interviewer took a qualitative research methods course designed to assist first time researchers in various techniques of data collection, including interviewing.

Interview guide. Following the directions of Smith and colleagues (2009), an interview guide (Appendix D) was created for the present study by the research team. Creswell (2007) noted that phenomenological studies address "what participants experienced", but perhaps more importantly, "how the participants experienced it" (p. 60). The first section contained opening questions that were meant to both introduce the topic, as well as initiate discussion with participants. Specifically, the first section addressed "what" the participants experienced (e.g., talk about your first diagnosed concussion in hockey and how it occurred). The second section included questions more specific to the central research questions (e.g., describe some of the difficulties you experienced as a result of your career ending concussion). This section dealt specifically with "how" participants experienced the phenomenon. The final section allowed the participant an opportunity to express comments or concerns with respect to the interview (e.g., do you have any other questions or comments you would like to share?). The same interview guide was used with each participant to ensure consistency between interviews.

Data Analysis

Data were analyzed according to the IPA recommendations forwarded by Smith et al. (2009). The primary interest of IPA is to provide a greater understanding of a phenomenon

by interpreting the lived experiences of individuals (Smith et al., 2009). Therefore, IPA analysis is inevitably a by-product of the participant's lived experience and researcher's interpretation (Smith et al., 2009). An inductive approach was used in the current study to analyze each participant's transcript. This section will outline the steps used to analyze the data.

Data analysis began by reading each transcript once. After each transcript had been read in its entirety, the most thorough and detailed transcript was selected as a case document, and was re-read several times (Smith et al., 2009). Next, exploratory comments were made in the right-hand margin (Smith et al., 2009). Smith and colleagues noted that exploratory comments explore the text at three levels: descriptive, linguistic, and conceptual. Descriptive comments focused on the context of participant's experience, linguistic comments related to the specific types of language used by participants, and conceptual comments referred to higher order interrogation of the transcript (Smith et al., 2009). After these exploratory comments were made, the transcript was re-read again in order to develop emergent theme titles, which were made in the left-hand margin (Smith et al., 2009). This process involved transforming exploratory comments into a higher level of abstraction which involved a combination of the participant's original words, and the researcher's interpretation (Smith et al., 2009). At this point, a table consisting of themes was created. These themes were then grouped together into categories based on the connections and interpretation made by the primary researcher, and based on this analysis a final table of themes and categories were created.

Upon completion of the analysis of the first transcript, the same process was repeated for each subsequent transcript. The table was used to code similar meanings in the same

categories, and was expanded when new ideas emerged (Smith et al., 2009). A definition was created for each theme to ensure that they were being properly identified and placed into the proper category. Consistent with IPA, a peer reviewer discussed the definitions of themes and coded transcripts, to confirm that the coding was appropriate and consistent (Smith et al., 2009).

Validation

Qualitative researchers are required to validate their methods of data collection, analysis, and conclusions (Eisner, 1991; Lincoln & Guba, 1985). Creswell (2007) described validation as a method used to assess the accuracy of the findings as described by both the researcher and participants. Creswell described eight different validation techniques and suggested that a minimum of two be used in every qualitative study. This section will include three different validation techniques that were used in the current study: researcher bias, peer review, and member checking (Creswell, 2007).

Researcher bias. It is important to clarify any assumptions or biases held by the researcher that may impact the study (Creswell, 2007). This has particular relevance to the current study, since the primary researcher is a former hockey player who has experienced post concussion symptoms. To limit researcher bias, the primary researcher followed the questions on the interview guide and used predetermined probes where necessary. By asking predetermined questions and probes, the researcher decreased the probability of leading participants (Rubin & Rubin, 1995). During data analysis, the researcher was again cautious to avoid prejudgment as a result of previous experience with the issues discussed during the interviews. Therefore, the primary researcher was careful to avoid any biases during interviews and analysis.

Peer review. Culver et al. (2003) determined that peer reviewing was the most commonly used form of validity in a survey of three sport psychology journals from 1990-1999. Lincoln and Guba (1985) defined the peer reviewer as a neutral person who questions the methodology, meanings, and interpretations made by the researcher. The peer reviewer in the current study was given a list of themes identified by the primary researcher, as well as a list of definitions to describe the themes. The peer reviewer was then presented with three complete transcripts and asked to code each meaning unit to ensure that the researcher has not been biased by his previous experiences. Disputed themes were discussed by the primary researcher and the peer reviewer until an inter-rater agreement of 80% was reached with each theme. Next, the peer reviewer was presented with a final list of themes and was asked to place each theme into the most appropriate category. The peer reviewer was also provided a definition for all four categories. This final process yielded an agreement of 100% between primary researcher and peer reviewer. This process ensured that the primary researcher was extracting the core themes as described by the participants, and protected against researcher bias.

Member checking. Member checking has been described as "the most critical technique for establishing credibility" (Lincoln & Guba, 1985, p. 314). Member checks involve sharing data, interpretations, and conclusions with participants (Creswell, 2007), which makes the researcher's account of their lived experience more accurate. The first member check occurred after the interview when participants were given the opportunity to ask questions or offer further comments. Following the interview, each participant was sent a verbatim transcript and given the chance to clarify any of their statements. Upon analyzing the data, conclusions were made by the research team and a summary of the results was sent

to participants. At that point, participants had the opportunity to question, comment, or voice any concerns that they had regarding the study. All five participants approved the summary of results, and offered positive comments regarding the study.

Chapter 4

Results

This chapter will present the results of the current study. An inductive analysis of the five interviews produced a total 75 pages of single-spaced text. From the text, 30 lower order themes emerged and are presented in Table 3. Of these themes, 4 higher order categories were derived: *Concussion Experiences, Environmental Influences, Professional Sport Transition,* and *Education and Recommendations*. This chapter will describe the four higher order categories by including their lower order themes. Quotes from the participants will be provided, followed by a label to identify each player (P1 – P5). Labels were used to protect their confidentiality, as well as credit the player who provided the excerpt.

The open-ended interviews allowed the participants the freedom to emphasize topics they deemed important and as a result, participants discussed a range of themes. For example, in the *Concussion Experiences* category, *personal concussion history* was described thoroughly by all participants while *anxiety* only emerged for P3 and P5. In the categories of *Environmental Influences* and *Professional Sport Transition,* themes were discussed consistently by all five participants. In the final category *Education and Recommendations*, two themes (*concussion – invisible injury* and *negative role models*) were discussed infrequently by participants *n=2* and *n=1* respectively. These discrepancies illustrate the nature of open-ended interviews and do not indicate that one participant provided richer information than another.

Concussion Experiences

This category described the participants' hockey careers, with particular emphasis on the physical and psychological symptoms they experienced as a result of their concussions, including the treatments they received for them.

All five participants discussed their playing careers to varying degrees. Each participant played minor hockey in either Canada or the United States and they all competed in Canadian Major Junior hockey. Throughout their junior and professional careers, all participants encountered a variety of musculosketal injuries that included broken bones, facial lacerations, as well as injuries to their ankles, knees, shoulders, and backs. In addition to the various athletic injuries they suffered throughout their careers, these participants spoke in detail about their concussion history. More specifically, participants began by describing how their on-ice concussions occurred:

> I don't remember exactly what happened but I saw it on tape. I go back in my own zone because they dumped the puck in. I turned towards the boards and he was coming down through the middle. I fired a pass and I watched my pass a little too long. And he did what he does – he finished his check. Relatively clean, but the guy was huge. (P1)

> My first concussion happened at (name of rink). It was kind of a cheap play because the puck came out of the zone and (name of player) steered me towards the boards. As the puck came out of the blue line, there was a quick turnover. And normally the defenseman is already following the play but somehow (name of player) must have lost his stick or something and was following the play late. So I re-entered the zone at full speed. I looked and saw (name of player) at the last second so I lifted back to try and dodge him but he kind of…The only part he caught was my head. So I'm out. You can see me go down and I'm knocked out and the back of my head hits the ice. I guess I was in and out for like 4-5 minutes. (P5)

It was evident that participants were relying on video replays to describe how their on-ice concussions occurred which suggested they experienced memory deficiencies as a result of

their concussions. P2 described playing a more aggressive style and that his on-ice concussions occurred during fights:

> I suffered one in Junior when I got knocked out cold. That one was a fight and I got hit right on the button. I was unconscious on the ice. I woke up in the dressing room. I thought I was ready to go play the third period but I couldn't stand up. (Name of team) another fight. Fighting (name of player). We went toe to toe. I thought I was fine after the fight. I didn't even think I got hit. I don't even remember getting hit. I didn't lose consciousness – nothing. And then the last two happened back-to-back. I count them as one because I fought (name of player) in (name of city) one night and he hit me. I didn't think overly hard – but I took a few punches. I played don't think I missed any games and then about a week later I fought (name of player). And he hit me hard. He hit me pretty hard. (P2)

In addition to participants relying on video evidence to recall their concussions, it was apparent that participants were unsure of the number of concussions they suffered during their careers:

> I couldn't tell you really how many concussions I had. My guess would be five or six but probably none documented – even after being knocked out cold. And then if you include the ones in the NHL, I would say ten to 12, but I really don't know. (P2)

> I can't remember my first one. I have four documented concussions and there are numerous ones that I played through. There's no way I could ever put a number on it because it was never really recognized as a concussion; it is well north of ten. (P4)

Participants consistently noted the difference between concussions that were documented and those that were not. All participants felt as though the majority of their concussions were not documented which is similar to existing research (Delaney, Lacroix, Leclerc, & Johnston, 2002). Furthermore, participants discussed that concussion testing was a relatively new phenomenon that progressed throughout their playing careers. One player noted that his concussions inspired the use of cognitive testing by the league:

> The time I got hit in (name of city) and they cleared me to play, I shouldn't have been cleared. That inspired (name of doctor) of the (name of team) to do baseline testing the following year with the (name of team), which then caught on with the National Hockey League. (P5)

All participants agreed that this type of testing was not commonplace at the beginning of their careers but it slowly evolved throughout their time in the NHL. Baseline testing generally occurred at the beginning of the season, as well as after suffering a concussion. Three out of the five participants described the types of testing they were subjected to. The following quote summarizes the type of concussion testing they experienced:

> I really got familiar with neuropsychological testing and it's a beating, it's a mental beating. It lasts three hours and there's just boom question, boom, boom, boom, boom. And it's just answer, answer, answer, answer. I've got to memorize and then boom, answer. And then there's a different topic and then back to the memory. And my brain, you know from using left and right and all the different parts of your brain. You know, what's your name? What's seven plus seven? What's the sequence of those numbers I gave you? What's your middle name? And bang, bang. Unbelievable! To the point where I would yell at them "Stop!" My head was killing me. I really felt like it was going to explode. And that's the point they had to get to. The MRI even says that I tried to hit the cancel button but it didn't work. I hit it three or four times but they'd tell me "We need this info, we need this" I'd be hooked up and they'd be watching me and (sigh). And I'd be trying to answer questions, trying to do the whole thing. Then I would say, "How much longer?" "We've got about ten more questions" and I'm dying, honestly. I feel like I'm dying. (P1)

It appeared as though P1 was able to relive the experience of neuropsychological testing during his interview. The pain he experienced was evident through his facial expressions and ability to recollect specific details of the testing.

Neuropsychological testing was strenuous for participants because they were still experiencing concussion symptoms. The following quote represents some of the physical symptoms participants suffered after being concussed: "It was a very difficult time for me with headaches, sleep patterns, dizziness, and loss of peripheral vision" (P1). Specifically, four participants described the vision impairments they endured had as a result of their concussions: "I played in (name of city) that night. I took a face-off and everything went

blurry and I got scared. And somehow I held it together I guess. I don't even remember the game" (P5).

> I went to the penalty box and couldn't see out of my left eye. My vision was all blurry. Everything was blurry in the whole eye. Couldn't see out of it, but I played the rest of the game. But I was obviously worried because I couldn't see. (P2)

> I'm playing and then all of the sudden both my blinders are on. I couldn't see anything peripherally. It was gone completely. It was like looking straight down a tunnel … and it could last a second, it could last ten minutes, or it could last a day and a half. But I had to learn to get used to it because this was the new me I guess. But eventually things would open up and I would get my peripherals back. (P1)

> I had never felt the symptoms of my concussions. My symptoms had always been headaches, fatigue. Now vision was part of the problem. I hadn't had that before. I had sensitivity to movement from looking out the car and plane windows – when I did get on the plane. Sensitivity to halogen lighting. And that was a different symptom for me (P4).

Loss of vision was particularly dangerous for hockey players given the speed of the game at the NHL level. Participants also noted they feared suffering additional injuries, both concussive and musculoskeletal, due to vision impairments they endured as a result of their concussions. Two participants also described the nausea they experienced as a result of their concussions:

> I think we had Friday off. Then we had a Saturday afternoon game. I get in the car to drive down to the rink for the game and then all of the sudden I'm nauseous and I'm thinking "What the hell?" Then I realized what it was. Visually I was all messed up. I got to the Starbucks two miles down the road and I called the trainer and said, "I don't think I can make it down there. I'm having some real problems. I'm feeling nauseous, and motion sickness. I think I have a concussion." He said "Alright, turn around and go home." That was it – I missed the next six weeks. (P4)

> When you first have a concussion you have that nauseousness that you sometimes get the next day where it feels like you're going to puke but you don't really always puke. Your stomach just doesn't feel right and I think it's because the headaches are so bad. (P2)

Although participants were not affected by nausea during games, they felt it affected their ability to travel with the team and rest before games.

In an attempt to alleviate some of the physical symptoms of a concussion, participants attempted a number of rehabilitation techniques. For instance, two participants described using types of cranial therapy: "I had to go through a lot of therapy when I was going through the concussions. But the one thing that really helped me was cranial-sacral treatments" (P5).

> At the time, I was doing acupuncture, and cranial therapy was also a big one. I was convinced that time that it was just a matter of having enough time to alleviate the symptoms opposed to doing anything in particular that can help you heal faster. So I was just basically under the instructions to hurry up and wait. (P3)

P3 felt that the most frustrating part of concussion rehabilitation was the inability to use strength training to rehabilitate the injured area which is common with most other injuries. One player attempted a number of techniques to try and minimize the physical symptoms of his concussion:

> I had seen everybody from Eastern to Western medicine: I tried Voodoo, Acupuncture, Reiki. But where I actually found the best relief for a period of time was with a form of Japanese style acupuncture. Initially I had some success but I think it ran its course and I wasn't able to get more relief. In the last four or five months I started prolotherapy treatments. (P4)

Participants attempted a variety of rehabilitation techniques to alleviate the physical symptoms of a concussion and achieved some positive results. Unfortunately, participants had very little success rehabilitating from the psychological symptoms of their concussions. All five participants felt the psychological repercussions of concussion were detrimental to their professional hockey careers, as well as their quality of life. Specifically, three participants discussed feeling isolated after suffering their concussion:

> I wasn't around much in the team setting once I was diagnosed with a concussion because I was out of the lineup. I wasn't really with the team. I was kind of on my own and trying to return to play. (P4)

> For three weeks nobody understood what was happening to me. I didn't even know because they were telling me that everything was ok. Meanwhile my whole world…

> I'll never forget that because in that three week period I never felt so alone in my life. And from that point, I went on a real downhill spiral. (P5)

> When you have a concussion, you're away from the team. It's kind of like you're forgotten, and you're on your own little island. Also, you don't hang out with the guys and that's the hardest part about getting injured – especially with a concussion because you don't really go out. You don't want to. You're not really around the guys because the team doesn't want you around the guys. They don't want injured guys around. They don't want that epidemic around and you're cast aside. (P2)

In part, participants felt isolated due to the unique rehabilitation process with concussions that kept them away from their teammates. Furthermore, the participants felt their coaches, general managers, and owners alienated them from the team while they were suffering concussive symptoms.

One player discussed his experiences with anxiety in the months following his concussion:

> Anxiety, absolutely. That year was the worst I've ever felt. I really believe that stress was a contributing factor too. To use the comparison of having your foot on a gas pedal and everything is going too fast. Everything was going too fast. But it got better. It did get better and I started feeling better. I started getting more control of the way I felt physically, emotionally, and psychologically. So it did get better. (P3)

There were a number of reasons why participants could have felt anxious after suffering a concussion. In particular, participants felt anxious about their recovery given the uncertainty surrounding concussions. In addition to suffering anxiety, one player discussed how he also suffered symptoms of paranoia as a result of his concussions:

> It forever changed me because now I have a really good understanding of what it must be like – and I don't want to undermine it but I also don't want to overstate it, but what it must be like to lose your mind in a short period of time. Where it all comes unraveled and you can't make sense of things. You're processing things differently. I would get a thought in my head and this is how I would describe it: the thought would be the pinball and would shoot out and bounce around. But in a pinball machine, there's an out through the flippers. I didn't have a hole in the flippers. So that thought would never leave. It would grow and get bigger and bigger and then it would turn into a migraine headache. Five hours later there are still thoughts bouncing around. I had a thought in my head that my doctor was just telling me he

> understood what I was going through to make me feel better. But I'm really thinking that I'm losing my mind. Your normal processing is: "I'm fine." But now your switchboard operator has pulled out some of your plugs so you don't know what to believe. And now another thought comes in your head where: "Yeah you are going crazy." And then boom it gets bigger. So I would be awake the whole night. (P5)

P5 provided a vivid and well-articulated description of the symptoms of paranoia he experienced which provided a sense of his psychological state after suffering a concussion. It was interesting how he could describe his thought processes at the time and retrospectively discuss how these feelings were irrational and uncharacteristic for him. Furthermore, four of the five participants talked about the depression they endured as a result of their concussions:

> Went into a depression. That was two or three months where I was down and out. I didn't feel good, I'd forget everything. Deep depression. Emotional because you think your career is over. Really, I think my wife came home one day and I think I was under the table crying. (P2)

> It was very tough for the first couple of years and especially through the depression. That was challenging but I think my family went through it worse than I did because it's almost like somebody developing dementia. I was full blown, let's say, dementia. So I wasn't really suffering anymore but everybody watching around me was suffering. Because they could see, "That's not my dad, that's not my husband." You know, "Are we losing him? What's going on here?" They were really worried so that was difficult. (P1)

> I took Zoloft which is an antidepressant. It was prescribed to balance me a bit in my emotional state as well as kind of bring things down a little bit. I thought it really did. I think it calmed me. But I think my wife would beg to differ. She would say that I was an emotional train wreck. (P4)

> It's just hard to understand. I went through it (depression) twice for six months. The first time I went through a really deep depression. It was a very scary time. And it changes your perspective forever because you think that you have control over things but the reality of it is, when Mother Nature takes over, you don't have any control. If you hit your head hard enough, things can get really confusing. Things can come unravelled and you have no control. It's a deep, dark train ride and there's no light at the end of the tunnel. You just wonder how you got there. People don't understand going from, in their eyes, a hockey celebrity to the point where you can't walk out of your house. You can't shave. You have no desire to do anything. You're depressed. You're emotional – you can't control these things. And it's the game that did it to you. So now you can't even look at the game because it scares you. (P5)

Although participants described their symptoms of depression in different ways, it was evident that they suffered significant detriments which also affected relationships with their family.

In addition to suffering these symptoms, three participants discussed thoughts of suicide. More specifically, P1 talked about his experience with suicidal ideation:

> I was going on websites but my wife didn't know. When she finally found out, she was very scared. I was at the point where I'd be driving along and would think about going full speed and hitting the wall. Just end it. The pain was unbelievable. I had headaches every day for minimum three and a half years. Not just a little headache where you want to take an aspirin. I'm talking… I almost wanted to scream. If I had a day off from my headaches it was like I won Super 7. I was ecstatic. It was amazing it was bright, I could see, I could think. So many times I would just want to end it. And I was communicating that with my doctor and when my wife found out they wanted to put me on anti-depressants. (P1)

P1 provided a very dark description of his experience with suicidal thoughts. Given his facial expressions and hand gestures, the interviewer could sense the pain caused by his situation and headaches and how that pushed him to contemplate taking his own life. P4 and P5 also shared their thoughts on suicidal ideation, however they focused on others' experiences rather than their own:

> I don't know if you're familiar with the Dave Duerson story. He was a former pro football player. And not that I was anywhere near my breaking point – I don't know what my breaking point is. But everyone has a breaking point. And I get it. I understand what he was going through. You know what I mean? He was just at his breaking point and he couldn't deal with it anymore. And… I get it. I understand it. You don't want it. Believe me. You don't want this for you or your kids. You don't want to wake up every day with a headache. (P4)

> I'm optimistic by nature but then to truly be optimistic you have to know the depths of despair. To know what it's like to be pretty down… I have an understanding where some people may not. I mean the suicide stuff. I can understand where those guys get to that place. I would never act on it. But I could understand how the mind would take you there. I get that. Because I was kind of there. (P5)

It was evident that discussing suicide was a challenging topic for these participants as they had downcast facial expressions and difficulty verbalizing their thoughts. It appeared that they were searching for docile terms to portray their dark thoughts of suicide as well as reassure the interviewer they were not themselves suicidal. This may have even influenced two of the three participants to discuss suicidal thoughts in relation to other professional athletes.

Environmental Influences

In this category, participants discussed their relationships with key individuals and organizations that played various roles throughout their hockey careers. In particular, participants focused on relationships with family, as well as hockey and medical personnel when they were concussed.

Four of the five participants discussed the role of their spouses with respect to their concussions. More specifically, three participants described their spouses as being very supportive:

> For at least three years, my wife was like a single mom to four kids. We have three kids, and I was the fourth. She took care of me, right up to the point where should would tell the kids, "Leave dad alone, it's that type of day, leave him alone." And she took complete care of me. She was very patient. (P1)

> My support system at home was terrific. My wife gave me the freedom to seek out whatever therapy I needed or wanted. If I had to get on a plane and go see a doctor there was no problem – and I have four kids. So that's a burden. (P4)

> My wife didn't grow up with hockey. We had dated for a year and a half before getting married, so I was still in my career at the time when we met. She was well aware of the circumstances of my concussions. Well aware of the doctors suggestions and recommendations. She was great. She was great throughout the whole thing. As much as she could alleviate off of me – she was there. (P3)

Participants noted their spouses cared for them in almost every way while they were symptomatic of their concussion. Their descriptions indicated they required a great deal of

care while suffering from their concussions. In addition, one player felt that his concussions may have caused his marriage to fail:

> My wife and I got divorced. I think concussions were a big reason. I don't think I treated her well after them. I think I snapped. I think I became a different person because of it. I just didn't give a shit for about two years. I didn't realize it because I never really got help. Now I'm conscious of it. I mean I've always been a great dad. I'm with them 24 hours a day. Hockey, dance or whatever it may be. But I think for about two years I took everyone for granted and just didn't care. (P2)

Although P2 did not elaborate on their relationship prior to the concussion, it is presumable that regardless of their relationship status, it was likely strained due to the combination of concussion symptoms and amount of care required by the spouse.

One player mentioned a specific coach who was very supportive throughout the initial stages of his concussion:

> (Name of coach) pulled me aside after the game and he said, "Are you ok?" This was a coach – not a doctor. I broke down. I didn't know where it was coming from. I guess I was holding it in. He said, "Something's not right with you." So the next day after practice, he called me in again and he goes, "We're going to get you some help, you're not skating anymore. Something's not right." To this day I'm indebted to our coach, who at that time, finally said, "I don't care what the doctors are saying. I don't care what the media or the fans are saying… you're not playing. And we're going to get you some help." (P5)

It was interesting that P5 noted his coach was supportive in seeking medical care because most participants felt that hockey culture was not accepting of concussions as a legitimate injury. Therefore, it is likely that this coach represented a minority of those who took concussion injuries seriously during that era.

Three of the five participants also discussed their relationship with their teams after suffering a concussion. Two participants described how their NHL teams supported them while contractually obligated:

> Teams are there to give you support but once you're not helping them, they could give a shit about you. Once you're out of the line-up they're going to help you but

> they really don't care. They really don't. They're going to set appointments up, but you have to force the issue. They're worried about getting players back in the line-up because it's about winning and I get it. I totally understand. (P2)

> I can tell you that the (name of team) were good. Once I suffered a concussion and it was established that I wasn't going to come back anytime soon, they were good. They were good with follow-ups. They were good with helping me book appointments. Get a flight. That was the good part. That was while I was still under contract. But the unfortunate part is, once they are no longer contractually obligated, then the follow-ups stop. There's no real interest in how you're doing after. Like there are no follow-ups now. The team isn't calling me now and asking, "Hey, how you doing? It's been a while but how's that head of yours? Anything we can do to help?" No. That's not happening. (P3)

Participants described varying amounts of support from their NHL teams during their careers, which suggest that the amount of support was dependant on the individual organization as opposed to mandated support by the NHL. One player received far less support from his team while playing in the minor leagues:

> There's nothing over here in North America. You're completely on your own. The message was more or less, "You're a piece of meat. Let me know when you're able to go. If you can't go, we'll get another piece of meat." And I knew that. That's the game, that's the business. Like it or not, you're paid well to be treated like that. If you find somebody, they're just a good person. But there's nothing offered within the game. There's nothing set up in the game other than your baseline testing at the beginning of the year. And they're doing that because they have to. (P1)

Participants frequently discussed the business aspect of professional hockey. More specifically, participants felt they were seldom aided by teams once they were no longer healthy and contributing to the success of the team.

While recovering from concussions, three of the five participants discussed that they communicated frequently with their medical professionals, as illustrated by the following quote: "At my retirement press conference, I thanked a list of doctors who tried to help me return, and the list was 20" (P4). Two participants discussed having both positive and negative experiences with medical professionals after suffering a concussion:

> (Name of doctor) was phenomenal. I remember some emotional times when my doctor actually had tears building up. It wasn't just a science for them. I wasn't just a file and they weren't just collecting data. I was a human being. I was a husband. I was a father. I was an athlete who had his career ended and my doctor really, really cared. I had access to them whenever I wanted to. I could call my doctor at any time. They were tremendous to the point where I was the one who initiated the stepping away process. I thought I needed to do it on my own. Looking back at my doctor's character, I could probably still have them as an asset for support if I needed to call, or if I was going through some difficult times. (P1)

> I remember going to the doctor after we got home from (name of city). Things were starting to unravel but I was trying to hold it all together. It was almost my call to see a doctor. The doctor said to me, "You know, you're captain of the team, you have three kids, you just won (name of trophy), your team is off to a slow start, you did have a concussion not too long ago. Put it all in a soup bowl and mix it up and it's no wonder you feel the way you do. I'm sure if you go out and score a few goals I'm sure you'll feel better." I remember feeling emotion and my eyes swelled up and I got scared. I said, "Doc, I don't care about scoring goals right now." He said, "Well I don't know what else to do. Do you want to take some time off?" I just walked out of there. (P5)

In addition to receiving little support from their teams, sometimes participants were not sufficiently supported by medical professionals which caused additional strain to their recovery. P5 described a tumultuous time after suffering his concussion and attributed some of his difficulties to a poor relationship with his medical professional.

Professional Sport Transition

In this category, participants discussed the events surrounding the termination of their professional hockey career, as well as the obstacles they faced transitioning to their post athletic career lives.

All five participants spoke in detail about their career termination. More specifically, three participants noted that their decisions to retire were heavily influenced by discussions they had with their families:

> I went and saw the coach after the game. I had spoken to my wife and she told me straight this was the final straw. She said "If you don't stop, we're done. I'm not going to watch you kill yourself. I'm leaving and taking the kids, don't call." So that

> was a wake-up call. So I went in and told the coach and explained everything to him, including how I was feeling. That was it. (P1)

> It was me and my family. I think I just realized my age. Obviously the symptoms that I was experiencing were different than I had before. I weighed the pros and cons of the amount of years that I could probably play, and the money I could make. I had already played a lot of years and the only thing that was keeping me in the game was that I hadn't won the Stanley Cup. But when I looked at my family, I wanted to be around them more. I also wanted to be able to help them and not be (an expletive) vegetable just sitting there. I just weighed all the different things. I didn't think that I would be able to play the way I was capable of playing either. I knew that if I wasn't going to be able to go out there and fight anymore, I obviously wouldn't be as attractive to other teams. So it just didn't make sense anymore. (P2)

> It was a group decision that I made with my wife. We weighed the pros and cons of coming back. I wish I could tell you for sure that I was going to retire anyways but… Announcing my retirement didn't make me feel sad that day. I wasn't blue. I was fine with it. I'm like "Ok, it's enough. I don't want to get punched in the head anymore. I don't want to feel bad anymore." I wish I played more games. But I won the Stanley Cup. My name's on the Cup. I don't care that I wasn't the top scorer. I don't care that I didn't make any all-star games. I mean I got my name on the cup. I got to lift it above my head. I got to hang in (name of city). I got to meet some great people. So thank your lucky stars that, other than crashing your head on the ice and almost dying that day, it's been ok. I had a pretty good run. (P3)

Despite having been retired for a number of seasons, the tone in the participants' voices indicated that career termination was still a difficult subject to discuss. Furthermore, P2 and P3 alluded to winning the Stanley Cup as a career milestone which influenced their decision to retire. The two other participants said that the decision to retire was a result of no longer being cleared to play by medical professionals. Furthermore, these participants acknowledged that they may have continued playing if they would have been cleared to play:

> After my last concussion, I worked diligently until the following year to put myself in a position where I could return to play. I went in to see the doctor and he asked me how I was doing and I said, "Good. You know, I'm doing alright. A few more days, maybe another week and I think I'll feel well enough to be ready for camp. I think I'm just about there." And he looked at me and said, "I appreciate your effort and I applaud your courage but I'll never clear you to play. I can't. I could never have that on my conscience. If you went out there and anything happened, it would be my responsibility." So I said, "It's over?" And he said, "Yes." When I was driving home I was obviously upset, but at the same time I was relieved because I needed someone

> to do that for me. Because I would have kept trying to come back and play until I died, or somebody told me to stop. So that was a pretty powerful moment for me. (P4)

> My concussion lingered for six months. And you see, the hard thing about it is the letting go of a process. What most people do in 35 years, hockey players compact into 15. You're forced to deal with letting go of something you loved to do since a very young age. Retirement alone is a very big step in your life both physically and emotionally. And I had to do this at (age), let alone having gone through two post-concussion syndromes. I wasn't even 100% healed yet. But I was conscious enough to know that I didn't want to go through this again. I also knew that I have an obligation to my wife and three kids. Also, the two doctors who cleared me to return after the first bad one weren't clearing me to play anymore. I was lucky that someone was there to make that decision. (P5)

Although P4 and P5 were adversely affected by career termination, they appeared more content with their retirement because they were not involved in the decision process. More specifically, not being cleared to play by medical professionals seemed to comfort these participants because they knew for certain they could no longer play hockey. After making the decision to retire from professional hockey, these participants were then faced with no longer being identified as professional hockey participants. Of the three participants who discussed the role of athletic identity, two described having a difficult adjustment:

> I remember being introduced to people as "(name of wife) and her husband the hockey player." So, my identity became the hockey player. Not (name of player). I wasn't (name of player). I wasn't the dad. I wasn't the guy who invested in businesses. I wasn't the happy-go-lucky, fun guy. I was the hockey player. So my identity got wrapped around that. And I was never a superstar or anything like that in the NHL, but even in the American league you do have some sort of star persona. Where you're signing autographs, you're on TV, you're in commercials, and you're in the print. You're identity gets wrapped up in that. And I don't think that it's necessarily an ego thing, I just think it's more how you're identified with people. So that identity was stripped from me. I had no identity. Who am I? I had to re-invent myself. I had to start from scratch and build something. So that was very difficult. (P1)

> Losing your sense of identity is the hardest thing in the world. I think that's a big thing for people who retire. It's tough. Especially if you don't have another career to move into. But even if you do, you're known as a hockey player. It's all I've ever done. So to quit that one day and have nothing is difficult. No more waking up at 8:00

> a.m. and you're at the rink by 8:30 a.m. You're having your coffee and a set routine that you're used to being in. Now there's no routine. It's totally different. That's the hardest part. And not hanging out with the guys. You go on the road, you go to the rink, it's that atmosphere that you had. Now all the sudden you're home and you don't feel great all the time. It's the weirdest thing to have to retire especially because you're young. And it's all you've ever known and you're cast into something else. Being Mr. Mom at home and doing all that stuff that you're not used to doing. It's really, really hard. But I think losing that identity is the hardest thing. You're not a hockey player anymore. You're just a regular guy. That's the hardest thing guys go through. (P2)

Having invested themselves in amateur and professional hockey for the majority of their lives, it was not surprising these participants identified themselves as hockey players. Moreover, loss of athletic identity affected these participants and was evident in their solemn tone while discussing their experiences. In contrast, one player did not possess a strong athletic identity and it made retirement much easier:

> I've always been a realist. I always knew that the game was only going to be a certain part of my life and I certainly didn't want the game to define who I was. I feel as though I had a great career and played a long time and feel very fortunate and blessed that I was able to. There are a lot of things that are more important to me than just playing the game. You know, my family and I had other aspirations so I was always very realistic about my career. I certainly didn't want the game to define who I am or who I was. I was able to get away. My wife always thought that I wouldn't be able to – that they were going to have to lock the doors and through away the key. I mean I certainly felt as though I could have played for a number of years longer if it wasn't for my head, but I need that part of my body. (P4)

Interestingly, P4 discussed the concept of athletic identity differently than the other two participants. He described hockey as a chapter in his life and did not appear emotional while talking about athletic identity which may have aided his transition from hockey.

Regardless of how participants experienced athletic identity, it was evident that participants faced a number of challenges when they retired from professional hockey. All five participants discussed that they experienced concussion symptoms in their day-to-day lives, as demonstrated by the flowing quote: "Just because you've retired doesn't mean the

injury goes away. That was probably the hardest thing. Even though the game is gone, the injury remains" (P4). Three participants discussed how they still deal with symptoms of their concussions on a day-to-day basis:

> There aren't too many days that go by where I don't have some type of discomfort in terms of headaches or head pressure. Yeah, I don't think it will ever resolve itself. At this point it's just keeping it manageable through maintenance I guess, right? (P4)

> Anytime you sit and do something for a long period of time, you start to feel it here. That's why I have those dim lights. I don't have bright lights. I get tired sometimes. I think I get tired more often than other people. There are days when I just don't want to get up because I'm just exhausted. But for the most part it's good. It's not like I lay in bed all day. I'm up at 6:30 a.m. and get my day done. Just sometimes I go through those lulls. And I don't know how everyone else feels, but I think I go through those lulls where I'm a little more tired than the normal person. I get headaches or those focus problems. Those are things I have to deal with. I think everyone has to deal with something and those are things that I have to deal with now. (P2)

> Sometimes I wonder if I'm just getting older, or if it's my concussions? Sometimes I wonder, "What exactly am I dealing with here? Is this just me not focusing? Or is it just me not focusing because…" Overall I think I'm ok. It's not like my bosses have come up to me and said, "You're not quite right. Or you didn't look quite right. Or you're not remembering. Or it's not good enough." I've never been told that I look like I'm suffering. So that's the good part. But I am finding it challenging sometimes. (P3)

It was evident from their tone of voice that ongoing symptoms caused participants significant challenges in their day-to-day lives. Furthermore, three participants discussed being sensitive to bright lights. In particular, one player described that lighting is problematic in his day-to-day life:

> Even to this day I'm still sensitive to light. That's the only symptom that stuck with me. And it's only certain types of light. I'll find that I'll wear sunglasses when other people won't. That's probably the only symptom that's remained with me. And it's not severe. (P5)

More specifically, the two other participants indicated that being sensitive to lighting has caused problems in their current careers:

> And there were times when I couldn't even sit under the hot lights because the lights would be overbearing. So I knew that I was still suffering from concussion-like symptoms. My eyes were incredibly sensitive. I would sweat. I would break out into sweats when I would be under hot lights, which was a really tough thing because I had started my new career. (P3)

> Sometimes the lights will get to you. That's more or less… you ask them to tone them down a bit and they're cool. But when those bright lights come on … if it's two minutes it's fine. But if they kept those lights on for a long period of time, I'd expletive kill someone. I would literally, literally kill someone. (P2)

Not only did physical symptoms from their concussions affect their hockey careers, for two participants it also affected their abilities in post-hockey employment. Although they did not allude to it directly, ongoing concussion symptoms appeared to affect their transition to their new careers. In addition to sensitivity to light, two participants discussed the types of vision impairments they endured after their professional hockey careers:

> If I stare at you like I am, it's a little blurry. Not blurry-blurry. But I can feel it in here and in here. Now the first 15 minutes I don't feel anything. But now as we go on, I feel it a bit more because I'm concentrating and thinking about what I'm saying. (P2)

> I'd be driving and then all of the sudden the road would totally tilt. I would lean my body in the car feeling that I am sideways. So I would panic and pull over. Then I would realize that it's in my head, and that the road isn't tilted. But I can't drive like that because my whole balance is off and if I were to pull the wheel, I might go off the road. So I was smart enough to realize get off the road. So eventually I told my wife that I shouldn't be driving. (P1)

In particular, P1's quality of life was significantly affected by visual impairments and altered his equilibrium to the extent to which he could not drive.

Two participants discussed how they have difficulty with certain types of daily tasks, such as reading and memory because of their concussions:

> I'm not as sharp as I was communication-wise. I'm not able to focus for long periods of time or process things as well, or as quickly. I use to love to read. But, you know, longer than a half-hour I still can't do it. And if I do, then I'm dead tired. I'm less tired after going to the gym than I am after reading for a half-hour. Now I really see it because I'm now I'm preparing a lot of things on a computer for my consulting business. It's just like (sighs). It's not like I did anything physical but I'm burnt. (P1)

> Sometimes I still have trouble. Over the course of a number of years, sometimes I'm not absorbing things. And I find that I can't remember phone numbers. You can tell me a phone number five times and I can repeat it five times, I'll still have trouble remembering it. But if you write it down and I look at it. Or if I take a pen and I write it down and then I'll be able to absorb it a lot easier. (P3)

It was apparent that participants attributed concussions to their inability to perform daily tasks which frustrated participants and was evident in the language they used to describe these day-to-day difficulties.

Four participants discussed their transition from professional hockey into their new careers. Two participants in particular had opposing experiences with their career transition:

> When I hit rock bottom, I had to wake up and almost kick myself in the pants. "OK look, you have something to work with. You have family support. You've saved and done well with hockey. That's in place. What are you going to do? Suck it up, and do what you can do with it." I started investing in businesses, I started doing my own thing, I bought industrial companies – I'm a partner in that. I started my own consulting company. It's coming together, it's really coming together. And the nice thing now is, I guess at least on a daily basis, I'm not getting punched, slashed or beaten up – other than my kids but other that not too bad. (P1)

> The problem was that there were a lot of changes in my life at that time. Obviously, I was contemplating retirement, starting a new career, I was about to get married, and then expecting a child nine months later. I had a bunch of things happening at the time. It was incredibly stressful which obviously didn't help me. I was coming off a concussion that was relatively fresh. I went through a really difficult time in that first year. I had a combination of stress and concussion-like symptoms. It was a really, really tough year to whether the storm. (P3)

These responses were interesting because of participants' unique experiences. Specifically, P1 did not have a career to transition into after retiring from hockey and described a less turbulent transition than P3 who had a career to transition into. This was counterintuitive as it was presumed that those who did not have a career to transition into (e.g., P1) would experience a more difficult adjustment. Although the reasons surrounding their responses are unclear, it suggested that career transition is more reliant on individuals' unique

circumstances at the time of their transition than having a career to transition into. Furthermore, two participants described how they've been limited in their career selection because of symptoms from their concussions:

> As active as I am, my concussions have hindered me in applying for work at the highest level. I don't want to do it if I'm not capable. I'm afraid that I'll get into a situation that I wouldn't be able to fulfill a commitment or an obligation. So, I wouldn't be able to travel if I became a scout, general manager or coach because my head wouldn't allow me. I can get through my day and do stuff but if I need a rest, I can take a rest. If I need to go take a nap in the middle of the day, I can find a way to go take a nap in the middle of the day. If you have a job where you're being relied upon, you don't have that kind of flexibility. So in that sense I think it's held me back. It hasn't held me back in terms of being active and taking on a million tasks. But it certainly has held me back from doing something that I think I would enjoy. (P4)

> I know that I could never be an 80 hour-a-week guy on Wall Street. Numbers, computer screens, phone calls, high pressure, high stress – no. My head would explode. I don't think I'm wired inside like that but at the same time my head doesn't work. So I'm hesitant. I want to go back to school because I want to finish everything, but I can't do it. My head won't allow me to manage my family, schooling, and my business. So, I'm evaluating. (P1)

It was clear that participants were very frustrated that head injuries prevented them from attaining post-hockey careers they desired. In particular, these athletes were limited in their post-hockey career ventures because of an injury they suffered during their athletic careers.

Education and Recommendations

In this category, participants discussed the current state of concussions, the growing awareness of concussive injury, and the ways of reducing the incidence and prevalence of concussions.

Three of the five participants discussed the prevalence of concussions in the NHL:

> Concussions in hockey are going to become more prevalent because guys are so big, so fast, and they hit so hard. It's never going to be football. Hockey's different but it's still not going to slow down. If they think it is, they're crazy. The ice has not gotten bigger. The guys have gotten bigger, stronger, and faster but the ice surface has

> stayed the same. If they don't think there's going to be more collisions, they're crazy. (P2)

> You're going to have some vicious contact. There's just no amount of equipment, there's no amount of anything that can really change how players attack the game. I think unfortunately guys are going to get hurt. They're going to continue to get hurt. It's a high demand, contact sport. I don't know how to avoid that. (P3)

> That's the sadness of where our game is at. Our rules and integrity are so across the board. In the past, (NHL player) got 25 games for that hit. Today, a guy might get one game for knocking a guy out for the series. The hits I see now are more vicious. Guys are just getting pummeled with head shots. (P5)

Participants felt as though sport administrators such as general managers and coaches must implement rule changes to make the game safer for participants. This frustrated them as they felt reducing concussion prevalence could be achieved rather easily with proper involvement from league officials. Participants also talked about how concussions were perceived by the hockey culture, both positively and negatively: "Yeah, in the beginning there was all this misunderstanding. And the support was more confusion for them. It was the old attitude of snap out of it and score a couple goals" (P5).

> But it's hard when your coach asks you, "What's wrong? Why can't you go?" I would say, "It's my head." You could see it in his face, "Pussy." You could see it. They couldn't see an x-ray or a broken bone. No matter what coaches, general managers, and other players say, they still don't respect it. I know guys who have dealt with it and they'd have to come back and rehab it because the coach won't let them skate with the team. The guilt of a concussion is phenomenal. (P1)

P1 and P5 were emotional when reflecting on teammates and coaches who did not believe he had suffered a concussion. Furthermore, P1 suggested that he was not the only player to experience that type of treatment because the hockey culture did not accept concussion as a valid injury. In contrast, one player discussed how his organization reacted positively when he suffered a concussion:

> I suffered my last concussion with the (name of team). Until I announced my retirement I thought they were excellent of not pressuring me to return. They never

> said, “You’re milking it and you don’t really want to play.” They were really good about it. I did not feel the pressure. They weren’t looking at me like I was some sort of thief coming in to steal money. (P3)

Unlike P1 and P5, P3 had a positive experience when he suffered a concussion which he attributed to his organization reacting favourably to his injury. Despite P3’s positive experience, some teams did not consider concussion a legitimate injury which may have influenced some participants to continue playing when a concussion was suspected or diagnosed:

> I’m playing against (name of team) and I played horrible but I scored two goals. It was a fluke. They were shots from the blue line that ended up finding their way in. But I played horrible. I felt horrible. I threw up after the first period and threw up after the game. I was in terrible shape. (P1)

> I’m playing with the (name of team). It’s probably like my fourth or fifth one – I don’t know. I’m in the locker room and the doctor comes over and asks me if I’m ok. And I say “Yeah, I’m fine. I’ll just shake it off I’ll be fine.” Hockey players are going to tell you we’re fine even if we’re not. He does a few tests and then he asks me, “Who’s their goalie and what’s the score?” And I say Doc, “It’s (name of goalie) and it’s 3-2.” He says, “Take off your stuff. It’s (name of other goalie) and it’s 2-1.” I said, “Yeah I think that’s what it was Doc.” He said, “No, no, you’re done.” I’ve also played in a game and I got elbowed from a guy and I was unconscious for 2-3 seconds. After the period, I went into the locker room and my line mate turned to me and said, “You ok?” And I said, “Yeah I’m fine, don’t worry about it. Hey what’s the score?” He said, “It’s 2-1.” I asked him, “We’re winning right?” He said, “Yeah.” I said, “Who scored?” He said, “You did. You have a goal and an assist.” And then I played the third period. (P5)

It was evident in participants’ expressions of guilt that they should not have continued playing while concussed. Although some participants discussed these events jokingly, you could sense they felt fortunate they were not further injured during this time. Three of the five participants also spoke about concussion threshold. They believed that participants were more susceptible to concussions if they had a history of the injury: “I have no doubt in my mind that I was not able to absorb the blows and the punches like I did five to seven years ago” (P3).

> These kids now are coming into the league at 18 years old and they've already had two or three. So they've already depleted the reserve that makes you bounce back from a concussion in a week or two. The thing that kids have against them today is the impacts are greater – so it uses more of that reserve which makes concussions more severe. So we all know that when you use up that reserve and you're on empty, that's when you enter post-concussion syndrome. (P5)

> There was no way that hit ended my career. The hit in (name of city) ended my career. It was prolonged. My issue is that I think if I rehabbed properly, I would have gotten back to baseline. I probably would have been alright. To me that is the issue. It's not the damage because I think you can regenerate. I just think that everything is cumulative. I cannot regenerate enough because every time I get a little bang, I go further back. Another bang, I go further back again – to the point where I'll never get back to where I'm supposed to be. I believe that respecting the lay-off and rehab is what's most important. (P1)

While discussing this topic it was as if participants assumed the role of teacher in the interview. It was clear that their knowledge stemmed from first-hand experience as well as research they had done individually to further educate themselves.

Three of the five participants discussed the difference between "normal" headaches and "concussion" headaches:

> Concussion headache was much more of a pressure-type headache. My brain wanted to get outside of my skull. That's a really weird thing to say. But that's what I felt. I felt like I was swelling. To the point where I would look to see if my head was swelling. I felt like my head would actually swell and it wanted to explode out of me. The pressure build up was unbelievable. I used to have migraines as a child but that was more of a shooting pain, like a knife was coming through my head. Unfortunately, I know headaches all too well, and concussions headaches are unbelievably painful because of the pressure build up. (P1)

> Physically, concussion headaches are different. They come at random times throughout the day, caused by different things. If it's really, really bright or really, really loud you'll get a different headache. It's not a migraine and it's not a headache, it's something a little different. It is right where the migraine is, right on your temples but it almost feels like a fullness of your head, almost like a cold. It feels like you have the flu without all the other flu symptoms. (P2)

Participants were able to point to various locations on their head where they experienced "normal" and "concussion" headaches respectively. This served as another reminder of the

extent to which these participants experienced daily headaches as a result of their concussions.

One player discussed medications that were able to sooth his concussion headaches:

> My doctor was able to give me some medicines at the time. The best way I could describe it was: the medicine took the buzz out of my head that I didn't even know was there. That static that was in my head that I get used to and thought was normal. What it did was slow my blood pressure down. As I learned, your nervous system is so out of whack so even when you think you're sleeping, you're not really healing. The only way for your brain to heal is to totally be able to shut down. (P5)

Two participants described that concussions have no physical signs like other musculoskeletal injuries:

> You can't see the brain. You can't x-ray the brain and see a break. Ok, if someone were to see blood showing on someone's head, they would think, "Ok, he's got a concussion or something." It's not like you have a broken neck and you're in a wheelchair. (P1)

> It's not as if you can see a guy lying down, and you know he just had major knee surgery and you know his career is in jeopardy. You can see it. The guy's on crutches. You see (name of player) walking around, doing interviews. People don't understand the damage. You can hear about it but you're kind of like, "What's the worst I can associate? Maybe I was hung-over once; maybe I banged my head and had a headache." They don't understand. (P5)

Participants once again assumed the role of teacher as they explained the invisible nature of concussions. More specifically, these participants were able to draw on personal experience to provide a more detailed understanding of how others perceived their concussions.

Three of the five participants said they did not always report symptoms of a concussion. Specifically, two participants indicated that they could cheat the concussion test (i.e., fake that they were not concussed) in order to get back in the line-up:

> Can people pass it? Yeah. People can pass it even if they're concussed. I guess you have to be honest with yourself and players aren't always going to be. As long as you can pass that test you're getting back in the line-up. I mean broken bones are one thing, but your head is something different. They'll get you back in the line-up as long as you can pass that baseline test. But after doing it a few times, you know that

> it's three groups of things. It's a lot easier than when you first start doing it. You start to get a handle of what to do. Obviously the more concussions you get, the tougher it is because your memory goes. (P2)

> I had to take my baseline test before they would give me permission to play. I remember really focusing to get through my baseline. I got through it and I remember the doctor looking at me and saying, "I know what you're doing." I remember sitting there and jokingly saying, "What?" She said, "You passed your baseline but that doesn't mean that you're ok. Just make sure you know what you're doing." And I said, "Yeah, I know what I'm doing." I treated it like a joke. (P4)

These were significant statements made by P2 and P4 as they believed they were able to deceive medical evaluations and return to the line-up faster. All participants felt as though familiarity with these tests enabled them to deceive medical professionals because they could anticipate the types of questions.

Four of the five participants discussed there is a growing awareness of concussions in the NHL. The following quote summarizes their comments:

> The league takes concussions seriously. They don't mess around with them like they did before. There's a real legitimate opportunity for concussed players to take a deep breath, and understand the symptoms. There's time to understand what you're dealing with. And if you're not comfortable with the way you feel, act, sound, you also have that time to get better. I don't think people can judge you now like they did 20 years ago. Because of all the research and because of the credible guys that have gotten hurt in the past – big, strong, macho guys. If they can go down with a concussion, anyone can go down with a concussion. You have a time frame to get yourself better, so take advantage of it. Be comfortable when you go back out. You don't have to go back less than 100%. From the NHL side, they've gotten better too. They've really learned how to respect concussions. Before, it was life and death to get an athlete back in the line-up. But now they're starting to treat these guys like real assets. (P3)

During their careers participants felt as though the NHL was not aware of the severity of concussions as they are today. However, they took solace in knowing they could aid future generations of hockey participants by sharing their experiences.

Finally, the four participants who had the most playing experience in the NHL offered their personal opinions of concussions in the game. Specifically, these participants offered their insights on what the league could do to reduce concussions.

> I remember when I broke in to the league, the ice seemed big out there. I go watch now and it just doesn't seem that big. The guys seem like they take up… there's a guy on you every second. Now guys are so fast. And you look at international hockey and there isn't that hitting. Now, hitting is a big aspect of the game and it creates a lot of the buzz and it's why it's exciting. But if you don't make the ice a little bit bigger… guys are getting pounded every shift. They're getting pounded every shift and they skate so fast and so hard. I don't know if there's another way to protect the players. Because it's so fast and everyone says that we need more respect but guys are out there playing for a job. They're going to do everything they can. And I don't care what anyone says, you're not going to let a guy go because he's in a vulnerable position. Because when you get back to the bench, the (expletive) coach will be yelling at you and giving you shit. You're not going to risk that for not taking a guy out. (P2)

> I think without a doubt there should be something in place. There should be… if I started suffering concussion-like symptoms again I feel like the (name of team) should be financially obligated. I should be financially compensated for whatever I need care-wise. But I don't think that's the case. I think once you disappear, it's gone. And I feel bad for a guy who didn't make great money and is still in a position where he's suffering. And the last major concussion that he suffered, the organization should be obligated to go seek medical advice or even be in a position to give him some compensation if he can't work. I don't know. But when guys give up that much of themselves for their job, they should be taken care of. Do we know about concussions enough to say that once you start feeling good again that your symptoms will never come back in 10-15 years? What happens if you get older and it starts up again? There should be follow-ups. If you've been diagnosed with a concussion under the (name of team) then they should have an obligation to say, "When you're hurting, we'll look after you. We'll make sure that you get the right people to look after you and get you better." (P3)

> I think we all have an opinion on what we'd like to see from a rules standpoint. And my opinion would be no head contact – intentional or unintentional. The same as you're not allowed to check a guy from behind into the boards. You're not allowed to high stick a guy in the face, it's a penalty. And whatever the severity of that penalty is… any head contact is a 5-minute major and is then reviewable by the league – I think curbs it to a degree. Then there's the human element right? It's about having a conscience. It's no different than what we're trying to do at the grassroots level. We're bred with this mentality first of all, to play and win at all costs. And that's the wrong approach. Yes, you want to play to win but not at the risk of somebody else's health. And that's overlooked. Also, if you are injured, we find the proper procedure

> to return to play. First, keeping players out when we suspect injury and two, having the wherewithal and the ability to protect the players from returning before they're capable of returning. For me, it's not simple or easy but it is easier then how difficult they're making it. (P4)

> Listen, I'm not a doctor. I don't need to do the research. But I know the solution. It's not going to go away. The guys are bigger, stronger, and the speed and forces are greater. What has to change is how we play the game. If you knock a guy out for six months, sorry bro, you're out for six months. Don't do it. If it's accidental, it's another story. Guidelines: five games, ten games, 20 games, half a season, a full year. You get caught three or four times, then you miss a year – done. Maybe it's two times. (P5)

Overall, the participants felt the most effective way to reduce the number of concussions in the NHL would be to change the way participants approach the game. More specifically, if more stringent rules on body checks targeting the head were implemented. In turn, they felt that participants and coaches would be less likely to encourage dangerous body checks which would make the game safer for participants and reduce the number of concussions.

Summary

The purpose of this study was to understand the effects of career ending concussions on former NHL players. Participants included five athletes who played professional hockey for a range of 10–15 years. An inductive analysis of the interview data produced four higher order categories: *Concussion Experiences*, *Environmental Influences*, *Professional Sport Transition*, and *Education and Recommendations*. This summary will explain the main findings in each of the four categories.

All five participants explicitly described their experiences with concussions. Specifically, they discussed the number of concussions they suffered and how they occurred from either body checks (both legal and illegal) or fights. They reported the physical symptoms they suffered from their concussions during their playing career that included headaches, nausea, and vision impairment. After suffering a concussion, the participants

described different types of rehabilitation techniques which varied for each of them from cranial therapy, to acupuncture, to prolotherapy. In addition to the physical effects, all five participants described the psychological symptoms they suffered which included isolation, anxiety, paranoia, depression, and for some, suicidal thoughts. Participants noted that the combination of physical and psychological symptoms from their concussions affected both their professional hockey careers and their quality of life.

While enduring the physical and psychological symptoms that resulted from their concussions, the participants were influenced by various environmental factors. Four of the five participants described in detail how they were positively supported by their spouses while they were suffering their concussion symptoms and playing professional hockey. The other player focused more on the support he received from one of his coaches, although he also mentioned that his wife was supportive. Additionally, three of the five participants described how their teams provided social and financial support after suffering a concussion. Participants also communicated frequently with medicals professionals throughout their recovery, and they described how these interactions helped facilitate their recovery.

The decision to retire from hockey was the beginning of the professional transition for each athlete. Three of the five participants noted this decision was made with their spouses, while the other two said the decision was mandated by medical professionals. Moreover, these two participants said they might have continued playing if they were allowed. Regardless of who initiated the decision, all five participants were hesitant to retire from professional hockey for a number of reasons. First, professional hockey was their primary means of income. Second, one participant noted he sacrificed his education to pursue his hockey career, a fact which felt would limit his post-hockey career earnings. Although the

four other participants did not discuss their education, all participants in this study sacrificed their educations to pursue a professional hockey career, which may have added to their reluctance to retire. Third, several participants were nervous about creating a new identity for themselves.

Further exacerbating the difficulty surrounding athletic retirement, participants were suffering a combination of physical and psychological symptoms as a result of their concussions. In fact, all five participants reported ongoing post-career physical symptoms were still present in their day-to-day lives including headaches, vision impairment, short-term memory loss, difficulty reading, and sensitivity to bright lights. These physical symptoms affected their transition to their post-hockey career because of the written and oral communication requirements associated with their new positions. Furthermore, two participants were unable to solicit post-hockey employment because they required a position with flexible work hours that would allow them sufficient time to rest and recover if their post-concussion symptoms emerged.

Due to their experiences, all the participants were eager to share their knowledge of concussions. In particular, they provided insights that were grouped into *concussion education* and *recommendations to improve safety*. Participants offered insights on concussion education as a result of their experiences. Two participants described "normal" headaches versus "concussion" headaches. Specifically, they described the painful build-up of pressure and severity of "concussion" headaches compared to "normal" headaches. Participants also identified problems with the neuropsychological assessments they went through, feeling that they could manipulate the results of the test as they became more familiar with the questions on the tests. Several participants discussed how they were able to

continue playing while concussed. For example, the hockey culture did not recognize concussion as a legitimate injury during their careers. Also, participants were able to hide symptoms of their concussions because there were no visible signs (i.e., swelling, stitches), due to the invisible nature of the injury.

Participants discussed that today's athletes are bigger, stronger, and faster which has likely increased the prevalence of concussions and made the game less safe for its players. Therefore, participants in this study offered a number of recommendations to improve safety. These included playing on larger surfaces, having better post-retirement financial support for concussed players, ensuring players were fit to return to play after a concussion, and more stringent rules and suspensions for body checks targeting the head.

In sum, the findings of this study represent the first empirical account of professional athletes who described their experiences with concussions, career termination, and career transition. Moreover, this is the first instance where a methodological approach has been implemented to allow participants the freedom to use their own language to tell their story. These results highlight the impact of concussions on athletes' professional careers, quality of life, and their environment. Furthermore, these findings illustrate the difficulties associated with career termination for professional athletes, and subsequently the transition to post athletic career. The results from this study also highlight the need for future research on concussions to employ different methods to allow participants to share their stories in order to gain a greater perspective of the effects of concussions on athletes.

Chapter 5

Discussion

The purpose of this study was to understand the effects of career ending concussions on former NHL players. Four higher order categories emerged from the data: *Concussion Experiences*, *Environmental Influences*, *Professional Sport Transition*, and *Education and Recommendations*. This section will discuss these categories in relation to previous literature.

Concussion Experiences

This higher order category described participants' experiences with concussions. Specifically, participants discussed their hockey careers, with particular emphasis on the physical and psychological symptoms they experienced as a result of their concussions, including the treatments they received for them. These themes will be discussed in relation to previous literature.

All five participants in this study described how their on-ice concussions occurred, as well as the mechanisms that caused these injuries. In line with previous research on concussions in hockey, body checking was the primary cause of this injury due to high player speeds, and collisions with an opponent, the ice, or the boards (Delaney, Puni, & Rouah, 2006; Flik, Lyman, & Marx, 2005; Honey, 1998; Tegner & Lorentzon, 1996). Results from this study also indicated that fighting caused concussions. Hockey aggression literature has suggested that on-ice fighting was an integral part of the game which allowed players to police themselves (Colburn, 1985, 1986; Smith 1979). In particular, Colburn (1985) noted that participation in on-ice fights often resulted in fat lips, black eyes, lost teeth, and broken noses. The current results expand this literature by including concussions as an outcome from engaging in on-ice fights in elite hockey. Furthermore, three participants noted their

concussions resulted from illegal body checks including elbows and late hits that targeted their head. Empirical literature has not yet linked illegal body checking and concussions, however several non-empirical reports (e.g., Canadian Broadcasting Corporation, 2011; The Sports Network, 2011) have discussed the occurrence of illegal blind-side body checks targeting the head. Similar to these reports, participants felt their concussions occurred as a result of being in a vulnerable position while an opponent delivered and illegal body check aimed at their head.

Although our participants were certain that illegal body checks resulted in some of their concussions, they were unable to identify the total number they suffered throughout their careers. More specifically, they indicated there was a large discrepancy between the number of documented concussions they suffered and their best estimation. Previous research determined that concussion incidence in hockey per 1000 athlete exposures ranged from 1.5 (Pelletier, Montelpare, & Stark, 1993) to 5.95 (Goodman, Gaetz, & Meichenbaum, 2001). More recently, Echlin et al. (2010) observed a junior hockey team over an entire season and determined the incidence of concussions was 21.5 per 1000 athlete exposures, which is 3.3 times higher than previously reported. The findings from Echlin and colleagues suggested the incidence of concussions has increased dramatically over the past 20 years, or perhaps more likely, that concussion identification has improved over this time period. Participants in this study noted that concussion identification and diagnosis was an evolving science during their careers and has improved since their retirement. These results suggest that participants' inability to accurately identify their true number of concussions can be attributed as much to concussion awareness and diagnosis as to the increase in fighting or illegal checks.

Once a concussion was identified, participants began the rehabilitation process which included a variety of rehabilitation techniques and prescribed medications. The consensus document from the third CIS conference in Zurich stated that medications were useful in the treatment of prolonged symptoms such as sleep disturbance and anxiety (McCrory et al., 2009). More specifically, these medications allow concussed individuals to sleep restfully and their concussive symptoms to resolve. Participants from this study reported that prescribed medications such as Zoloft were successful in controlling their mood and improving their sleep. In addition to taking medication, participants indicated that rehabilitation techniques such as cranial-sacral therapy, acupuncture, and prolotherapy were successful in alleviating some of the physical symptoms from their concussions. In their consensus document, McCrory and colleagues indicated that rehabilitation strategies were an avenue for future research because little empirical research exists on this topic. The findings from this study suggest that rehabilitation techniques may be a useful method to relieve concussion symptoms in combination with other treatments and warrants further investigation.

Following their concussions, all five participants suffered physical symptoms such as headaches, vision impairment, and nausea, outcomes which have been widely cited in the literature (viz., Aubry et al., 2002; McCrory et al., 2005; McCrory et al., 2009). Due to the qualitative framework in our study, the participants described how these physical symptoms affected them. For example, several participants described the types of vision impairments they experienced on the ice during their playing careers which ranged from partial blurred vision to complete loss of peripheral vision. Furthermore, participants noted these symptoms occurred sporadically and could last for a few minutes or up to a week. These results extend

previous quantitative findings by allowing participants to describe the type and degree of physical symptoms they experienced, as well as their overall effect on their daily functioning. Also, the current findings may provide medical professionals with a greater overall understanding of concussive injury, which in turn may enhance their ability to treat athletes.

Although physical symptoms of concussions have received more attention, several researchers have investigated psychological aspects of the injury (e.g., Bloom, Horton, McCrory, & Johnston, 2004; Chen, Johnston, Petrides, & Ptito, 2008; Covassin, Swanik, & Schatz, 2007; Horton, Bloom, & Johnston, 2002; Johnston et al., 2004; Mainwaring et al., 2004; Ptito, Chen, & Johnston, 2007; Shapcott, Bloom, Johnston, Loughead, & Delaney, 2007). For example, Horton and colleagues noted that concussed university-aged athletes contended with isolation because their unique recovery period often kept them apart from their teammates. By attending support groups, they found that concussed athletes improved their overall mood states and reduced the effects of isolation and anxiety that they were feeling. Results from the current study revealed that participants also felt isolated after suffering a concussion because they were excluded from practice, team activities, and social events until they were asymptomatic of their physical symptoms. Furthermore, participants felt they were excluded from team functions by their coaches who attempted to eliminate negative distracters for other players which further intensified their feelings of isolation. Similar to literature on the psychology of athletic injuries, participants in this study felt that isolation from their teammates had adverse effects on their recovery from concussion due to the loss of camaraderie (Brewer, Linder, & Phelps, 1995; Quinn & Fallon, 1999; Weiss & Troxel, 1986). The current results indicate that concussed professional hockey players may require additional support as they were isolated from the team environment after their injury.

Given the success of support groups among university athletes (cf. Horton et al., 2002), it may be useful to attempt similar methods of rehabilitation in professional hockey players to offset the adverse effects of isolation.

In addition to contending with isolation, participants in this study also experienced anxiety and depression as a result of their concussions. Similarly, a study from Johnston et al. (2004) noted that concussed amateur athletes suffered from a combination of anxiety and depression. Using fMRI scans, Chen et al. (2008) determined that concussed individuals had similar neural responses in brain areas commonly linked with major depression. The current study provided the first empirical account of professional athletes who described symptoms of anxiety and depression they endured as a result of concussions. Specifically, participants discussed the duration of their anxiety and depression symptoms, medications they were prescribed from their doctors, and the effects of these symptoms on their family members. Although much remains to be explored, these findings are among the first to describe the degree to which various psychological symptoms impede the daily functioning of concussed athletes' personal and professional lives.

Finally, findings from this study revealed that three participants also experienced suicidal ideation as a result of their concussions. While there have been several anecdotal accounts of concussed hockey and football players having suicidal thoughts (e.g., Gulli, 2011), there is a lack of empirical research in the area. Research on involuntary career termination has indicated that amateur athletes who suffered a career ending injury also experienced suicidal ideation (Ogilvie & Howe, 1982; Werthner & Orlick, 1986). In the current study, it is difficult to differentiate whether the suicidal thoughts were initiated by their concussion or career termination because they occurred during the same time. However,

two of the three participants who discussed suicidal ideation cited their constant headaches as a primary reason to contemplate suicide. The other player discussed the difficulties of communicating suicidal thoughts to his doctor and spouse, and the strain it caused to those relationships. These results suggest that concussed individuals should be monitored closely throughout their recovery to ensure they are receiving the proper care based on their individual needs.

Environmental Influences

In this category, participants discussed their relationships with key individuals and organizations that played various roles throughout their hockey careers. All participants focused on relationships with family members, with an emphasis on their spouses. This related closely to literature investigating the effects of Traumatic Brain Injury (TBI) on family functioning. As stated in the literature review, concussion is a subtype of TBI and the two terms should not be used interchangeably. However, given the lack of concussion research in this domain, this section will discuss TBI literature in relation to findings from the current study.

After suffering a concussion, participants in the current study noted that physical and psychological symptoms from their concussions affected relationships with their families in many ways that were similar to previous literature (Gan, Campbell, Gemeinhardt, & McFadden, 2006; Leach, Frank, Bouman, & Farmer, 1994; Watanabe, Shiel, McLellan, Kurihara, & Hayashi, 2001). For example, Gan and colleagues found that families living with someone who suffered a TBI underwent psychological distress, anxiety, burden, and loss of income. Participants from the current study reported that they received positive emotional support from their families while suffering physical and psychological symptoms from their

concussions. However, participants indicated they were burdening their family members by being unable to fulfill their role as a provider, husband, and father. These findings suggested that despite being cognisant of their diminished contribution to their families, physical and psychological symptoms from their concussions rendered athletes helpless at home. Although families were not interviewed in the current study, these results indicated that families of the participants would have experienced a number of stressors while living with them.

Of the family members affected, participants in the current study noted their spouses were their primary caregivers when they were concussed, which is in line with previous research (Kreutzer, Gervasio, & Camplair, 1994, Kreutzer et al., 2009). Participants also said their spouses cared for them, their children, and managed their personal finances and homes when they suffered symptoms from their concussions. In their studies, Kreutzer and colleagues determined that caregivers of patients with a TBI demonstrated increased stress, difficulty making decisions, feelings of isolation or alienation from others, and feelings of being overwhelmed. Furthermore, they determined that spouses demonstrated the most distress of any family member. Results from the current study indicated that spouses cared for concussed individuals, as well as their children which undoubtedly increased their stress. While the aim of the current study was not to explore the effect of concussions on spouses, these findings suggested that primary caregivers undergo a number of stressors while caring for those who have suffered concussions. Given the nature of this study, it is unclear which stressors primary caregivers experienced, however it is an interesting area for future inquiry.

Research indicated that spouses of TBI patients experienced distress while caring for them which led researchers to investigate the rate of divorce among those couples (Arango-

Lasprilla et al., 2008; Kreutzer, Marwitz, Hsu, Williams, & Riddick, 2007; Tate, Lulham, Broe, Strettles, & Pfaff, 1989; Thomsen, 1984). Earlier studies from Tate et al. and Thomsen indicated that individuals who suffered a severe brain injury had a divorce rate of 54% and 80% respectively. More recently, Arango-Lasprilla and colleagues conducted a study to determine the marital stability among 977 participants who suffered a TBI. In contrast to previous literature, they found that only 15% of participants who were married upon admission for TBI indicated being separated or divorced two years post-injury. Similarly, Kreutzer et al. found that 25% of marriages in their sample of 120 patients had dissolved after 2–8 years post-injury. Results from the current study found that four of the five participants who were married at the time of their career ending concussion reported a stable marriage at the interview. One participant indicated that his marriage failed because his experiences with a career ending concussion, accounting for 20% of our participants. Although these results are consistent with previous findings, they should be interpreted with caution due to the small sample size, and because this was not the intended purpose of the study. Moreover, financial constraints were a precursor for divorce among TBI patients but were likely not an issue with our sample of former professional athletes. Nevertheless, these findings provide preliminary evidence that career ending concussions affect marital stability similarly to TBI's.

Professional Sport Transition

In this category, participants discussed the events surrounding the termination of their professional hockey career, as well as the obstacles they faced transitioning to their post-athletic career lives. More specifically, participants in this study indicated that career termination and transition were influenced by their identities as professional hockey players,

as well as ongoing physical symptoms from their concussions. This section will discuss these themes as they relate to previous literature.

All five participants in this study experienced injury-based career termination. Taylor and Ogilvie (2001) noted that career termination "was perhaps the most significant and traumatic experienced encountered by athletes" (p. 672). Other researchers have also indicated that injury-based career termination caused the greatest amount of emotional and psychological challenges for athletes (McKnight et al., 2009; Mihovilovic, 1966; Taylor & Ogilvie, 1994, 2001; Underleider, 1997; Webb, Nasco, Riley, & Headrick, 1998; Werthner & Orlick, 1986). For example, Mihovilovic found that former professional soccer players who experienced a career ending injury feared for their futures and reported serious psychological difficulties. He noted further how these difficulties may pose greater challenges for professional athletes because sport was their livelihood and primary means of providing for their families. Several participants feared they would be unable to provide for their families financially in a new career setting because they had sacrificed their education in pursuit of their professional hockey careers. Ungerleider noted that former Olympic athletes wished they had prepared more adequately for their retirement by investing in education or skills training which they believed would have eased their athletic retirement. In addition to inadequate post-career planning, participants in the present study believed they would be unable to provide for their families due to persistent concussion symptoms which often rendered them incapacitated for long periods of time. They noted symptoms such as headaches and vision impairment were best managed with frequent rest (e.g., naps) which caused them to feel less marketable to potential employers. These findings indicate that professional athletes may benefit from career planning seminars during their careers (e.g., to

showcase post-career opportunities) which may be particularly useful in the case of unanticipated career termination.

Research has also indicated that career ending injuries may pose the most difficulties for athletes in their transition to post-career (Alfermann, Stambulova, & Zemaityte; Sinclair & Orlick, 1993; Webb et al., 1998; Williams, Rotella, & Heyman, 1998). In particular, Webb and colleagues noted that high school, collegiate, and professional athletes who suffered a career ending injury experienced a more turbulent transition than athletes with more control over their retirement. For example, Williams et al. found that career ending injuries caused amateur athletes social withdrawal, fear, anxiety, and loss of self esteem while transitioning to their new careers. In line with these findings, participants in the current study described symptoms of fear and anxiety while transitioning to their post-careers. More specifically, several participants explained these symptoms occurred while transitioning to their new careers that relied heavily upon written and oral communication. Presumably, these would exacerbate ongoing physical symptoms from their concussions (i.e., sensitivity to bright lights, difficulties with memory and reading) which would further complicate their transition. Interestingly, participants reported a relatively smooth transition to careers in the professional sporting industry despite these overlapping symptoms and the need to rely on their communication skills. It is possible that skills athlete's learned during their professional careers were transferable to the post-athletic careers (McKnight et al., 2009), which may have accounted for their smooth transitions. Further to this, participants who were retired for a longer period of time (i.e., more than ten years) may have reported a smooth transition because they were desensitized to the various emotions they experienced at the time of their career transition. These results suggest that prospective interviews may be more appropriate

in determining athletes' experiences with transition to post-career as athletes in the current study may have been unable to accurately account for the emotions they experienced 4–14 years previous.

Adding to the difficulty of career termination and transition, two participants in this study acknowledged they lost their sense of identity after retirement (Grove, Lavallee, & Gordon, 1997). Grove and colleagues postulated that athletic identity was defined as "the degree to which one defines him/herself in terms of the athlete role" (p. 193). Previous empirical findings have also examined the effects of athletic identity on retirement for amateur athletes (Alfermann, Stambulova, & Zemaityte, 2004; Brewer, Van Raalte, & Petipas, 2000; Grove, Fish, & Eklund, 2004; Grove et al., 1997; Lavallee, Gordon, & Grove, 1997; McKnight et al., 2009; Ungerleider, 1997). Ungerleider found that 40% of former Olympians who reported a high athletic identity experienced significant challenges transitioning to the workplace which included concerns with their self-image and difficulties with drug and alcohol abuse. Furthermore, Ungerleider determined that those who based their identity around the athlete role had the most difficulty adapting to life without sport. While it was outside the scope of the current study to determine level of athletic identity among participants, results suggested that two participants had high athletic identity. For instance, these participants noted that in addition to identifying themselves as professional athletes they were primarily identified by extended family, friends, and acquaintances by their athletic role. Given the previous findings on former Olympic athletes, high athletic identity may have caused participants in this study additional difficulty with their retirement. These findings appear to indicate that pre-retirement planning may also allow professional athletes

to begin creating alternative identities for themselves during their careers which may ease the overall effect of career transition and termination.

Participants' retirement and transition was also influenced by the ongoing presence of physical symptoms from their concussions. Although research has investigated short-term physical symptoms of a concussion (Benson, Meeuwisse, Burke, & Rizos, 2008; Delaney, Puni, & Rouah, 2006; Goodman, Gaetz, & Meichenbaum, 2001; Johnston et al., 2004), little is known about the long-term effects of the injury (McCrory et al., 2009). Johnston and colleagues noted that concussive injury may involve a lengthy recovery which may affect athletes' careers, family relations, and sociability. The current results build on these findings as participants reported ongoing physical symptoms from their concussions including difficulty reading and sensitivity to bright lights 4–14 years after their athletic retirement. These ongoing physical symptoms affected participants' adaptation to their post-hockey lives by hindering their quality of life, and their ability to find employment outside of professional hockey. Although little research currently exists, these findings addressed McCrory and colleagues' call for increased research on long-term outcomes of concussions, and provide evidence that concussion symptoms affect athletes' quality of life after retirement.

Education and Recommendations

In this category, participants discussed the current state of concussions, the growing awareness of concussive injury, and the ways of reducing the incidence and prevalence of concussions in professional hockey. Given their experiences, participants shared a number of unique insights on concussions and this section will discuss themes that related to previous literature.

Three participants in the current study discussed the growing prevalence of concussions (Canadian Medical Association, 2011; Daneshvar, Nowinski, McKee, & Cantu, 2011; Echlin et al., 2010; Flik et al., 2005; Honey, 1998; McCrea, Hammeke, Olsen, Leo, & Guskiewicz, 2004). Daneshvar and colleagues posited the size and speed of today's athletes caused more forceful and violent collisions which has increased the prevalence of concussions. Similarly, participants in the current study felt the size, speed, and strength of contemporary athletes have increased dramatically since the beginning of their careers, a fact which they attributed to the increasing number of concussions in professional hockey. Participants also felt the NHL could make a number of rule changes to decrease concussion prevalence such as playing on larger surfaces and more stringent rules and suspensions for body checks targeting the head. The current findings expanded previous literature by including recommendations from former professional athletes to make the game safer for players. Given their experiences with concussions and professional hockey, their recommended rule changes may warrant further investigation from the NHL in order to decrease the prevalence of concussions.

Participants in this study noted they did not always report symptoms of a concussion which allowed them to continue playing despite being symptomatic. Findings from Delaney, Lacroix, Leclerc, and Johnston (2002) suggested that amateur athletes hid symptoms of their concussions from medical professionals, coaches, and teammates for fear of being removed from competition. Results from Delaney and colleagues suggest that professional athletes may have increased motivation (e.g., financial) to hide concussion-like symptoms and continue playing. In addition, participants noted they were able to hide symptoms of a concussion because it is an invisible injury. Bloom et al. (2004) posited that concussions

were unique from other injuries because there are no visible signs such as crutches, swelling, or stitches. These current results expand previous literature by adding that participants may take advantage of the invisibility of concussive injury and hide symptoms of a concussion from others. This suggests that concussion education may be particularly important for athletes, coaches and parents to ensure concussions are identified promptly thus protecting athletes from themselves.

Finally, several participants in this study discussed their familiarity with headaches caused by their concussions. Concussion research has previously found that headaches are commonly reported by athletes after suffering a concussion (viz., Aubry et al., 2002; Johnston et al., 2004; McCrory et al., 2005, 2009). However, the majority of these studies have employed quantitative methodologies which have not allowed participants to describe their headaches. In the current study, two participants described the pressure build-up associated with their "concussion" headaches, which they felt mirrored flu-like headaches. Moreover, they identified specific regions on their heads where they experienced "normal" and "concussion" headaches respectively. Although these are preliminary findings, the current results build on previous literature by suggesting concussed athletes may experience a different type of headache. In their consensus document, McCrory and colleagues noted that medical professionals may attempt pharmacological therapy (i.e., antidepressants) when treating psychological symptoms of a concussion. Interestingly, they did not recommend medications for the treatment of physical symptoms such as "concussion" headaches. While it was outside the scope of the current study to discuss medications in the treatment "concussion" headaches, the current results suggest that gaining a better understanding of

these headaches may enhance medical professionals' ability to care for concussed individuals.

Chapter 6

Summary of the Study

Research has indicated that the incidence (Echlin et al., 2010) and prevalence (Daneshvar, Nowinski, McKee, & Cantu, 2011) of concussions in sport is increasing. In North America, football, ice hockey, and soccer are considered high risk sports for suffering a concussion. Ice hockey players are perhaps most susceptible because they can reach speeds of 30 mph, and collide frequently with each other, the ice, and the boards (Flik, Lyman, & Marx, 2005). When collisions cause a musculoskeletal injury, there are typically visible signs that range from swelling, stitches, or crutches. However, concussions are unique from other injuries because they are invisible (Bloom, Horton, McCrory, & Johnston, 2004). Concussion injuries may involve a combination of physical (i.e., headaches, dizziness) and psychological (i.e., anxiety, depression) symptoms (Johnston et al., 2004), whereby the physical symptoms are amplified when combined with psychological factors (Bloom et al., 2004; Johnston et al., 2004; Mainwaring et al., 2004). In the most extreme cases, concussions have led to career termination, where athletes experienced such adverse outcomes that included social withdrawal, fear, anxiety, depression, and substance abuse (Werthner & Orlick, 1986; Williams, Rotella, & Heyman, 1998).

The purpose of this study was to understand the effects of career ending concussions on retired National Hockey League (NHL) players. Participants included five former NHL players who played professional hockey for 10–15 seasons. All participants suffered a medically-diagnosed concussion that resulted in the termination of their professional hockey careers. Semi-structured, open-ended interviews lasted 45–90 minutes, and were conducted in mutually agreed upon locations.

Interpretative phenomenological analysis (IPA) was selected for the current study and emergent themes from the interview data were grouped into four higher order categories: *Concussion Experiences, Environmental Influences, Professional Sport Transition*, and *Education and Recommendations*. *Concussion Experiences* pertained to the participants' hockey careers, with particular emphasis on the physical and psychological symptoms they experienced as a result of their concussions. This category also included treatments participants received during their rehabilitation from concussions. *Environmental Influences* discussed participants' relationships with key individuals and organizations that played various roles throughout their hockey careers. In particular, participants focused on relationships with their family, as well as hockey and medical personnel when they were concussed. *Professional Sport Transition* described the events surrounding the termination of their professional hockey career, as well as the obstacles they faced transitioning to their post athletic career lives. Finally, *Education and Recommendations* related to participants' thoughts on concussions in hockey, the growing awareness of concussive injury, and the ways of reducing the incidence and prevalence of concussions.

Although each player had different experiences, several commonalities existed among the participants. For instance, all participants identified and articulated the physical and psychological symptoms they experienced as a result of their concussions. These symptoms ranged from headaches, nausea, and vision impairment to depression, anxiety, and for some, suicidal ideation. Participants agreed their spouses offered the most support for them both during and after their careers. In particular, participants indicated that in addition to caring for them, spouses also raised their children and managed their finances. All the participants hesitated to retire from professional hockey for a number of reasons, including loss of

income and identity. Further to this, each participant described ongoing post-career physical symptoms from their concussions such as sensitivity to bright lights and vision impairments, which caused a number of difficulties transitioning to their post-athletic careers. Finally, participants offered a number of recommendations to protect NHL players which included playing on larger surfaces, having better post-retirement financial support, ensuring players were fit to return to play, and more stringent rules and suspensions for hits targeting the head.

Conclusions

Within the confines and limitations of the current study, the following conclusions appear warranted:

- All participants suffered a variety of musculoskeletal injuries to their ankles, knees, shoulders, and backs during their professional hockey careers.
- All participants said their concussions resulted from both legal and illegal body checks, and on-ice fights.
- All participants were unsure of the number of concussions they suffered during their careers and they felt their actual number of concussions was higher than the number of documented concussions.
- Each player described the type of cognitive testing he experienced after suffering a concussion as well as the evolution of these tests throughout his career.
- Participants encountered a number of physical symptoms as a result of concussions during their playing careers such as headaches, nausea, and vision impairment.
- Three participants attempted a variety of rehabilitation techniques such as cranial-sacral treatments, acupuncture, and prolotherapy which they felt were successful in alleviating some of the physical symptoms of their concussions.

- All participants described the psychological symptoms they experienced as a result of their concussions which included isolation, anxiety, paranoia, depression, and for some, suicidal ideation.
- All participants said their spouses were supportive, and cared for them while they endured physical and psychological symptoms from their concussions.
- After suffering a concussion, one player noted that his coach recognized he was suffering and sought medical treatment for him.
- Three participants talked about the type of support they were offered from their teams after suffering a concussion which varied from very supportive to no support whatsoever.
- Three participants communicated frequently with their medical professionals while suffering from physical and psychological symptoms of their concussions, and they experienced both positive and negative support from their doctors.
- All participants talked about their career termination. Three said their decision to retire was influenced by family members while two attributed the decision to their medical professionals who would not clear them to return to hockey.
- Several participants said their identity revolved around being a professional athlete which caused them distress upon career termination.
- All participants reported ongoing post-career physical symptoms which included headaches, vision impairment, short-term memory loss, difficulty reading, and sensitivity to bright lights.

- Two of the four participants who talked about their transition from professional hockey felt they were limited in choosing a new career due to post-concussion symptoms.
- Several participants discussed the growing prevalence of concussions in the NHL; they felt that athletes were bigger, stronger, and faster which likely increased the prevalence of concussions and made the game less safe for its players.
- Two participants described the painful build up of pressure associated with their "concussion" headaches as opposed to their "normal" headaches.
- During their careers, three participants said they were hesitant to talk about physical and psychological symptoms of their concussions and thus would often not report concussion symptoms to spouses, teammates, coaches, and medical professionals.
- Two participants felt they were able to manipulate concussion testing and get back in the lineup quicker despite still being symptomatic.
- Several participants reported that concussion awareness has improved among players, coaches, general managers, and league officials in the NHL since their retirement.
- Participants offered a number of recommendations for the NHL in relation to concussions such as playing on larger surfaces, having better post-retirement financial support, ensuring players were fit to return to play, and more stringent rules and suspensions for body checks that target players' heads.

Practical Implications

The current study has a number of practical implications which may benefit athletes, coaches, parents and sport administrators. Moreover, these findings may enhance the ability of physiotherapists, sports psychology experts, and medical professionals to provide care for

their patients who have suffered a concussion. This study provided the first qualitative empirical account of former professional athletes who were forced to retire due to symptoms from their concussions. By employing qualitative methods, participants in this study were able to use their own language to describe their experiences with concussions. Specifically, participants were able to articulate the type and intensity of symptoms they experienced which ranged from physical (e.g., headaches, vision impairments) to psychological (e.g., isolation, anxiety, depression), related to their careers, career termination, and career transition. Also, the use of semi-structured interviews allowed participants to emphasize topics they deemed important and allow the conversation to follow their lead. As a result, participants provided a number of unique insights that may only be learned through experience with the injury, and with a methodology allowing participants to share their experiences.

These findings are beneficial for those involved in all levels of sport, and in any capacity, to better understand the short and long-term effects of concussive injury. For example, athletes and coaches may increase their knowledge of concussions by learning about the experiences of retired professional athletes. This may encourage athletes and coaches to adjust their style of play which would make the game safer at all levels of sport. Similarly, parents may gain a greater understanding of concussive injury and encourage them to be more cautious when returning their child to sport after suffering a concussion. In addition to benefitting those directly involved in sport, this study may equally benefit those who care for injured athletes. For instance, participants felt they received positive results with certain rehabilitation techniques which may encourage physiotherapists to explore physical therapy in concussion rehabilitation. Sport psychology experts may attempt different

strategies to assist concussed clients based on participants' descriptions of their physical and psychological symptoms. Also, participants shared their experiences with various medical treatments and tests they endured which may enhance the ability for medical professionals to care for concussed athletes.

Concussion research has predominantly focused on physical symptoms and often overlooked various psychological aspects of the injury. This study enhanced the understanding of psychological aspects of concussive injury by allowing those with experience to share their stories. Although previous empirical findings have noted that concussed individuals may experience symptoms such as anxiety and depression, literature has not yet accounted for how these symptoms affect quality of life for individuals and their families. In addition, findings indicated that persistent psychological symptoms affected athletes' hockey careers, and subsequently their retirement and transition. These results provided evidence of the severity of psychological aspects of concussions for individuals and families who have been impacted by concussion.

Participants in this study noted they experienced physical symptoms such as headaches and trouble reading 4–14 years after retiring from professional hockey. These results provided one of the first empirical accounts of the long-term implications of concussions. Stakeholders such as the NHL and Hockey Canada may particularly benefit from these findings as they demonstrated the long-term significance of concussive injury. For example, all athletes indicated they suffered ongoing physical symptoms in their day-to-day lives. These findings may encourage the aforementioned organizations to further implement strategies to increase the awareness of concussive injury at all levels of hockey. In addition, these findings may also provide younger athletes with a history of concussions a better

indication of the long-term effects of the injury. Similarly, medical professionals may advise athletes who have suffered multiple concussions to refrain from playing contact sports due to the possibility of long-term sequelae from the injury.

Finally, these results are beneficial to any athlete who has suffered a concussion. In line with research from Bloom et al. (2004), participants in the current study indicated feelings of isolation and being misunderstood after suffering a concussion. The current findings may offer concussed athletes some degree of comfort by learning about the experiences of former professionals. Although research does not yet fully understand the long-term implications of concussions, concussed athletes may find comfort in knowing they are not alone.

Limitations

Although the current study enhanced the overall understanding of concussions, a number of limitations should be acknowledged when interpreting these results. First, the length of NHL playing career varied among participants from parts of two seasons to as many as 15 seasons. Athletes who had shorter NHL careers may reflect on their careers and concussion experiences differently than athletes who had longer NHL careers. Also, responses from participants may have differed due to the length of time since their career ended. For example, participants who retired recently may recall their experiences more vividly than participants who retired more than a decade previous. Second, position and player type were not included in selection criteria. It is possible that less physical players (i.e., scorers) had different concussion experiences than more aggressive players (i.e., tough guys) who were often involved in physical contact and on-ice fights. Third, data collection involved one data source which failed to include spouses, teammates, and former coaches. It

is probable that the inclusion of these individuals would have allowed for a greater understanding of these athletes' experiences. For example, participants indicated that their spouses were supportive throughout their recovery from concussion which implies spouses may have a different perspective on athletes' experiences with concussions. Therefore, it appears warranted to collect data from athletes' environment in order to gain a more complete understanding of athletes' experiences with concussions. Fourth, while the current study expanded the knowledge of concussions, results may not be generalizable across all professional sports and all levels of professional sport (e.g., minor professional hockey). For instance, professional athletes that have not ascertained the highest level in their chosen sport may experience career ending concussions differently than athletes who played at the highest level.

Recommendations for Future Research

Given the exploratory nature of the study and the uniqueness of the sample and topic, future studies are encouraged to continue investigating career ending concussions. For example, future studies could investigate athletes who were forced to retire prematurely and were unable to play professional sport. Professional athletes in the current study experienced ongoing symptoms after their career ended which adversely affected their transition to post-athletic careers. It would be interesting to understand the effect of career ending concussions among amateur athletes. For instance, amateur athletes who were forced to retire prior to playing professional sport may experience greater difficulty than professional athletes who achieved their goal in sport. Furthermore, their transition from sport may be more difficult due to the lack of financial stability upon retirement which was not of concern for participants in the current study.

The current study investigated career ending concussions through the use of retrospective interviews. Although this method of data collection was useful in providing a preliminary understanding of athletes' experiences with career ending concussions, it would be useful for future research to account for changes in athletes over time. For example, McCrory et al. (2009) called for future concussion researchers to implement longitudinal approaches in order to gain a more thorough understanding of the long-term implications of the injury. By addressing this gap in literature, athletes, coaches, and parents may better understand the long-term implications of concussive injury. In addition, future research is encouraged to use methodologies which allow participants to share their experiences with concussions. Specifically, results from the current study suggested that participants possessed a unique knowledge of concussions which was acquired primarily through experience. Allowing athletes to share their insights and experiences may permit researchers and clinicians to gain a better overall understanding of concussive injury.

Results from the current study also indicated that concussions adversely affected family functioning similar to families living with Traumatic Brain Injury patients. As stated in the previous chapter, research has yet to investigate the effects of concussions on family functioning and spousal stress. Results from the current study indicated that spouses were the primary caregivers for participants when they were suffering symptoms from their concussions which undoubtedly increased their stress and disrupted family functioning. It would be interesting for future studies to address this gap in literature, as well as implement strategies to assist families living with a concussed individual.

Finally, although the current study expanded a growing body of literature on psychological aspects of concussions, much remains to be understood. For instance, results

from the current study indicated that participants suffered a range of psychological symptoms as a result of their concussions. Future research could investigate which factors of concussive injury are predictors of psychological symptoms of a concussion. For example, researchers may investigate whether physical trauma (i.e., area of brain injured) or psychological factors (i.e., isolation after injury) are indicative of the type and intensity of psychological symptoms of concussions. Although much remains to be explored to fully understand concussive injury, the current study provided a preliminary investigation into the experiences of athletes who suffered a career ending concussion.

References

Alfermann, D., & Groß, A. (1998). Erleben und Bewältigen des Karriereendes im Hochleistungsport [Coping with career termination in high performance sport]. *Leistungsport, 28,* 45–48.

Alfermann, D., & Stambulova, N. (2007). Career transitions and career termination. In G. Tenenbaum & R.C. Eklund (Eds.), *Handbook of sport psychology* (pp. 712–733). Hoboken, New Jersey: John Wiley & Sons.

Alfermann, D., Stambulova, N., & Zemaityte, A. (2004). Reactions to sport career termination: A cross-national comparison of German, Lithuanian, and Russian athletes. *Psychology of Sport and Exercise, 5,* 61–75.

Arango-Lasprilla, J.C., Ketchum, J.M., Dezfulian, T., Kreutzer, J.S., O'Neil-Pirozzi, T.M., Hammond, F., & Jha, A. (2008). Predictors of marital stability two years following traumatic brain injury. *Brain Injury, 22,* 565–574.

Aubry, M., Cantu, R., Dvorak, J., Graf-Baumann, T., Johnston, K.M., Kelley, J., Lovell, M., McCrory, P., Meeuwisse, W.H., & Schamasch, P. (2002). Summary and agreement statement of the 1st international symposium on concussion in sport, Vienna 2001. *Clinical Journal of Sports Medicine, 12,* 6–11.

Barnes, B.C., Cooper, L., Kirkendall, D.T., & Garrett, W.E. (1998). Concussion incidence in elite college soccer players. *The American Journal of Sports Medicine, 26,* 238–241.

Barnes, B.C., Cooper, L., Kirkendall, D.T., McDermott, T.P., Jordan, B.D., & Garrett, W.E. (1998). Concussion history in elite male and female soccer players. *The American Journal of Sports Medicine, 26,* 433–438.

Benson, B.W., Meeuwisse, W.H., Burke, C.J., & Rizos, J. (November, 2008). The National Hockey League–National Hockey League Players Association concussion programme: A prospective study of seven regular seasons (1997–2004). P McCrory (Chair), Paper presented at the 3rd International Conference on Concussion in Sport held in Zurich, Switzerland.

Benson, B.W., Rose, M.S., & Meeuwisse, W.H. (2002). The impact of face shield use on concussions in ice hockey: A multivariate analysis. *British Journal of Sports Medicine, 36,* 27–32.

Biasca, N., Simmen, H.P., Bartolozzi, A.R., & Trentz, O. (1995). Review of typical ice hockey: A multivariate analysis. *Der Unfallchirurg* [The Trauma Surgeon]*, 98,* 283–288.

Bloom, G.A., Horton, A.S., McCrory, P., & Johnston, K.M. (2004). Sport psychology and concussion: New impacts to explore. *British Journal of Sports Medicine, 38,* 519–521.

Boden, B.P., Kirkendall, D.T., & Garrett, W.E. (1998). Concussion incidence in elite college soccer players. *American Journal of Sports Medicine, 26,* 238–241.

Brewer, B.W., Linder, D.E., & Phelps, C.M. (1995). Situational correlates of emotional adjustment to athletic injury. *Clinical Journal of Sports Medicine, 5,* 241–245.

Brewer, B.W., Van Raalte, J.L., & Linder D.E. (1991). Role of the sport psychologist in treating injured athletes: A survey of sports medicine providers. *Journal of Applied Sport Psychology, 3,* 183–190.

Brewer, B.W., Van Raalte, J.L., & Petipas, A.J. (2000) Self identity issues in sport career transitions. In D. Lavallee & P. Wylleman (Eds.), *Career transitions in sport: International perspectives* (pp. 29–43). Morgantown, WV: Fitness Information, Technology.

Brooks, D.A. (2007). Use of computer based testing of youth hockey players with concussions. *NeuroRehabilitation, 22,* 169–179.

Buckley, W.E. (1988). Concussions in college football: A multivariate analysis. *American Journal of Sports Medicine, 16,* 51–56.

Canadian Broadcasting Corporation. (2011, July 13). Re: Headshot rule in the NHL. Retrieved from http://www.cbc.ca/sports/hockey/stanleycup/story/2011/06/08/sp-nhl-blindside.html

Canadian Medical Association. (2011, July 12). Re: Policy statement on head injury and sport. Retrieved from http://policybase.cma.ca/dbtw-wpd/Policypdf/PD11-10.pdf

Cantu, R.C. (1986). Guidelines for return to contact sports after a cerebral concussion. *The Physician and Sportsmedicine, 14,* 75–83.

Cantu, R.C. (2001). Posttraumatic retrograde and anterograde amnesia: Pathophysiology and implications in grading and safe return to play. *Journal of Athletic Training, 36,* 244–248.

Cantu, R.C., & Mueller, F.O. (2000). Catastrophic football injuries: 1977–1998. *Neurosurgery, 47,* 673–675.

Centers for Disease Control and Prevention (2010, June 15). Re: Traumatic Brain Injury. Retrieved from http://www.cdc.gov/TraumaticBrainInjury/statistics.html

Centers for Disease Control and Prevention (2010, June 16). Re: Concussion as a type of mTBI. Retrieved from http://www.cdc.gov/concussion/index.html

Chen, J-K., Johnston, K.M., Petrides, M., & Ptito, A. (2008). Neural substrates of symptoms of depression following a concussion in male athletes with persisting post-concussion symptoms. *Archives of General Psychiatry, 65,* 81–89.

Colburn, K. (1985). Honor, ritual and violence in ice hockey. *Canadian Journal of Sociology, 10,* 153–170.

Colburn, K. (1986). Deviance and legitimacy in hockey: A microcultural theory of violence. *The Sociological Quarterly, 27,* 63–74.

Collins, M.W., Iverson, G.L., Lovell, M.R., McKeag, D.B., Norwig, J., & Maroon, J. (2003). On-field predictors of neuropsychological and symptom deficit following sports-related concussion. *Clinical Journal of Sports Medicine, 13,* 222–229.

Covassin, T., Swanik, C.B., & Schatz, P. (2007). Sex differences in neuropsychological function and post-concussion symptoms of concussed collegiate athletes. *Neurosurgery, 61,* 345–351.

Creswell, J.W. (2007). *Qualitative inquiry and research design: Choosing among five approaches.* (2nd ed.). Thousand Oaks, CA: Sage.

Culver, D.M., Gilbert, W.D., & Trudel, P. (2003). A decade of qualitative research in sport psychology journals: 1990–1999. *The Sport Psychologist, 17,* 1–15.

Curtis, J., & Ennis, R. (1988). Negative consequences of leaving competitive sport: Comparative findings for former elite-level hockey players. *Sociology of Sport Journal, 5,* 87–106.

Daneshvar, D.H., Nowinsky, C.J., McKee, A.C., & Cantu, R.C. (2011). The epidemiology of sport-related concussion. *Clinics in Sports Medicine, 30,* 1–17.

Delaney, J.S. (2004). Head injuries presenting to emergency departments in the Unites States from 1990 to 1999 for ice hockey, soccer, and football. *Clinical Journal of Sports Medicine, 14,* 80–87.

Delaney, J.S., & Drummond, R. (1999). Has the time come for protective headgear for soccer? *Clinical Journal of Sports Medicine, 9,* 121–123.

Delaney, J.S., Lacroix, V.J., Leclerc, S., & Johnston, K.M. (2000). Concussions during the 1997 Canadian Football League season. *Clinical Journal of Sports Medicine, 10,* 9–14.

Delaney, J.S., Lacroix, V.J., Leclerc, S., & Johnston, K.M. (2002). Concussions among university football and soccer players. *Clinical Journal of Sports Medicine, 12,* 331–338.

Delaney, J.S., Puni, V., & Rouah, F. (2006). Mechanisms of injury for concussions in university football, ice hockey, and soccer: A pilot study. *Clinical Journal of Sports Medicine, 16,* 162–165.

Echemendia, R.J., & Cantu, R.C. (2003). Return to play following sports-related mild traumatic brain injury: The role for neuropsychology. *Applied Neuropsychology, 10,* 48–55.

Echlin, P.S., Tator, C.H., Cusimano, M.D., Cantu, R.C., Taunton, J.E., Upshur, R.E.G., Hall, C.R., Johnson, A.M., Forewell., L.A., & Skopelja, E.N. (2010). A prospective study of physician-observed concussions during junior ice hockey: Implications for incidence rates. *Journal of Neurosurgical Focus, 29,* 1–10.

Eisner, E.W. (1991). *The enlightened eye: Qualitative inquiry and the enhancement of educational practice*. New York: Macmillan.

Erlanger, D.M., Kutner, K.C., Barth, J.T., & Barnes, R. (1999). Neuropsychology of sports-related head injury: Dementia pugulistica to post-concussion syndrome. *The Clinical Neuropsychologist, 13,* 193–209.

Flik, K., Lyman, S., & Marx, R.G. (2005). American collegiate men's ice hockey: An analysis of injuries. *The American Journal of Sports Medicine, 33,* 183–187.

Gan, C., Campbell, K.A., Gemeinhardt, M., McFadden, G.T. (2006). Predictors of family system functioning after brain injury. *Brain Injury, 20,* 587–600.

Gillogly, S.D., & Whaley, W. (2000). Medical aspects of professional hockey in Atlanta. *Journal of the Medical of Association of Georgia, 89,* 39–44.

Giorgi, A., & Giorgi, B. (2003). Phenomenology. *Qualitative psychology: A practical guide to research methods.* In J.A. Smith (Ed.), (pp. 25–49). Thousand Oaks, CA: Sage.

Giorgi, A., & Giorgi, B. (2008). Phenomenology. *Qualitative psychology: A practical guide to research methods.* In J.A. Smith (Ed.), (pp. 26–52). Thousand Oaks, CA: Sage.

Goodman, D., Gaetz, M., & Meichenbaum, D. (2001). Concussions in hockey: There is cause for concern. *Medicine & Science in Sports & Exercise, 33,* 2004–2009.

Granacher, R.P. (2008). Commentary: Applications of functional neuroimaging to civil litigation of mild traumatic brain injury. *The Journal of the American Academy of Psychiatry and Law, 36,* 323–328.

Greendorfer, S.L., & Blinde, E.M. (1985). "Retirement" from intercollegiate sport: Theoretical and empirical considerations. *Sociology of Sport Journal, 2,* 101–110.

Grove, J.R., Fish, M., & Eklund, R.C. (2004). Changes in athletic identity following team selection: Self-protection versus self-enhancement. *Journal of Applied Sport Psychology, 16,* 75–81.

Grove, J.R., Lavallee, D., & Gordon, S. (1997). Coping with retirement from sport: The influence of athletic identity. *Journal of Applied Sport Psychology, 9,* 191–203.

Grove, J.R., Lavallee, D., Gordon, S., & Harvey, J.H. (1998). Account-making: A model of understanding and resolving distressful reactions to retirement from sport. *The Sport Psychologist, 12,* 52–67.

Gulli, C. (2011, May). The untold story. *MacLean's Magazine, 124,* 56–62.

Guskiewicz, K.M., Marshall, S.W., Bailes, J., McCrea, M., Harding, H.P, Matthews, A., Mihalik, J.R., & Cantu, R.C. (2005). Recurrent concussion and risk of depression in retired professional football players. *Neurosurgery, 57, 719–726.*

Guskiewicz, K.M., Ross, S.E., & Marshall, S.W. (2001). Postural stability and neuropsychological deficits after concussion in collegiate athletes. *Journal of Athletic Training, 36,* 263–273.

Guskiewicz, K.M., Weaver, N.L., Padua, D.A., & Garrett, W.E. (2000). Epidemiology of concussion in collegiate and high school football players. *The American Journal of Sports Medicine, 28,* 643–650.

Honey, C.R. (1998) Brain injury in ice hockey. *Clinical Journal of Sports Medicine, 8,* 43–46.

Horton, A., Bloom, G.A., & Johnston, K.M. (2002). The impact of support groups on the psychological state of athlete's experiencing concussions. *Medicine & Science in Sport & Exercise, 34,* 99.

Hutchison, M., Mainwaring, L.M., Comper, P., Richards, D., & Bisschop, S.M. (2009). Differential emotional responses of varsity athletes to concussion and musculoskeletal injuries. *Clinical Journal of Sports Medicine, 19,* 13–19.

Johnston, K.M., Bloom, G.A., Ramsay, J., Kissick, J., Montgomery, D., Foley, D., Chen, J-K., & Ptito, A. (2004). Current concepts in concussion rehabilitation. *Current Sports Medicine Reports, 3,* 316–323.

Johnston, K.M., Lassonde, M., & Ptito, A. (2001). A contemporary neurosurgical approach to sports-related head injury: The McGill concussion protocol. *Journal of the American College of Surgery, 192,* 515–524.

Johnston, K.M., McCrory, P., Mohtadi, N.G., & Meeuwisse, W. (2001). Evidence-based review of sport-related concussion: Clinical science. *Clinical Journal of Sports Medicine, 11,* 150–159.

Kirkendall, D.T., Jordan, S.E., & Garrett, W.E. (2001). Heading and head injuries in soccer. *Sports Medicine, 31,* 369–386.

Kontos, A.P., Collins, M., & Russo, S.A. (2004). An introduction to sports concussion for the sport psychology consultant. *Journal of Applied Sport Psychology, 16,* 220–235.

Kreutzer, J.S., Gervasio, A.H., Camplair, P.S. (1994). Primary caregivers' psychological status and family functioning after traumatic brain injury. *Brain Injury, 8,* 197–210.

Kreutzer, J.S., Marwitz, J.H., Hsu, N., Williams, K., & Riddick, A. (2007). Marital stability after brain injury: An investigation and analysis. *NeuroRehabilitation, 22,* 53–59.

Kreutzer, J.S., Rapport, L.J., Marwitz, J.H., Harrison-Felix, C., Hart, T., Glenn, M., & Hammond, F. (2009). Caregivers' well-being after traumatic brain jury: A multicenter prospective investigation. *Archives of Physical Medicine and Rehabilitation, 90,* 939–946.

Lavallee, D. (2000). Theoretical perspectives on career transitions in sport. In D. Lavallee & P. Wylleman (Eds.), *Career transitions in sport: International perspectives* (pp. 1–27). Morgantown, WV: Fitness Information Technology.

Lavallee, D., Gordon, S., & Grove, J.R. (1997). Retirement from sport and the loss of athletic identity. *Journal of Personal and Interpersonal Loss, 2,* 129–147.

Leach, L.R., Frank, R.G., Bouman, D.E., & Farmer, J. (1994). Family functioning, social support and depression after traumatic brain injury. *Brain Injury, 8,* 599–606.

Lincoln, Y.S., & Guba, E.G. (1985). *Naturalistic Inquiry*. London: Sage.

Lovell, M.R. (2002). The relevance of neuropsychologic testing for sports-related head injuries. *Current Sports Medicine Reports, 1*, 7–11.

Mainwaring, L.M., Bisschop, S.M., Green, R.E.A., Antoniazzi, M., Comper, P., Kristman, V., Provvidenza, C., & Richards, D.W. (2004). Emotional reaction of varsity athletes to sport-related concussion. *Journal of Sport & Exercise Psychology, 26,* 119–135.

Mason, J. (2002). *Qualitative researching*. London: Sage.

McCrea, M., Hammeke, T., Olsen, G., Leo, P., & Guskiewicz, K. (2004). Unreported concussions in high school football players: Implications for prevention. *Clinical Journal of Sports Medicine, 14,* 13–17.

McCrory, P., Johnston, K., Meeuwisse, W., Aubry, M., Cantu, R., Dvorak, J., Graf-Baumann, T., Kelley, J., Lovell, M., & Schamasch, P. (2005). Summary and agreement statement of the 2nd international conference on concussion in sport, Prague 2004. *British Journal of Sports Medicine, 39,* 196–204.

McCrory, P., Meeuwisse, W., Johnston, K., Dvorak, J., Aubry, M., Molloy, M., & Cantu, R. (2009). Consensus statement on concussion in sport: The 3rd international conference on concussion in sport held in Zurich, November 2008. *British Journal of Sports Medicine, 43,* 76–84.

McKnight, K., Bernes, K., Gunn, T., Chorney, D., Orr, D., & Bardick, A. (2009). Life after sport: Athletic career transition and transferable skills. *Journal of Excellence, 13, 63–77.*

Mihovilovic, M. (1968). The status of former sportsmen. *International Review of Sport Sociology, 3,* 73–96.

Morse, J., & Richards, L. (2002). *Readme first for a user's guide to qualitative methods*. Thousand Oaks, CA: Sage.

Moustakas, C. (1994). *Phenomenological research methods.* Thousand Oaks, CA: Sage.

Mueller, F.O. (1998). Fatalities from head and cervical spine injuries occurring in tackle football: 50 years' experience. *Clinical Sports Medicine, 17,* 169–182.

NIH Consensus Development Program. (2010, June 9). Re: National Institutes of Health consensus procedure. Retrieved from http://consensus.nih.gov/aboutcdp.htm

Ogilvie, B.C., & Howe, M. (1982). Career crisis in sport. In T. Orlick, J.T. Partington, & J.H. Salmela (Eds.), *Proceedings of the 5th World Congress of Sport Psychology* (pp. 176–183). Ottawa: Coaching Association of Canada.

Padgett, D. (2008). *Qualitative methods in social work research*. Thousand Oaks, CA: Sage.

Patton, M. Q. (2002). *Qualitative research and evaluation methods* (3rd ed.). Newbury Park, CA: Sage.

Pelletier, R.L., Montelpare, W.J., & Stark, R.M. (1993). Intercollegiate ice hockey injuries: A case for uniform definitions and reports. *American Journal of Sports Medicine, 21,* 78–81.

Ptito, A., Chen, J-K., & Johnston, K.M. (2007). Contributions of functional Magnetic Resonance Imaging (fMRI) to sport concussion evaluation. *NeuroRehabilitation, 22,* 217–227.

Quinn, A.M., & Fallon, B.J. (1999). The changes in psychological characteristics and reactions of elite athletes from injury onset until full recovery. *Journal of Applied Sport Psychology, 11,* 210–229.

Riemen, D.J. (1986). The essential structure if a caring interaction: Doing phenomenology. In P.M. Munhall & C.J. Oiler (Eds.), *Nursing research: A qualitative perspective* (pp. 85–105). Norwalk, CT: Appleton-Century-Crofts.

Rubin, H.J., & Rubin, S.I. (1995). *Qualitative interviewing: The art of hearing data.* London: Sage.

Sampson, H. (2004). Navigating the waves: The usefulness of a pilot interview in the social sciences. *Qualitative Inquiry, 9,* 643–668.

Schlossberg, N.K. (1981). A model for analyzing human adaptation to transition. *The Counseling Psychologist, 9,* 218.

Schlossberg, N.K. (1984). *Counseling adults in transitions*. New York: Springer.

Shapcott, E.J.B., Bloom, G.A., Johnston, K.M., Loughead, T.M., & Delaney, J.S. (2007). The effects of explanatory style on concussion outcomes in sport. *NeuroRehabilitation, 22,* 161–167.

Sharf, R.S. (1997). *Applying career development theory to counseling*. Pacific Grove, CA: Brooks/Cole Publishing Company.

Sinclair, D.A., & Orlick, T. (1993). Positive terminations from high-performance sport. *The Sport Psychologist, 7,* 138–150.

Smith, J.A., Flowers, P., & Larkin, M. (2009). *Interpretative phenomenological analysis: Theory, method, and research.* Thousand Oaks, CA: Sage.

Smith, J.A., & Osborne, M. (2003). *Qualitative psychology: A practical guide to research methods*. In J.A. Smith (Ed.), (pp. 51–80). Thousand Oaks, CA: Sage.

Smith, J.A., & Osborne, M. (2008). *Qualitative psychology: A practical guide to research methods*. In J.A. Smith (Ed.), (pp. 53–80). Thousand Oaks, CA: Sage.

Smith, M.D. (1979). Hockey violence: A test of the violent subculture hypothesis. *Social Problems, 27,* 235–247.

Strean, W.B. (1998). Possibilities for qualitative research in sports psychology. *The Sport Psychologist, 12,* 333–345.

Tate, R.L., Lulham, J.M., Broe, G.A., Strettles, B., & Pfaff, A. (1989). Psychosocial outcome for the survivors of severe blunt head injury: The results from a consecutive series of 100 patients. *Journal of Neurology, Neurosurgery and Psychiatry, 52,* 1128–1134.

Taylor, J., & Ogilvie, B.C. (1994). A conceptual model of adaptation to retirement among athletes. *Journal of Applied Sport Psychology, 6,* 1–20.

Taylor, J., & Ogilvie, B. (2001). Career termination among athletes. In R.N. Singer, H.A. Hausenblas, & C.M. Janelle (Eds.), *Handbook of sport psychology* (pp. 672–691). New York: John Wiley & Sons.

Tesch, R. (1990). *Qualitative research analysis types and software tools*. New York: Falmer.

Tegner, Y., & Lorentzon, R. (1996). Concussions among Swedish elite ice hockey players. *British Journal of Sports Medicine, 30,* 251–255.

The Sports Network. (2011, July 13). Re: Head shots and concussions in hockey. Retrieved from http://www.tsn.ca/nhl/story/?id=351577

Thomsen, I.V. (1984). Late outcome of very severe blunt head trauma: A 10-15 year second follow-up. *Journal of Neurology, Neurosurgery and Psychiatry, 47,* 260–268.

Ungerleider, S. (1997). Olympic athletes' transition from sport to workplace. *Perceptual and Motor Skills, 84,* 1287–1295.

Wapner, S., & Craig-Brey, L. (1992). Person-in-environment transitions: Theoretical and methodological approaches. *Environment and Behavior, 24,* 161–188.

Watanabe, Y., Shiel, A., McLellan, D.L., Kurihara, M., & Hayashi, K. (2001). The impact of traumatic brain injury on family members living with patients: A preliminary study in Japan and the UK. *Disability and Rehabilitation, 23,* 370–378.

Webb, W.M., Nasco, S.A., Riley, S., & Headrick, B. (1998). Athlete identity and reactions to retirement from sports. *Journal of Sport Behavior, 21,* 338–362.

Weiss, M.R., Troxel, R.K. (1986). Psychology of the injured athlete. *Athletic Training, 21,* 104–110.

Werthner, P., & Orlick, T. (1986). Retirement experiences of successful Olympic athletes. *International Journal of Sport Psychology, 17,* 337–363.

Wertz, F. J. (2005). Phenomenological research methods for counseling psychology. *Journal of Counseling Psychology, 52,* 167–177.

Wiese, D.M., & Weiss, M.R. (1987). Psychological rehabilitation and the physical injury: Implications for the sports medicine team. *Journal of Sport Psychology, 1,* 318–330.

Williams, J.M., Rotella, R.J., & Heyman, S.R. (1998). Stress, injury, and the psychological rehabilitation of athletes. In J.M. Williams (Ed.), *Applied sport psychology: Personal growth to peak performance* (pp. 409–428). Mountain View, CA: Mayfield.

Wolfenden, L.E., & Holt, N.L. (2005). Talent development in elite junior tennis: Perceptions of players, parents, and coaches. *Journal of Applied Sport Psychology, 17,* 108–126.

Wylleman, P., & Lavallee, D. (2004). A developmental perspective on transitions faced by athletes. In M. Weiss (Ed.), *Developmental sport and exercise psychology: A lifespan perspective* (pp. 507–527). Morgantown, WV: Fitness Information Technology.

Yin, R.K. (2003). *Case study research: Design and method* (3rd ed.). Thousand Oaks, CA: Sage.

Appendix A
Recruitment Script

Dear _____,

My name is Jeff Caron and I am a second year Master's student at McGill University specializing in Sport Psychology. We are writing to invite you to participate in our research study at our institution because you were identified as a potential candidate by colleagues in the NHL. We are contacting you based on your interest in receiving more information regarding the study. The current research project focuses on the effects of career ending concussions on former National Hockey League players. Should you choose to participate, you will be asked to discuss your thoughts, feelings, emotions, and experiences with respect to concussions, and specifically those pertaining to your career ending injury.

Prior to contacting you, ethics was obtained through the McGill University Research Ethics Board which ensures that any information you share during this study will remain confidential. Should you choose to participate, a 1-2 hour interview will be conducted by myself in a location of your choosing. If more information is necessary, then a follow-up telephone conversation may occur.

If you have any questions regarding the purpose or procedure of my study, please do not hesitate to contact me personally or my supervisor Dr. Gordon Bloom (information provided below). The McGill sport psychology lab has a long-standing history of producing innovative research in concussions, as well as other branches of sport psychology. If you wish to learn more about the sport psychology research laboratory at McGill, please visit: http://sportpsych.mcgill.ca/index.html

Thank you for your time, I look forward to hearing from you in the near future.

Sincerely,
Jeff Caron

Jeffrey G. Caron
MA Candidate in Sport Psychology
McGill University
E-mail: jeffrey.caron@mail.mcgill.ca

Or

Dr. Gordon A. Bloom
Associate Professor
Department of Kinesiology and Physical Education
McGill University
gordon.bloom@mcgill.ca
(514) 398-4184, ext 0516

Appendix B
Informed Consent Form

This study is in partial fulfillment of the requirements for the degree of Master of Arts for Jeffrey Caron, a graduate student in sport psychology, in the Department of Kinesiology and Physical Education at McGill University. The purpose of this study is to understand the experiences of former National Hockey League players who retired due to symptoms from a concussion. The intended benefit of this study is to increase knowledge of athlete's experiences with concussions. If you participate in this study you will be requested, without payment, to partake in a 1-2 hour interview where you will be asked to discuss your thoughts, feelings, emotions, and experiences of your career ending concussion. If more information is necessary, then a follow-up telephone conversation may occur. It is common practice that research interviews are audio-recorded in order to produce a transcript of the session. Yes __ / No __ I agree to the audio-taping of the interviews with the understanding that these recordings will be used solely for the purposes of transcribing these sessions.

Once the interview is complete, you will obtain a typed transcript, which may be edited at your discretion. Prior to publishing, you will also receive copies of the results and the conclusion of the study. The information you provide throughout the research study will **remain confidential.** All data and paper copies of questionnaires and consent forms will be securely stored in a password protected computer and locked cabinet for a period of 5 years. Both the data and all paper copies will be destroyed 5 years after the study ends. The information disclosed during the interview will remain confidential and will be used for publication purposes in scholarly journals or for presentations at conferences. The researchers will not disclose names or identity of the participants at any time, rather participants will be identified by a number or pseudo name. This study has been approved by the McGill Research Ethics Board.

Your participation in this study is voluntary and not mandatory. You are free to refuse to answer any questions or withdraw from participation at any time, for any reason, without penalty or prejudice.

After reading the above statements and having had the directions verbally explained, it is now possible for you to freely consent and voluntarily agree to participate in this research project based on the terms outlined in this consent form. You may refuse to continue participation at any time, without penalty, and that all the information gathered will remain confidential. Please contact the Research Ethics Officer at 514-398-6831 if you have any questions or concerns regarding your rights or welfare as a participant in this research study. Please sign below if you agree to participate in the study.

_____ _____
Participant Signature Date

_____ _____
Researcher Signature Date

Please feel free to contact us at any time:

Jeffrey G. Caron
Master's Candidate, Sport Psychology
Dept. of Kinesiology & Phys. Education
McGill University, Montreal, Quebec

jeffrey.caron@mail.mcgill.ca

Gordon Bloom, Ph.D.
Graduate Program in Sport Psychology
Dept. of Kinesiology & Phys. Education
McGill University, Montreal, Quebec
(514) 398-4184 ext. 0516
gordon.bloom@ mcgill.ca

Appendix C
Demographic Questionnaire

1. Name: _____

2. Age: _____

3. E-mail: _____

4. Address: _____

5. Phone Numbers (home, cell, and work).

_____

_____

6. Prior to playing in the NHL, list the number of concussions you suffered, approximately how many games you missed for each one, and the length of time (in days) before you played another game.

_____

_____

_____

_____

_____

7. List the NHL teams you played for when your concussions occurred:

_____

_____

_____

_____

_____

_____

8. List any post-concussion symptoms you experienced in the days, weeks, or months following your career ending concussion.

_____

_____

_____

_____

_____

_____

_____

_____

9. List all jobs once your hockey career ended:

_____

_____

_____

_____

_____

_____

10. List any media interviews or talks about concussions you have given since your career ended:

_____

_____

_____

_____

_____

Appendix D
Interview Guide

Opening Questions:

1. Discuss your playing career beginning with minor hockey.
    - Junior hockey
    - Minor pro
    - NHL

2. Describe some of the injuries you suffered during your playing career.
    - Talk about your first diagnosed concussion in hockey and how it occurred.

Key Questions:

ALL OF THE NEXT QUESTIONS PERTAIN TO YOUR CAREER ENDING CONCUSSION

3. Describe the concussion that ended your NHL career.

4. Describe some of the symptoms you experienced as a result of your career ending concussion.
    - How did these symptoms impact your day-to-day life?

5. Tell me about the people both inside the game (i.e., team, league, agents, and medical professionals) and outside the game who supported you throughout your recovery?
    - Which people had the greatest impact on your recovery?
    - Which type of medical help do you feel was most effective?
    - Who offered the most support?

6. Describe some of the difficulties you experienced as a result of your career ending concussion.
    - Describe your retirement from hockey.
    - How was this experience challenging for you?
    - In what ways was it challenging to no longer be able to identify yourself as a National Hockey League player?

7. Describe how the symptoms of your career ending concussion affect relationships with those close to you.
    a. How did your behaviour affect:
        - Teammates
        - Coaches
        - Family

8. In what ways did the post-concussion symptoms you experienced make your transition to life after hockey more challenging?
    - Describe any jobs you've had since your career ended.

Concluding Questions:

9. Do you have any other questions or comments you would like to share?

Table 1

Constructs that help define the nature of concussive head injury

Number	Construct
1	Concussion may be caused either by a direct blow to the head, face, neck or elsewhere on the body with an "impulsive" force transmitted to the head.
2	Concussion typically results in the rapid onset of short-lived impairment of neurologic function that resolves spontaneously.
3	Concussion may result in neuropathologic changes but the acute clinical symptoms largely reflect a functional disturbance rather than a structural injury.
4	Concussion results in a graded set of clinical symptoms that may or may not involve loss of consciousness. Resolution of the clinical and cognitive symptoms typically follows a sequential course; however it is important to note that in a small percentage of cases however, post-concussive symptoms may be prolonged.
5	No abnormality on standard structural neuroimaging studies is seen in concussion.

(McCrory et al., 2009)

Table 2

Graduated return to play protocol

Rehabilitation Stage	**Functional exercise at each stage of rehabilitation**	**Objective of each stage**
1. No activity	Complete physical and cognitive rest	Recovery
2. Light aerobic exercise	Walking, swimming or stationary cycling keeping intensity < 70% maximum predicted heart rate	Increase heart rate
3. Sport-Specific exercise	Skating drills in ice hockey, running drills in soccer. No head impact activities	Add movement
4. Non-contact training drills	Progression to more complex training drills, eg passing drills in football and ice hockey	Exercise, coordination, and cognitive load
5. Full contact practice	Following medical clearance participate in normal training activities	Restore confidence and asses functional skills by coaching staff
6. Return to play	Normal game play	

(McCrory et al., 2009)

Table 3

Concussion modifiers

Factors	**Modifier**
Symptoms	Number Duration (>10 days) Severity
Signs	Prolonged loss of consciousness (>1min), amnesia
Sequelae	Concussive convulsions
Temporal	Frequency – repeated concussions over time Timing – injuries close together in time "Recency" – recent concussion or traumatic brain injury
Threshold	Repeated concussions occurring with progressively less impact force or slower recovery after each successive concussion
Age	Child and adolescent (<18 years old)
Co- and pre morbidities	Migraine, depression or other mental health disorders, attention deficit hyperactivity disorder, learning disabilities, sleep disorders
Medication	Psychoactive drugs, anticoagulants
Behaviour	Dangerous style of play
Sport	High risk activity, contact and collision sport, high sporting level

(McCrory et al., 2009)

Table 4

Table of categories and themes separated by participant

Player	Concussion Experiences	Environmental Influences	Professional Sport Transition	Education and Recommendations
P1	Depression Personal concussion history Personal concussion tests Personal non-concussion injuries Playing career Playing career physical symptoms Suicidal ideation	Health professionals Hockey organization Spouse & children	Athletic identity Career termination Career transition Post career physical symptoms	Concussion – awareness Concussion – headaches Concussion – invisible injury Concussion – knowledge Concussion – perceptions Concussion – threshold Negative role models Playing while concussed
P2	Isolation Personal concussion history Personal concussion tests Personal non-concussion injuries Playing career Playing career physical symptoms	Hockey organization Spouse & children Teammates & coaches	Athletic identity Career termination Career transition	Concussion – headaches Concussion – underreporting NHL – prevalence of concussions Personal opinions
P3	Anxiety Depression Personal concussion history Personal concussion treatments Personal non-concussion injuries Playing career Playing career physical symptoms	Health professionals Hockey organization Spouse & children	Athletic identity Career termination Career transition Post career physical symptoms	Concussion – awareness Concussion – knowledge Concussion – perceptions Concussion – threshold Concussion – underreporting Personal opinions
P4	Depression Isolation Personal concussion history Personal concussion tests Personal concussion treatments Personal non-concussion injuries Playing career Playing career physical symptoms Suicidal ideation	Health professionals Hockey organization Spouse & children Teammates & coaches	Athletic identity Career termination Career transition Post career physical symptoms	Concussion – awareness Concussion – perceptions Concussion – underreporting NHL – concussed players NHL – prevalence of concussions Personal opinions Playing while concussed
P5	Anxiety Depression Isolation Personal concussion history Personal concussion treatments Playing career Playing career physical symptoms Suicidal ideation	Health professionals Spouse & children Teammates & coaches	Career termination Post career physical symptoms	Concussion – awareness Concussion – headaches Concussion – invisible injury Concussion – knowledge NHL – concussed players NHL – prevalence of concussions Personal opinions Playing while concussed