

Youth Athlete Sport Commitment Following Multiple  
Concussions and Persistent Symptoms

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### Abstract

The purpose of this Master's research was to explore factors involved in youth athletes' sport commitment decision following multiple concussions and persistent symptoms. Individual semi-structured interviews were conducted with 11 pre-adolescent and adolescent athletes (three males, eight females) between 12 and 18 years of age ( $M = 15.25$ ). Participants were involved in a variety of sports including soccer ( $n = 3$ ), hockey ( $n = 3$ ), basketball ( $n = 1$ ), cheerleading ( $n = 1$ ), gymnastics ( $n = 1$ ), jiu-jitsu ( $n = 1$ ), and rugby ( $n = 1$ ). Based on the data emanating from the interviews, two articles were written. In article one, the sport commitment model (SCM) (Scanlan, Chow, Sousa, Scanlan, & Knifsend, 2016) facilitated the exploration of the determinants of youth athletes' sport commitment following multiple concussions and persistent (i.e., lasting beyond 28 days) symptoms. A further objective was to expand upon the current SCM by exploring other potential determinants specifically related to return to play after multiple concussions. Findings indicated that sport enjoyment, valuable opportunities, and the desire to excel were the most salient sources of sport commitment. Constructs pertaining to social influences were the least influential in athletes' sport commitment. Findings also supported the addition of athletic identity as a new construct in the SCM. Article two uncovered the psychosocial challenges faced by youth athletes during recovery and return to play following multiple concussions and protracted symptoms. The findings revealed that athletes with concussions experience concerns about persistent symptoms, re-injury anxiety, a diminished perceived ability, lack of social support, and emotional turmoil and mental health problems. Finally, findings provided insight into the potential role concussions and ensuing psychosocial challenges may play in mental health and wellbeing. Collectively, this research improves the understanding of difficulties experienced by youth athletes following multiple concussions and supports the need to improve concussion education and foster a more supportive environment.

## Introduction

A common perception and understanding of sports is that they provide plentiful benefits to one's health and wellbeing (Fraser-Thomas, Coté, & Deakin, 2005). Organized sport at a young age encourages positive physical, social, and psychological development (Zarrett et al., 2008). Sports provide the opportunity to cultivate valuable life lessons and transferable skills that can be employed for the remainder of one's life (Petitpas, Cornelius, Van Raalte, & Jones, 2005). Despite the multitude of benefits associated with youth (i.e., 18 years of age and younger) sport participation, the risks and dangers are often understated. Youth sport-related concussions are one such risk. Sport-related concussions account for 9-12% of all high school athletic injuries (i.e., injuries sustained within the sport context) (Purcell, 2014). After sustaining one concussion, an individual's susceptibility to sustain a subsequent one increases up to 5.8 times (Graham, Rivara, Ford, & Spicer, 2014).

The short and long-term implications associated with multiple concussions and ongoing symptoms are severe. Athletes may develop cognitive deficits such as memory impairments, attentional and concentration problems, dementia, and Alzheimer's (Schatz, Moser, Covassin, & Karpf, 2011; Semple et al., 2015; Stern et al., 2011). Paired with the emergence of neurocognitive problems, the persistent physical symptoms such as headaches, dizziness, fatigue, and sensitivity to light have the potential to further impact an athlete's wellbeing and prompt more serious issues including severe depression, anxiety, isolation, and suicidal thoughts (Caron, Bloom, Johnston, & Sabiston, 2013). In a study with high school athletes, Yang and colleagues (2017) reported an average annual concussion rate of 39.8 per 100,000 athletic exposures. The highest concussion rates among the observed sports were football (78.4), girls' soccer (54.9), boys' wrestling (36.4), girls' basketball (34.6), and boys' soccer (30.9). Given the high rate and high risk of concussions and a sporting culture that praises and idealizes athletes who push

through injuries (Guay et al., 2016; McGannon, Cunningham, & Schinke, 2013; Nixon, 1992), it is imperative to acknowledge the potentially detrimental consequences sport-related concussions may present to an athlete's current and future health and wellbeing.

Peers, coaches, and parents of young athletes frequently fail to consider the magnitude of concussions and their potential to inflict harm to one's wellbeing (Graham et al., 2014). During adolescence, the brain remains in a developmentally sensitive stage subjecting it to higher risk when traumatic biomechanical forces occur to the head (Grady, 2010; Semple et al., 2015). Consequently, the youth demographic is exposed to amplified dangers to mental health and physical wellbeing in comparison to older adults (Field, Collins, Lovell, & Maroon, 2003).

Current literature has focused on physiological consequences of the injury, the implementation of sport regulations and rules to protect the athlete, the development of more efficient protective equipment, and guidelines to determine when the athlete should be permitted return to play. No research has, however, attempted to understand the sources of commitment for athletes to return to their sport following one or multiple concussions. Furthermore, given the unfavourable potential outcomes associated with returning to a high risk sport and subjecting oneself to possible further harm, it is necessary to understand the factors involved in youth athletes' sport commitment following multiple concussions and persistent symptoms. Despite previous research attempting to understand the psychosocial challenges and thought process when returning from musculoskeletal injuries, little is known regarding the athlete perspective and challenges encountered when returning from multiple concussions.

### **Research Purpose**

The purpose of this Master's research was to explore factors involved in youth athletes' sport commitment decision following multiple concussions and persistent symptoms. Three questions guided this research: (a) Guided by the sport commitment model (SCM), what are the



determinants of youth athletes' sport commitment following multiple concussions and persistent symptoms? (b) Do any novel sources of sport commitment emerge that are unique to concussions that grant inclusion in the SCM? (c) What are the challenges athletes with multiple concussions and protracted symptoms encounter during the recovery and return to play transition that may undermine sport commitment? While the first two research questions were developed prior to the study, the latter question was developed upon inductive analysis when it became evident that the youth athletes encountered many challenges related to the injury and return to play following multiple concussions and persistent symptoms.

## **Review of Literature**

### **Concussions**

The magnitude and significance of concussions has gained awareness in recent history. With the deaths of young teenagers and severe long-term symptoms reported among retired high level athletes (Caron et al., 2013), it is essential to better understand these brain injuries in order to avoid more serious consequences. A concussion, also called mild traumatic brain injury, is defined as “a complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces” (McCrory et al., 2013, p. 256). These forces may be presented by a direct blow to the head or forces to the body resulting in a quick acceleration and deceleration of the brain within the skull (Guskiewicz, Herring, & Putukian, 2009). The manifestation of such forces results in neuro-inflammation and neural dysfunction due to changes in metabolism, impaired connectivity, or altered neurotransmission within the brain (Giza & Hovda, 2001). With these rapid changes in the brain, the athlete may exhibit symptoms such as headaches, confusion, blurred vision, sensitivity to light, nausea, and dizziness for a short or extended period of time (Centers for Disease Control and Prevention, 2015). The initial recognition of the injury and receiving effective care from health professionals are vital to ensure the safety of the athlete and

to prevent premature return to play, risking further damage to the brain (Broglia et al., 2014; McCrea, Hammeke, Olsen, Leo, & Guskiewicz, 2004; McCrory et al., 2017). This is not an easy feat as diagnosis is often predicated upon subjective patient self-reports (Graham et al., 2014; McCrory et al., 2017).

In 2013, an estimated 2.8 million traumatic brain injuries occurred in the United States alone (Taylor, Bell, Breiding, & Xu, 2017). Furthermore, Coronado and colleagues (2015) issued a report regarding trends in sport and recreation-related traumatic brain injuries from 2001 to 2012 revealing that over 244,000 traumatic brain injuries occurred in U.S. athletes ages 10 to 19 in 2012. This constituted a 141% increase from 2001 (Coronado et al., 2015). Substantial increases in concussion reporting may be principally attributed to improved diagnosis of the injury and heightened awareness from athletes, physicians, coaches, athletic therapists, and the general public (Bakhos, Lockhart, Myers, & Linakis, 2010; Taylor et al., 2017). Nevertheless, these troubling numbers fail to consider the high rate of unrecognized concussions and deliberately unreported symptoms by athletes (Daneshvar, Nowinski, McKee, & Cantu, 2011; McCrea et al., 2004; Yeates, 2010).

### **Lack of Understanding and Support**

Despite efforts to increase awareness through the implementation of educational resources (e.g., HEADS UP, Making Head Way), laws (e.g., Rowan's Law, Zackery Lystedt Law), and protocols that educate and enforce better injury management (e.g., Canadian Pediatric Society: Sport-Related Concussion: Evaluation and Management, Parachute Canada: Return to Play Guidelines), the existing concussion literature continues to report a lack of proper support and understanding of the injury (Carroll-Alfano, 2017; Miyashita et al., 2014; Sye, Sullivan, & McCrory, 2006). In a study documenting the awareness and attitude of high school rugby players, Sye and colleagues (2006) indicated a limited understanding of concussion guidelines,

protocols, and dangers. More recent research has validated these findings by reporting a continued lack of understanding in regards to the severity of concussions and an overall ineffectiveness of concussion education (Carroll-Alfano, 2017; Miyashita et al., 2014).

Social pressure from family, peers, coaches, and fans frequently influence athletes to prematurely return to play (Echemendia & Cantu, 2003; Kroshus, Garnett, Hawrilenko, Baugh, & Calzo, 2015). The athlete's level in the sport and the importance of upcoming games or competitions indicate a significant predictor of the pressures athletes experience to return to play prior to symptom resolution (Sye et al., 2006). This may be attributed to the existing sporting culture that dismisses injuries and encourages young athletes to push through pain (Guay et al., 2016; McGannon et al., 2013; Nixon, 1992). In a sample of 477 participants, 151 athletes alleged that a concussed player on the team had been pressured to play while managing a concussion. In addition, 128 participants condoned playing with a concussion in championship games (Sye et al., 2006). Kroshus and colleagues (2015) expressed similar findings where nearly one quarter of the 328 participant sample expressed pressure to play from a coach, teammate, parent, or fan following head impact. Moreover, the pressure experienced from teammates, parents, and fans was associated with decreased intention to report potential future concussions (Kroshus et al., 2015).

In a study including 63 athletes with concussions and 63 athletes with orthopedic injuries, Covassin and colleagues (2014) compared anxiety and social support provision. Despite relying on similar sources of support, participants with concussions indicated more dissatisfaction with the support provided. Furthermore, the findings showed that greater social support effectively diminished state anxiety and return to play concerns. A lack of optimal support was further communicated in Caron and colleagues' (2013) study with professional hockey players who retired due to their concussion history. The athletes expressed feeling isolated and alone due to

coaches encouraging their alienation from the team. The participants also expressed a lack of understanding of their circumstances from support systems during their recovery (Caron et al., 2013). The overall lack of support and understanding from family, teammates, friends, and coaches has been attributed to the invisible nature of the injury and the lesser need for tangible support and rehabilitation support by athletes with musculoskeletal injuries (Bloom, Horton, McCrory, & Johnston, 2004; Covassin et al., 2014).

### **Multiple Concussions**

Multiple concussions prove to have grave consequences to the athlete brain and injury threshold (Graham et al., 2014). Evidence from current literature indicates that concussion history predisposes an individual to increased risk and susceptibility to a subsequent one in the future (Graham et al., 2014; Laker, 2015; Purcell, 2014; Semple et al., 2015). In a study with high school and collegiate football players, it was revealed that the risk of sustaining future concussions is increased drastically after only one concussion (Guskiewicz, Weaver, Padua, Garrett, 2000). In addition, research has suggested a cumulative effect in concussions resulting in more severe and pronounced symptoms when a subsequent concussion is sustained (Collins et al., 2002).

Research examining the relationship between concussion history and intensified symptoms following a subsequent concussion add to the current literature regarding the effects of multiple concussions (Collins et al., 2002). In a study conducted by Collins and his peers (2002), 60 adolescent athletes with no concussion history and 28 adolescent athletes with a history of three or more concussions were compared in terms of on-field concussion symptoms. The results demonstrated that a prominent concussion history is associated with an increased susceptibility to display more symptoms immediately following an impact. Moreover, high school athletes with a history of at least three concussions were nine times more likely to exhibit

at least three abnormal concussion symptoms of the injury after sustaining another concussion (Collins et al., 2002). This demonstrates the increased vulnerability and decreased threshold that exists in youth athletes who have experienced multiple concussions (Collins et al., 2002; Field et al., 2003; McCrory, Davis, & Makkdissi, 2012). A longitudinal study with 2905 collegiate football players revealed similar findings. Players reporting at least three concussions were 3 times more likely to sustain a concussion than their colleagues who reported no concussion history (Guskiewicz et al., 2003).

The long-term risk factors associated with multiple concussions pose major threats to one's future health and wellbeing and have been associated with the development of chronic traumatic encephalopathy (CTE), a progressive neurodegenerative condition resulting from multiple concussions (Iverson, 2014). CTE has been associated with post-traumatic stress disorder, anxiety, depression, and substance abuse (Semple et al., 2015). Dementia and mood disorders are also commonly reported (Stern et al., 2011). According to Purcell (2014), medical retirement from sport is recommended for young athletes when there is evidence of decreased threshold and higher sensitivity to less force; the presence of more severe and persistent symptoms following subsequent concussions; the emergence of learning disabilities and reduced cognitive functioning; or when the athlete plays a high risk position or dangerous playing style.

Multiple concussions have also been associated with the persistence of concussion symptoms which may become debilitating, frustrating, and ultimately alter one's lifestyle (Caron et al., 2013). In a study examining 119 cases of pediatric concussions, evidence proved that previous head injuries were prognostic of persistent concussion symptoms three months following the injury (Ponsford et al., 2012). Eisenberg, Andrea, Meehan, and Mannix (2013) further supported this finding in their study involving 280 11-22 year-old participants who experienced repeated concussions. Results indicated that previous concussions and the amount of

time between injuries had a predictive capacity in the persistence of concussion symptoms. Patients with multiple concussions or history of a concussion within a year prior to the study experienced more prolonged symptoms than patients with no previous concussion or a single concussion beyond the one year timeframe (Eisenberg et al., 2013). Among the youth population, Schatz and Moser (2011) additionally found that a concussion history may be associated with the onset of more symptoms related to the development of CTE.

### **Youth Sensitivity**

Although the degree to which multiple pediatric concussions affect individuals in the long-term through the onset of CTE, depression, and dementia remains unclear, a young age of occurrence is recognized as a crucial factor to be considered (Graham et al., 2014). According to the National Hospital Ambulatory Medical Care Survey, concussions account for 1 in 220 Canadian emergency department visits among the pediatric population (below 18 years of age) (Zemek, Farion, Sampson, & McGahern, 2013). Furthermore, of all adolescent emergency room visits, 50% are attributed to sport participation (Gordon, Dooley, & Wood, 2006). Given the severity and implications of repetitive concussions to one's quality of life and wellbeing, the risk is heightened for adolescents due to the fact that the brain remains in a developmental stage. During the teen years through the mid-twenties, there continues to be "rapid changes in synapses, myelination, and metabolism" within the brain (Graham et al., 2014 p. 55). Due to these dynamic changes, adolescent brains respond differently to concussions in comparison with adults (Choe, Babikian, Difiori, Hovda, & Giza, 2012).

The pediatric population is subject to the longest recovery time post-concussion. While older adults are often able to recover within 7-10 days (Echemendia, Putukian, Mackin, Julian, & Shoss, 2001; McCrory et al., 2017), youth athletes will experience extended recovery and only return to cognitive baseline within 14-28 days (Corwin et al., 2014; Graham et al, 2014).

According to animal models, this prolonged recovery is due to a “pathological release of excitatory amino acid neurotransmitters following trauma” (Grady, 2010, p. 156). Furthermore, pediatric concussion patients report more prolonged cognitive concussion symptoms at one year post-concussion than adults (Eisenberg, et al., 2013). Semple and colleagues (2015) emphasize the presence of negative short-term and long-term implications associated with repetitive concussions to the brain during maturation. Such implications include decreased white matter integrity (Semple et al., 2015), slowed advances in neurocognitive functioning, and impediments to the development of effective cognitive strategy (Alexander, Shuttleworth-Edwards, Kidd, & Malcolm, 2015). In comparison to college athletes aged 18 to 25, high school athletes aged 14 to 18 also display more pronounced memory problems, processing speed, and reaction time following a concussion (Field et al., 2003). Performance and functioning in academic settings also suffer (Fay et al., 2010). Given the evidence substantiating the extent to which youth concussions can be detrimental, this population warrants examination. It is essential to understand the return to play perceptions and sources of youth athletes’ continued involvement in their sport despite sustaining multiple concussions.

### **Persistent Concussion Symptoms**

Several studies indicate that symptoms of sport-related concussions will typically subside within 4 weeks (Corwin et al., 2014; Graham et al., 2014; Wasserman, Kerr, Zuckerman, Covassin, 2015). Although the majority of cases are resolved within this period, there is growing consensus that symptoms have the potential to persist for several months or years beyond the injury in 10-20% of all cases of concussion (Zemek et al., 2013). Among all patients, children and adolescents inevitably remain the most vulnerable to these persisting symptoms (Semple et al., 2015; Zemek et al., 2013). Nearly one third of acute youth sustained concussions are characterized by ongoing somatic, cognitive, and behavioural symptoms (Zemek et al., 2016).

Persisting post-concussion symptoms can manifest themselves as a more severe condition called post-concussion syndrome or post-concussional syndrome (PCS). According to the 10<sup>th</sup> revision of the International Statistical Classification of Diseases and Related Health Problems (ISCDRHP), post-concussional syndrome is “a syndrome that occurs following head trauma (usually sufficiently severe to result in loss of consciousness) and includes a number of disparate symptoms such as headache, dizziness, fatigue, irritability, difficulty in concentration and performing mental tasks, impairment of memory, insomnia, and reduced tolerance to stress, emotional excitement, or alcohol” (WHO, 2016, F07.2). The ICD-10 and the DSM-IV are the most commonly cited sources when considering diagnostic criteria and definitions for PCS; however, they yield contrasting standards. While both guidelines include the onset of symptoms resulting from head trauma and the presence of at least three of the aforementioned symptoms presenting themselves following the trauma, the DSM-IV requires a much more conservative approach to diagnosing PCS. According to the DSM criteria, symptoms must persist for at least 3 months, a duration that was not specified in the ICD-10 criteria. In addition, it further requires that patients display a cognitive deficit in attention or memory and interference with social, work, or academic functioning (Rose, Fischer, Heyer, 2015).

Criteria have been largely debated among health professionals and researchers. While some accept the DSM-IV’s more conservative guidelines, several studies elect to adopt a more flexible definition of PCS, which requires 28 days of persisting symptoms (Leddy, Sandhu, Sodhi, Baker, & Willer, 2012; Willer & Leddy, 2006; Zemek et al., 2016). Sport-related concussions are often resolved within this period of time (Graham et al., 2014; Makdissi et al., 2010). Zemek and the Pediatric Emergency Research Canada Concussion Team (2016) accept this period of time as an accurate representation of prolonged concussion symptoms. These lasting symptoms can prove to be challenging to one’s life and well-being. Whether it is high



school athletes or retired professional athletes, the cumulative effects of concussions can result in persistent PCS lasting for several years as cited by Zemek and colleagues (2013).

### **Injury and Return to Play**

Accompanying any severe injuries is a multitude of challenges that undermine an individual's confidence, self-esteem, self-efficacy, and social identity (Brewer, 2010; Grindstaff, Wrisberg, & Ross, 2010; Heijne, Axelsson, Werner, & Biguet, 2008; Tracey, 2003). Although negative cognitive appraisals and emotions improve throughout recovery, they may persist and disrupt a positive return to play outcome (Evans, Hardy, & Fleming, 2000; Johnston & Carroll, 1998; Langford, Webster, & Feller, 2009). These appraisals and emotions have been found to influence the behavioural responses of athletes throughout the rehabilitation process and thus further impact the mental health of athletes (Clement, Arvinen-Barrow, & Fetty, 2015; Wiese-Bjornstal, Smith, Shaffer, & Morrey, 1998). In both concussion and musculoskeletal injury research, the challenges associated with prolonged recoveries have been related to the onset of mood disturbances, depression, and anxiety (Appaneal, Rockhill Levine, Perna, & Roh, 2009; Guskiewicz et al., 2007; Wiese-Bjornstal, 2010). Kontos, Covassin, Elbin, and Parker (2012) suggested that a major antecedent for athletes' depression following concussions is related to persistent post-concussion symptoms which incite frustration and feelings of isolation from their team. According to Brewer (2001), depression and frustration remain salient in every stage of the athlete recovery process.

The psychosocial challenges associated with injuries during the recovery process initiate substantial barriers that affect positive return to play outcomes (Podlog & Eklund, 2007; Podlog, Dimmock, & Miller, 2011; Podlog & Dionigi, 2010). Present literature supports the necessity for athletes to not only be physically prepared to return to sport, but psychologically prepared as well (Glazer, 2009; Wadey & Evans, 2011). Although there is minimal literature pertaining to

return to play following concussions, the psychosocial barriers involved in returning to play among athletes with musculoskeletal injuries have been widely examined (Johnston & Carroll, 1998; Kvist, Ek, Sporrstedt, & Good, 2005; Podlog & Eklund, 2007; Podlog et al., 2011; Podlog et al., 2013; Udry & Andersen, 2008). Adult and adolescent athletes returning to practice and play following injury have reported feeling anxiety associated with the potential of re-injury, negative appraisals pertaining to post-injury ability, concerns regarding their self-presentation, and frustration about the potential of falling behind other competitors (Bianco, 2001; Carson & Polman, 2012; Evans et al., 2000; Podlog et al., 2013; Walker, Thatcher, Lavallee, 2010). The social isolation and detachment from the sport, teammates, and coaches adds to the difficulties of returning following injury (Grindstaff et al., 2010; Podlog & Eklund, 2007; Podlog & Dionigi, 2010; Tracey, 2003). In a study consisting of 108 athletes undergoing ACL surgery, Brewer, Cornelius, Stephan, and Van Raalte (2010) found that participants' identity as an athlete was the most threatened during the later stages of rehabilitation and return to play. Athlete pressure to return prior to psychological or physical readiness is another prominent component that initiates problems associated with the return to play (Echemendia & Cantu, 2003; Kroshus et al., 2015; Murphy & Waddington, 2007; Podlog et al., 2011). Feelings of pressure may be self-imposed by the athlete who is concerned about letting teammates and coaches down, is impatient with the injury recovery, has established a specific return to play deadline, or is fearful about losing a position on the team (Kontos, Collins, & Russo, 2004; Podlog & Dionigi, 2010; Podlog et al., 2013; Roderick, Waddington, & Parker, 2000). The concussion and musculoskeletal injury literature has additionally revealed that parents, coaches, and teammates place pressure on the athlete to return prematurely (Andersen, 2001; Bauman, 2005; Gould, Udry, Bridges, & Beck, 1997; Podlog et al., 2011).

### **Gaps in the Literature**

Literature currently supports the necessity to observe the youth athlete population in the area of concussions. There is extensive support demonstrating the damaging and detrimental influences of repetitive concussions. Multiple concussions have the potential to inflict significant short-term and long-term dangers related to concussions. Concussion literature has, however, largely focused on quantitative methodologies and post-positivist worldviews in the fields of physiology and neuroscience (Caron et al., 2013). The focus has predominantly been on better understanding the injury and the potential consequences, developing improved equipment, introducing new sporting regulations to better protect the athlete, and implementing improved return to play guidelines. No studies have attempted to understand the sources of athletes' sport commitment decisions following multiple concussions.

Existing injury and return to play literature has solely focused on musculoskeletal injuries. Contrary to musculoskeletal injuries, however, concussions result from trauma to the brain and are arguably associated with higher potential detriments to future mental health and quality of life. Moreover, the increasing understanding of the consequences of multiple concussions and the high rate of occurrence (Coronado et al., 2015) and vulnerability among the youth athlete population (McCrory et al., 2017) suggests a necessity to better understand the psychosocial ramifications of concussions and return to play perceptions in athletes who remained committed to their sport following multiple concussions.

The aforementioned gaps in the literature provided the rationale for conducting the present research, aimed at understanding the challenges and determinants for which athletes remain committed to a sport following multiple concussions and ongoing symptoms. This was deemed necessary to increase knowledge of various factors that may undermine or strengthen the desire to remain committed, even when a history of concussions poses serious risks to

athletes. Given the limited research on athlete commitment following concussions in sport, the sport commitment model (SCM) was used to guide the present study.

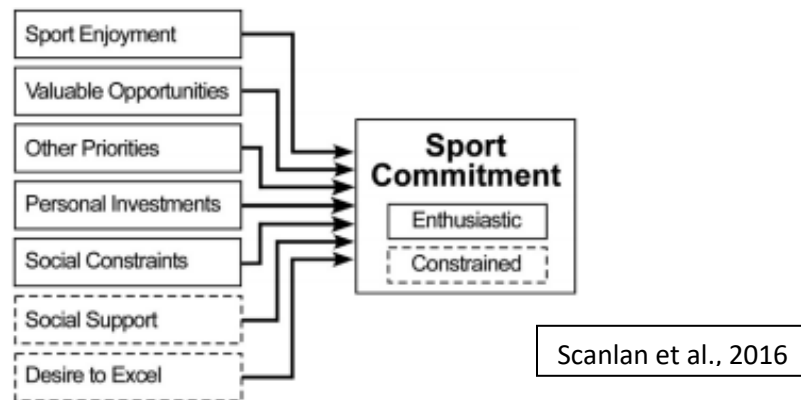
Provided the evident gaps pertaining to youth athletes' sport commitment following multiple concussions, the purpose of this research was to explore factors involved in youth athletes' sport commitment decision following multiple concussions and persistent symptoms. The three research questions of this Master's research were related to athlete sources of sport commitment and the psychosocial challenges encountered throughout the recovery and return to play process. The researchers therefore sought to answer: (a) What are the determinants of youth athletes' sport commitment following multiple concussions and persistent symptoms? (b) Do any novel sources of sport commitment emerge that are unique to concussions and grant inclusion in the SCM? (c) What are the challenges athletes with multiple concussions and protracted symptoms encounter during the recovery and return to play transition that may undermine sport commitment?

### **Theoretical Framework**

#### **Sport Commitment Model (SCM)**

The sport commitment model (Scanlan, Carpenter, Schmidt, Simons, & Keeler, 1993; Scanlan, Chow, Sousa, Scanlan, & Knifsend, 2016) is a theoretical model describing the underlying motivational determinants involved in an athlete's continued involvement in a sport. Sport commitment is defined as "the desire and resolve to continue sport participation over time" (Scanlan et al., 1993, p. 7). Scanlan and colleagues (2016) postulate that there are seven sources of sport commitment that predict either enthusiastic commitment or constrained commitment (see *Figure 1*). Enthusiastic commitment reflects the athlete's ambition to persevere in a sport due to an autonomous desire. Constrained commitment represents feelings of control and obligation to remain committed to a sport.

The seven determinants of sport commitment include: sport enjoyment, valuable opportunities, other priorities, personal investments, social constraints, social support, and desire to excel. *Sport enjoyment* refers to intrinsic feelings and positive affect when engaging in a sport. This may involve feelings of joy, pleasure, fun, love, and passion (Scanlan et al., 2016). *Valuable opportunities* concern the anticipated experiences and benefits that engagement in the sport creates. These may include intrinsic (e.g., fitness, skill mastery, positive interactions, friendships) and extrinsic (e.g., scholarships, travel, career opportunities, recognition) opportunities (Iñigo, et al., 2015; Scanlan et al., 2016; Weiss & Amorose, 2008). *Other priorities* refers to the attractiveness or obligation to pursue other alternatives (e.g., school, other sports, family, significant other) that may potentially counter full commitment to the sport and directly conflict with sport involvement (Scanlan, Russell, Beals, Scanlan, 2003; Scanlan, Russell, Magyar, & Scanlan, 2009; Weiss, Kimmel, & Smith, 2001). *Personal investments* comprise both the loss and quantity of personal resources (e.g., time, money, effort, training) invested into a sport that may strengthen or weaken commitment (Scanlan et al., 2016). *Social constraints* pertain to feelings of obligation and expectations from others to remain committed to the sport (Scanlan et al., 2016; Weiss & Amorose, 2008). *Social support* refers to encouragement and support significant others provide to an athlete that aids their continued involvement. This determinant incorporates emotional, informational, and instrumental support (Scanlan et al., 2016). The *desire to excel* was added in the most recent revision of the SCM (Scanlan et al. 2016). This determinant can be looked at through mastery achievement (i.e., striving to improve, striving to accomplish goals, achieving one's potential) or social achievement (i.e., winning, outperforming opponents) (Scanlan, Russell, Scanlan, Klunchoo, & Chow, 2013).



*Figure 1:* Restructured Sport Commitment Model incorporating most recent updates (i.e., social support, desire to excel, and constrained commitment)

This model has predominantly been applied to the continued involvement of healthy athletes; however, a recent study also applied it to athletes with musculoskeletal injuries. Through the use of the sport commitment model, Iñigo and colleagues (2015) examined the reasons for injured athletes to remain committed to their sport. Sport enjoyment, valuable opportunities, personal investments, social constraints, and social support were all found to be prominent reasons for athletes to remain committed to their sport and return to play. Desire to excel was, however, not considered in this study. Given the alignments found between the sport commitment model and return to play following musculoskeletal injury, this theoretical framework was deemed suitable for the present research with athletes who have sustained multiple concussions and protracted symptoms.

### **Paradigmatic Position**

The principles of the post-positivist paradigm were employed to inform this Master's research. The critical realist ontology within post-positivism recognizes that a true reality may exist however it is fallible and cannot fully be established due to individuals' pre-existing knowledge, assumptions, biases, and values (Guba & Lincoln, 1994; Robson & McCartan, 2016). In order to control for the imperfect reality, the researcher seeks objectivity by accounting

for and managing the influence of personal preconceived notions and knowledge (Ponteretto, 2005; Robson & McCartan, 2016). In line with the scientific approach, the post-positivist paradigm supports the testing of a pre-existing theory through data collection in order to support, expand, or critique it (Robson & McCartan, 2016).

The post-positivist paradigm was deemed suitable for the present study as we used the SCM as a predetermined framework to collect and analyze data. The SCM was additionally used to develop the interview guide. The use of both inductive and deductive reasoning in the present study allowed for critique and expansion of the current SCM. Specifically, it helped the researchers to determine the most influential sources of sport commitment within the SCM for youth athletes with multiple concussions and consider whether any additional sources of sport commitment may influence their desire to remain committed.

### **Methodology**

A basic qualitative methodology guided this research. Qualitative researchers employ an interpretive approach that seeks to acquire a comprehensive understanding of phenomena through individuals' experiences, perceptions, and meanings (Creswell, 2013; Denzin & Lincoln, 2005; Merriam, 2002). Given that no previous research has examined the return to play decision after sustaining multiple concussions, adopting a qualitative methodology promoted a comprehensive exploration of factors involved in the continued sport commitment of youth athletes following multiple concussions and persistent symptoms as well as the challenges that may undermine this continued involvement. A quantitative ranking question was also asked in order to gain a greater image of athletes' perspectives of the sources of sport commitment. This, however, was not sufficient to diverge from a qualitative methodological approach.

## Methods

### Participants

Purposive sampling (Patton, 2002) and snowball sampling (Miles & Huberman, 1994) were employed to recruit 11 participants between the ages of 12 and 18. All participants were athletes involved in a year-round competitive sport team. In accordance with Guskiewicz and Mihalik (2011), a concussion was defined by any instance where, following a contact to the head, neck, or body, the athlete displayed signs of disrupted cognitive, physical, and affective functioning. Participants experienced at least three of the following symptoms in the days or weeks following the most recent incidence: headache, dizziness, fatigue, irritability, reduced tolerance to stress, reduced emotional excitement, nausea, sleep disturbances, or memory problems (WHO, 2016, F07.2; Center for Disease Control and Prevention, 2015). In order to be eligible, these symptoms were required to persist beyond 28 days. The final inclusion criterion for the present study was that youth athletes had to remain committed to their sport following a minimum of three concussions. Athletes meeting the aforementioned criteria but who have retired following subsequent concussions were also included in this study. The reasoning for including athletes who have retired is that they still displayed substantial commitment prior to retiring from their sport and would be able to provide insight into why they remained committed during their playing career despite sustaining multiple concussions. For example, an athlete who retired after her seventh concussion was deemed suitable for the study because she remained committed to her sport beyond the three concussion minimum of the study.

The number of participants required in qualitative research has been widely discussed (Francis et al., 2010). In the present study, participants were interviewed until theoretical saturation was achieved. Theoretical saturation occurs when participant responses no longer enhance the information or contribute to the emergence of significant new codes or themes



across the data (Fusch & Ness, 2015). According to Guest, Bunce and Johnson (2006), theoretical saturation may be reached in as little as six interviews (Guest et al., 2006). The initial target sample for the present study was 10 to 12 participants due to the challenging demographic and specific inclusion criteria of the study. Theoretical saturation was established after 11 participant interviews.

**Participant demographics.** Participant demographic information was obtained in the first phase of the semi-structured interview. Eight participants in the present study were female and three were male. The athletes were between the ages of 12 and 18, with the mean age being 15.25 years of age. All participants were from the province of Ontario in Canada. The number of concussions sustained across the participant sample ranged between three and nine, with an average of 4.27. Concussions were both self-diagnosed and medically diagnosed by a health care professional. Participants were involved in contact sports (rugby), collision sports (women's hockey, soccer, basketball), combat sports (jiu-jitsu), and high risk non-contact sports (gymnastics, cheerleading). Despite remaining committed to their initial sport after a minimum of three concussions, four participants have since made the decision to retire, two were required to retire, four intend to return to their sport, and one has returned to her sport. The majority of participants have experienced symptom improvement; however, only four have completely recovered since the most recent injury.

### **Procedure**

Upon receiving ethical approval to conduct the study from the University of Ottawa Research Ethics Board, contact was made with the lead physician, a pediatric concussion specialist, at the desired medical clinic in Ontario. Permission to recruit from the clinic was subsequently granted by the physician and the owner of the clinic. Recruitment letters and consent forms were provided to the lead nurse of the clinic's sport medicine branch. The

recruitment letters briefly describing the research and including the contact information of the principal investigator were distributed to athletes meeting the inclusion criteria of the study. Parents of participants under the age of 18 were encouraged to discuss study details with their children. Interested athletes 18 years of age and parents or legal guardians of minors signed the consent form and included contact information (i.e., telephone number and email) for the lead investigator to contact them directly. The principal investigator subsequently contacted athletes or parents/guardians in order to schedule an interview at a time and place that was most convenient for the participant (i.e., home, participant's school, principal investigator's university). Prior to the interview, participants were informed of their rights to anonymity and confidentiality. In compliance with the University of Ottawa's research ethics policy, participants under the age of 18 additionally signed an assent form.

**Trustworthiness.** Steps were taken to augment trustworthiness in the research process. First, the principal investigator underwent a bracketing interview (Rolls & Relf, 2006) conducted by a fellow researcher at the principal investigator's university. It must be noted that the principal investigator has never experienced a concussion and was therefore approaching the research with limited concept of the challenges the youth athletes faced following multiple concussions and persistent symptoms. The bracketing interview, however, helped the researcher to become aware of any preconceived assumptions and biases that media attention and peers involved in sports may have generated. Furthermore, it allowed him to reflect upon his own sport commitment decision after sustaining a major knee injury. The increased media attention within the sporting world was an important reason for the principal investigator's interest. Although his knee injury was a musculoskeletal injury, returning to play following the injury created assumptions regarding why athletes make the decision to return to their sport. The enjoyment of the sport and valuable opportunities were important factors for his continued commitment to his

sport. He also recognized that his sport of track and field was important to his self-identity and how he perceived himself. The bracketing interview therefore helped the principal investigator to be aware of his personal experiences and views regarding sport commitment following injury and ensure they were not disclosed or evident during the interview process.

To ensure interview questions were coherent and impartial, pilot interviews were conducted with two athletes who met the eligibility criteria of the study. Pilot interviews ensure that the questions are unbiased, orderly, easy to understand, and generate detailed answers (Turner III, 2010). The pilot interviews, therefore, ensured comfort in the interview process for the lead investigator and allowed for the refinement and sequencing of interview questions. Following the first pilot interview, necessary changes were made to the interview guide. The researchers were satisfied with the modifications made to the interview guide and the principal investigator felt more comfortable in the interview process during the second pilot interview. The second pilot interview was therefore deemed appropriate for inclusion in the present study.

### **Data Collection**

Data were collected through semi-structured interviews with the youth athletes at a time and place convenient for them. The interview questions were open-ended in order to explore the personal and individualized experiences of the participants. Open-ended questions enhance the content of the interview as they encourage deeper thought and description from the participant and thus generate rich data (Yin, 2011). This encouraged athletes to expand on the challenges and apprehensions about returning to sport as well as the reasons for which they remained committed for an extended period of time. It additionally prompted new ideas and inductive themes to emerge from the data. The semi-structured nature of the interview was ideal as it allowed the lead investigator to adapt questions according to participant responses. Having the flexibility to probe allows the researcher to acquire clarification and gather missing information

(Rubin & Rubin, 2011). All interviews took place between the months of March and May of 2017. Interviews were audio-recorded and ranged from 31 to 85 minutes with an average time of 50 minutes and 21 seconds.

The interview guide (Appendix A) was framed to better understand the intrinsic and extrinsic influences involved in the athletes' decision to remain committed to his or her sport. Following a brief introduction and explanation of the research and its purposes, initial questions were asked pertaining to the demographics of the participants. The following section of the interview guide inquired about the athletes' knowledge of concussions, their experiences with concussions, and the challenges they have encountered. Guided by the SCM (Scanlan et al., 2016), the following portion of the interview explored the motivational factors involved in the decision to remain committed to a sport following multiple concussions and protracted symptoms. Concluding questions then further examined the reasons for which athletes maintained a desire to return; whether alternative sports were considered; and touched on athletes' mental health. The interview was finally culminated with athletes answering one ranking question on a sheet of paper in order to rate the seven determinants of sport commitment from most influential to least influential in their decision to return to their sport despite multiple concussions and persistent symptoms. This was used to support sport commitment findings from the individual semi-structured interviews. Despite being framed with the SCM, the interview guide and discussion of the sources of sport commitment prompted thought about the challenges and struggles athletes encountered pertaining to their continued commitment and recovery outcomes, and how these challenges influenced their motivation to return or eventually retire from their sport.

## **Data Analysis**

Participants' audio recorded interviews were transcribed verbatim, yielding 201 single spaced pages of data. Identifying information as well as any names shared during the interviews were removed from the transcripts. In order to enhance credibility, member checking (Merriam, 2002) was employed by emailing all 11 verbatim transcripts to the corresponding participant. According to Sandelowski (2008), member checking enhances validity and accuracy in qualitative research. Each youth athlete was given two weeks to make clarifications, revisions, or contribute new information they deemed necessary or worthy of inclusion. No modifications were requested by the athletes. Interview transcripts were subsequently uploaded to the qualitative data analysis software, NVivo 10 (Qualitative Solution and Research 2012, version 10), in order to organize data and facilitate the coding process during analysis (Creswell, 2013).

Data from this Master's research were analyzed both inductively and deductively in compliance with Braun and Clarke's (2006) six steps for conducting thematic analysis. Thematic analysis was deemed suitable for this study as it allows the researcher to examine extensive textual information in order to create links, discover emerging themes, and organize data (Braun & Clark, 2006). The first step of analysis required multiple readings of each transcript in order to familiarize the researcher with the data. During this process, he recorded initial notes and ideas he deemed relevant for the study. Following the familiarization with interview transcripts, initial codes (i.e. passion, love for the sport, fear, health concerns) were then generated from the data set. During this step, each individual transcript was coded line by line. Deductive analysis during this step also allowed the categorization of the codes within pre-existing constructs of the SCM in the first article. The principal investigator however remained aware and considered the additional codes, which would potentially contribute to the expansion of the SCM. These codes were compared and merged and subsequently sorted into potential themes. In the fourth step of

data analysis, new themes were reviewed and refined to ensure they reflected the data and purpose of the study. Final themes were then defined and named. During this step, each theme was described and thoroughly analyzed to ensure they helped to better understand the sport commitment decision. The final step of thematic analysis involved the production of the written report. This stage included final selections of quotes that best portrayed study findings and supported the themes. This contributed to a coherent analytic narrative.

During the coding process, it became evident that participants encountered several psychosocial barriers that countered their desire and confidence to remain committed to their sport. Using the same analysis to develop the second article, all deductive and inductive codes related to the SCM were then omitted. The third research question was developed at this point in data analysis. The researchers sought to answer: What are the challenges athletes with multiple concussions and protracted symptoms encounter during the recovery and return to play transition that may undermine sport commitment?

**Article One**

Determinants of Youth Athletes' Sport Commitment Following Multiple  
Concussions and Persisting Symptoms



### Abstract

Multiple concussions have been a topic of great and controversial interest in sports as of recently. Despite their proven detrimental effects on athletes' physical, social, and emotional functioning (Cantu, Guskiewicz, & Register-Mihalik, 2010), many athletes still remain committed to their respective sport after being concussed. The purpose of this study was to explore the determinants of youth athletes' sport commitment following multiple concussions and persistent symptoms, using the sport commitment model (SCM) (Scanlan, Chow, Sousa, Scanlan, & Knifsend, 2016) as a theoretical framework. A secondary purpose was to expand upon the current SCM by exploring other potential determinants specifically related to return to play after multiple concussions. Individual semi-structured interviews were conducted with 11 youth athletes between the ages of 12 and 18 ( $M = 15.25$ ). All participants had previously demonstrated commitment to their sport despite sustaining a minimum of three concussions with the onset of protracted symptoms lasting beyond 28 days following the most recent concussion. Deductive and inductive thematic analyses generated three main findings. First, sport enjoyment, involvement opportunities, and desire to excel were the most salient sources of sport commitment. Second, constructs of social support and social constraints were the weakest indicators of youth sport commitment. Finally, findings supported the inclusion of athletic identity as a novel construct within the SCM. Overall, findings from this study expand the current understanding of sport commitment following injury and provide the first insights into the reasons athletes with multiple concussions remain committed to their sport despite potential detrimental future consequences.

*Keywords:* sport commitment model, multiple concussions, youth sport, motivation

### Determinants of Youth Athletes' Sport Commitment Following Multiple Concussions and Persisting Symptoms

Sport participation is instrumental in youth development as it promotes social and mental development, fosters physical literacy, and promotes the adoption of a healthy and active lifestyle (Fraser-Thomas, Coté, & Deakin, 2005; Hamilton, Hamilton, & Pittman, 2004). Despite the numerous benefits, the potential destructive consequences of sport participation are seldom acknowledged. In recent years, however, concussions, or mild traumatic brain injuries, have become a prevalent issue affecting approximately 2.8 million people annually in the United States alone (Taylor, Bell, Breiding, & Xu, 2017). There is a current increase in incidence rates and emergency department visits regarding sport-related concussions, with the greatest increase among the youth population (i.e., 18 years of age and younger) (Canadian Institute for Health Information, 2016; Gilchrist, Thomas, Xu, McGuire, & Coronado, 2011). According to Coronado and colleagues (2015), 244,000 traumatic brain injuries were reported by athletes between the ages of 10 to 19 in 2012. This reflected a 141% increase from 2001 (Coronado et al., 2015). Some research attributes this trend to greater awareness and better diagnosis of the injury (Bakhos, Lockhart, Myers, & Linakis, 2010; Guay, et al., 2016). However, such increases amplify the evident problem surrounding concussions in sport.

Multiple concussions are a growing fear when it comes to the long-term health and well-being of athletes. Following one mild traumatic brain injury, an individual is predisposed to greater risk and increased susceptibility to sustaining a subsequent one (Graham, Rivara, Ford, & Spicer, 2014; Laker, 2015; Purcell, 2014; Semple et al., 2015). The current literature surrounding multiple concussions claims a potential cumulative effect associated with more pronounced short-term symptoms and the onset of long-term physical and mental health complications (Collins et al., 2002; Guskiewicz et al., 2003; Zemek, Farion, Sampson, & McGahern, 2013).

According to Purcell (2014), medical retirement should be recommended to athletes who (a) display decreased injury threshold, (b) exhibit persistent symptoms following each subsequent concussion, (c) develop learning disabilities and demonstrate reduced cognitive functioning, or (d) play a high-risk position or have a dangerous style of play.

The youth demographic constitutes a high-risk population and serves as an important group to investigate. They are exposed to heightened sensitivity and amplified dangers as the young brain remains in a crucial developmental stage characterized by rapid changes in synapses, myelination, and metabolism (Graham et al., 2014). These dynamic changes within the adolescent brain result in altered responses and extended recovery time following a mild traumatic brain injury (Choe, Babikian, Difiori, Hovda, & Giza, 2012; Echemendia, Putukian, Mackin, Julian, & Shoss, 2001; McCrory et al., 2017). In comparison to adults who will typically be symptom free within 7-10 days (Echemendia et al., 2001; McCrory et al., 2017), youth athletes will experience a longer recovery period lasting between 14-28 days (Corwin et al., 2014; Graham et al., 2014). Symptoms lasting beyond 28 days are classified as persistent concussion symptoms and may present additional challenges to the young athlete (Leddy, Sandhu, Sodhi, Baker, & Willer, 2012; Zemek et al., 2013; Zemek et al., 2016).

The return to sport following injury has historically been very challenging. Athletes are faced with both emotional and physical challenges as they confront apprehensions, doubts, and uncertainties pertaining to their return to sport (Podlog & Eklund, 2006). These negative feelings are often accompanied by re-injury anxiety and fear of returning to sport (Covassin et al., 2014; Kvist, Ek, Sporrstedt, Good, 2005; Tracy, 2003). Despite this, individuals frequently make the decision to remain committed to their sport. Such decision may be credited to over-conformity to the sport ethic and the athlete role (Guay et al., 2016; Podlog & Eklund, 2005). The current sporting culture glorifies and idealizes athletes who push through pain and persevere regardless

of the potential negative consequences to health and wellbeing (Guay et al., 2016; McGannon, Cunningham, & Schinke, 2013; Nixon, 1992). Various other motives that may influence athletes to return to sport following injury include enjoyment of the game (Bianco, Malo & Orlick, 1999; Iñigo, Podlog & Hall, 2015; Podlog & Eklund, 2005; 2009), socialization and sense of connectedness to a team (Podlog & Eklund, 2006), the pursuit of excellence or victory (Podlog & Eklund, 2006), and identifying oneself with the athlete role (Apps & Walter, 2011; Brewer, Cornelius, Stephan, & Van Raalte, 2010). In the case of athletes with concussions, individuals often feel a sense of obligation to return to sport from family, coaches, teammates, and themselves (Kroshus, Garnett, Hawrilenko, Baugh, & Calzo, 2015). Furthermore, support offered from family, friends, teammates, coaches, and sport medicine practitioners may help relieve an anxiety and distress of returning to play following a concussion (Covassin et al., 2014).

Many of the aforementioned motivators in one's decision to return to a sport are consistent with the determinants identified in the sport commitment model (SCM) (Scanlan Carpenter, Schmidt, Simons, & Keeler, 1993; Scanlan, Chow, Sousa, Scanlan, & Knifsend, 2016). Scanlan and colleagues (1993; 2003; 2009; 2013; 2016) postulated that athletes' continued involvement is based on the following seven determinants: (a) sport enjoyment, (b) valuable opportunities, (c) other priorities, (d) personal investments, (e) social constraints, (f) social support, and (g) desire to excel. The SCM is a widely accepted theoretical model that has been used extensively to guide research seeking to understand the resolve to continue sport participation for an extended time among healthy athletes (Scanlan et al., 1993). It has additionally been applied to understand sport commitment following musculoskeletal injuries (Iñigo et al., 2015). Through the use of the SCM and the Scanlan Collaborative Interview Method, Iñigo and colleagues (2015) examined the sources of commitment for 10 injured varsity

athletes following a musculoskeletal injury. Sport enjoyment, valuable opportunities, personal investments, social constraints, and social support were all found to be prominent reasons for athletes to remain committed to their sport and return to play. Given the increased risk to youth athletes and challenges associated with the return to sport, more research is needed to better examine the determinants of remaining committed or retiring from a sport following multiple concussions in the youth athlete demographic. Therefore, the purpose of this study was to explore the determinants of youth athletes' sport commitment following multiple concussions and persistent symptoms, using the sport commitment model (SCM) as a theoretical framework. A secondary objective was to expand upon the current SCM by exploring other potential determinants specifically related to return to play after multiple concussions. Current application of the model has focused on the continued involvement in sport with healthy athletes and one study explored why athletes remain committed following musculoskeletal injuries. The researchers therefore sought to understand whether any new sources of commitment may originate that are unique to youth athletes who have sustained multiple concussions.

### **Concussions**

A concussion is defined as a “complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces” (McCrory et al., 2013, p. 256). This may be a result of contact to the head or contact to the body, which results in a rapid acceleration and deceleration of the brain within the skull (Guskiewicz & Mihalik, 2011). The manifestation of these biomechanical forces causes abnormalities within the normal neural functioning of the brain (McCrory et al., 2013) resulting in somatic symptoms (e.g., headaches, confusion, blurred vision, photosensitivity, nausea, dizziness, fatigue, insomnia), cognitive symptoms (e.g., memory problems, attention problems, clouding of consciousness), and emotional symptoms (e.g.,

irritability, reduced tolerance to stress, nervousness, reduced emotional excitement, sadness) (Cantu, Guskiewicz, & Register-Mihalik, 2010; Guay et al., 2016).

In the province of Ontario, 150,000 people are diagnosed with a mild traumatic brain injury every year (Ontario Neurotrauma Foundation, 2017). Although data of Canadian sport-related concussions have yet to be established, research reports that 300,000 sport-related concussions occur annually in the United States (Halstead & Walter 2010). The majority of sport-related concussions occur in contact or collision sports such as soccer, football, and hockey (Grady, 2010); however, a major contributor is concomitant with the playing style of the athlete and the position or role within the sport (Purcell, 2014).

### **Multiple Concussions**

There is growing medical concern for athletes who have sustained multiple concussions. In addition to being associated with longer recovery times and more pronounced and persistent symptoms (Collins et al., 2002; Eisenberg, Andrea, Meehan, & Mannix, 2013; Ponsford et al., 2012), they have been found to be related to psychological disorders such as anxiety, depression, post-traumatic stress disorder, substance abuse, and suicide (Semple et al., 2015; Stern et al., 2011); cognitive problems like memory problems, difficulty focusing, and learning disabilities; and comorbid neurodegenerative diseases such as motor neuron disease, Alzheimer's disease, Parkinson's disease, and frontotemporal dementia (Manley et al., 2017). The onset of chronic traumatic encephalopathy (CTE), a neurodegenerative disease linked to multiple head traumas, evoked additional fear in recent years (Gavett, Stern, & McKee, 2011; McKee et al., 2013). Current research reports that following one concussion, an individual's susceptibility to sustain a future one increases nearly six times (Graham et al., 2014). Collins and colleagues (2002) conducted a study that supported such findings. They determined that athletes with a history of three or more concussions were more vulnerable to a subsequent one when compared to athletes

with no concussion history. Furthermore, athletes with a prior concussion demonstrated more severe symptoms 3 months following the concussion (Collins et al., 2002). In a study looking at 2557 high school athletes, these findings were further supported. Previous mild traumatic brain injuries were found to be prognostic of prolonged recovery and more persistent symptoms following the injury (Schatz & Moser, 2011).

### **Youth Sensitivity**

The potentially predictive capacity multiple concussions have in symptom persistence among the youth population is substantial. Young athletes have become the focus of concussion literature as head injuries sustained during this crucial time of brain development may significantly affect the individual (Grady, 2010; Graham et al., 2014; Semple et al., 2015). Over 329,000 children and adolescents are treated for concussions every year in the United States (Centers for Disease Control and Prevention, 2017; Coronado et al., 2015). The Government of Canada (2017) reported that 64% of emergency department visits among 10 to 18 year-olds are related to sport or recreational activities. Within this high percentage, 39% are diagnosed as concussions and 24% are possible concussions (Government of Canada, 2017). Literature has reported a greater increase in youth athlete concussion than in any other population (Canadian Institute for Health Information, 2016; Gilchrist et al., 2011). The Canadian Institute for Health Information (CIHI) (2016) reported a 45% increase in sport-related concussions in athletes aged 12 to 17 between 2010 and 2015 in the provinces of Ontario and Alberta. Athletes in their teen years display more prominent memory problems, slower processing speeds, and slower reaction times following multiple concussions (Field, Collins, Lovell, & Maroon, 2003). Consequently, young athletes are exposed to amplified dangers and increased risk when compared to adults. Such findings support the necessity for concussion research to remain attentive to this population.

Current sport commitment literature has predominantly looked at commitment in healthy athletes. Iñigo and colleagues (2015) were the first to empirically examine why athletes remain committed following major musculoskeletal injuries. Mounting evidence suggests potential dangerous implications associated with multiple concussions and increased vulnerability of the youth population. Contrary to musculoskeletal injuries, concussions involve trauma to the brain which has been associated with potential detrimental consequences to mental health and future wellbeing (Bloom, Horton, McCrory, & Johnston, 2004; Caron, Bloom, Johnston, Sabiston, 2013). The SCM has not been used with vulnerable youth athletes to better understand their motives to sustain their participation after multiple concussions and persistent symptoms. In fact, very little research has focused on this area of research. As such, the present study is addressing an important gap in the literature.

From a theoretical perspective, this research intended to expand the understanding of sport commitment among injured athletes and athletes with multiple concussions. Examining the applicability of the SCM, in particular, was believed to improve our understanding as to why athletes remain committed to their sport when retirement is a reasonable option. In terms of practical contributions, this study aimed to disseminate information and inform support systems such as health care providers, family, coaches, and teammates about what is involved in the decision to remain committed to sport following multiple concussions. With more knowledgeable social support systems, young athletes may be significantly better equipped to make informed decisions that are both logical and rational for their future health and wellbeing.

### **Methodology**

This study was guided by the principles of the post-positivist paradigm (Guba & Lincoln, 1994). The ontological assumptions of this paradigm are grounded in critical realism, which



states that although an objective reality can be assumed, there is a necessity to recognize that all observation and theory is fallible and revisable (Guba & Lincoln, 1994). Qualitative research within the post-positivist paradigm supports a holistic outlook of phenomena and supports the emergence of new empirical findings (Denzin & Lincoln, 2005). A qualitative methodology informed by the SCM and an interpretive approach seeking an in-depth understanding of a phenomenon through individual experiences (Creswell, 2007; Denzin & Lincoln, 2005; Merriam, 2002) guided this research. The researchers were, therefore, able to consider the various experiences and realities of each individual athlete.

### **Participants**

A total of 11 pre-adolescent and adolescent athletes (3 males, 8 females) between the ages of 12 and 18 ( $M = 15.25$ ) were recruited for this study. Purposeful sampling (Patton, 2002) was employed to deliberately select participants from diverse sporting backgrounds who could provide rich information and varied perspectives pertaining to their sport commitment following multiple concussions and persistent symptoms. Snowball sampling (Miles & Huberman, 1994) was also used due to the challenging demographic of the research. Participants satisfied the following eligibility criteria: (a) aged between 12-18, (b) participated in a year-round competitive sport in contact (football, rugby), collision (soccer, basketball), combat (martial arts), or a high risk non-contact sport (gymnastics or cheerleading), (c) sustained a minimum of three concussions with the onset of persisting post-concussion symptoms following the third injury for the duration of at least one month, and (d) displayed sport commitment by returning to their initial sport following a minimum of three concussions.

Although some athletes in this study have attempted to replace their initial 'dangerous' sport with a safer alternative sport, they all demonstrated sport commitment despite multiple concussions and persistent symptoms. For example, an athlete who sustained seven concussions

prior to retiring demonstrated high levels of sport commitment and would be able to contribute to our understanding as to why youth athletes remain committed following multiple concussions.

The aforementioned criteria were indicated on the recruitment letter and both the consent and assent forms. Participants were only recruited if eligibility criteria were met. The youth athletes meeting the criteria were involved in soccer (n = 3), basketball (n = 1), hockey (n = 3), rugby (n = 1), jiu-jitsu (n = 1), cheerleading (n = 1), and gymnastics (n = 1). All participants were recruited from Ottawa and surrounding locations in Eastern and Southwestern regions of Ontario, Canada.

### **Procedure**

In February 2017, upon receiving approval from the University of Ottawa Research Ethics Board, potential participants were recruited from a medical clinic in Ontario. A recruitment letter briefly describing the research and athlete/parental consent forms were distributed to participants meeting the inclusion criteria of the study by the lead nurse in the sport medicine branch of the clinic. The nurse was additionally responsible for the collection of consent forms, which required the consenting individual's signature, email, and phone number. After collecting the signed consent forms, interested athletes and parents were contacted by e-mail or telephone to schedule an interview. Youth athletes under the age of consent (i.e., under 18 years of age) additionally signed an assent form in compliance with the University of Ottawa's ethics policy. Prior to beginning the interviews, participants were informed of their rights to anonymity and confidentiality. They were notified of the voluntary nature of the study and their freedom to withdraw from the study at any point without negative repercussions.

Two pilot interviews were conducted by the principal investigator with athletes meeting the inclusion criteria of the study in order to test and refine the interview guide. Pilot interviews ensured that the questions were coherent, orderly, unbiased, and generated detailed answers

(Turner III, 2010). The second pilot interview was deemed appropriate and of sufficient quality to be included in the study.

### **Data Collection**

Data were collected through one individual semi-structured interview per athlete ranging between 31 minutes to 85 minutes ( $M = 50:21$ ). One ranking question was employed to determine the significance of the sources of the SCM for each individual. Interviews with the youth athletes were audio-recorded and conducted at a time and place convenient for them (i.e., home, school, principal investigator's university). Interviews were conducted until theoretical saturation was achieved and participant responses no longer contributed to new codes or themes across the data (Fusch & Ness, 2015). Theoretical saturation was achieved following 11 participant interviews. The semi-structured nature of the interview was ideal as it permitted the researcher to probe and adapt his questions in accordance with participant responses in order to clarify and further explore their ideas. This allowed for rich data and description to emerge from the interviews. The inclusion of the ranking question allowed researchers to gather additional evidence regarding the importance of each sport commitment determinant for each athlete.

The interview guide was framed to better understand the reasons for which athletes remain committed to their sport following multiple concussions and prolonged symptoms. It was developed in accordance with the seven sources of sport commitment cited in the SCM (Scanlan, et al., 2016) and a previous study applying the SCM to musculoskeletal injuries (Iñigo et al., 2015). The interview guide included six sections. The first section consisted of familiarizing the participant with the purpose of the study, the interview process, participant rights and responsibilities, and to answer any questions or concerns the adolescent had prior to the interview. In the second section, participants were asked demographic questions and questions to become better acquainted with the athlete's sport participation (e.g., age, sporting experience,

training schedule, importance of the sport). The third section dealt with questions regarding the athlete's concussion history and experiences (e.g., Describe your journey with concussions), as well as their knowledge about the injury (e.g., Are you aware of any long-term health risks or implications associated with multiple concussions? If yes, which?). The fourth section was developed to explore the seven tenets of the SCM outlined by Scanlan and colleagues (2016) (i.e., sport enjoyment, valuable opportunities, other priorities, personal investment, social constraints, social support, and desire to excel) and how they influenced the athletes' decision to remain committed. This section sought to gain a better understanding as to why athletes remained committed to their sport for so long and in some cases, the reasons for which they eventually pursued an alternative athletic path. The fifth section of the interview sought to gain additional insight into the athletes' own personal beliefs regarding their commitment. This section also allowed for other ideas to originate that were not included in the SCM and may be unique to concussions (e.g., athletic identity, knowledge of concussion risk, awareness of the severity of the injury, etc.). The final part of the interview required athletes to answer one ranking question in which they ranked the seven sources of sport commitment in order from most important to least important in their decision to remain committed to their sport.

### **Data Analysis**

Thematic analysis (Braun & Clark, 2006) was the guiding approach to data analysis. Both deductive and inductive themes emerged throughout this process. All 11 audio recordings were transcribed verbatim by the principal investigator, yielding 201 single-spaced pages of data. Member checking was employed to ensure proper understanding. Transcripts were emailed to the respective participants for revisions, clarifications, or additions they deemed necessary. No modifications were suggested. Transcripts were then coded using the qualitative data analysis

software, NVivo (Qualitative Solution and Research 2012, version 10). This facilitated data organization and assisted in the analysis process.

Data analysis was conducted both deductively in accordance with the SCM (Scanlan et al., 2016) as well as inductively to explore potential sources that were unique to athletes with multiple concussions. In compliance with the six-step process recommended by Braun & Clarke (2006), the principal investigator read and re-read the transcripts in order to become familiar with the data and take note of initial ideas significant to the research. During preliminary data analysis, the researcher examined each individual transcript. The meaning units acquired through this process contributed to the development of initial codes across the data. These codes were categorized within the pre-existing guiding facets of the SCM: i) sport enjoyment ii) valuable opportunities iii) other priorities iv) personal investment v) social constraints vi) social support, and vii) desire to excel (Scanlan et al., 2016). The principal investigator, however, considered meaning units generated by participants that extended beyond the main facets of the SCM. This allowed for latent inductive themes to emanate from the data, which may support the expansion of the SCM to comprehensively address the motives of concussed athletes. Following this step, all themes were reviewed and inductive themes were refined (e.g., athletic identity). This phase of analysis allowed the principal investigator to ensure that the themes developed offered coherent patterns that were consistent with the purposes of the study. The principal investigator performed the final refinements of the thematic map to confirm the themes reflected the data and contributed to the understanding of athletes' commitment to remain involved in sport. The potential inductive themes were also thoroughly analyzed to ensure salience and pertinence within the data set. The final phase of the thematic analysis involved the production of the report. The principal investigator selected rich participant quotes that best portrayed the data and supported the major themes found in the data analysis. These extracts and the evidence presented

from the data ensured that the analytic narrative accurately presented the findings and provided evidence to meet the purposes of the study.

## Results

Eight determinants of sport commitment were yielded from the data analysis process. Seven were deductively generated in accordance with the SCM (Scanlan et al., 2016): i) sport enjoyment, ii) valuable opportunities, iii) other priorities, iv) personal investment, v) social constraints, vi) social support, and vii) desire to excel. Within these constructs, factors wakening sport commitment were established that are likely unique to athletes with multiple concussions. Athletic identity was the only inductive theme to emerge as a potential new construct to be included in the SCM. The ranking question results (*Table 1*) were utilized to demonstrate the athletes' perceptions regarding the importance of each construct within the SCM. The total score indicates the influence of the sources of sport commitment across the study population. The lowest total score signifies the most influential source in the athletes' commitment decision while the highest total score signifies the least influential source of commitment.

### Ranking Question Results

*Table 1. Ranking question regarding significance of each source of sport commitment*

	Sport Enjoyment	Valuable Opportunities	Other Priorities	Personal Investments	Social Support	Social Constraint	Desire to Excel
Participant 1	1	3	4	5	6	7	2
Participant 2	1	2	4	3	6	7	5
Participant 3	4	7	6	5	3	2	1
Participant 4	1	2	6	4	7	5	3
Participant 5	1	3	5	4	7	6	2
Participant	3	1	7	5	6	4	2

6 Participant	4	3	5	2	7	6	1
7 Participant	1	2	4	5	7	3	6
8 Participant	1	2	5	3	7	6	4
9 Participant	1	2	5	3	7	6	4
10 Participant	1	6	7	2	4	5	3
11 TOTAL	19	33	58	41	67	57	33

\*Lower total score signifies greater influence in sport commitment decision

### Sport Enjoyment

Sport enjoyment was identified as a critical factor in sport commitment for the young athletes. This determinant refers to feelings of positive affect and pleasure acquired through sport engagement (Scanlan et al., 1993). Eight of the eleven athletes considered their enjoyment of the sport to be the most salient reason for which they chose to remain committed despite sustaining multiple concussions and prolonged symptoms (*Table 1*). The words “passion”, “love”, “joy” and “fun” were commonly used by the participants to express the positive sentiments they acquired while participating in their sport. For example, Participant 4 stated: “I am playing the sports that I enjoy and love. I enjoy it so much and even though I have had three concussions, I don’t know how I would stop.” Participant 6 compared the happiness and enjoyment to a “therapy” and an “escape” from the mental challenges she experiences:

Sports are like a therapy for my anxiety and depression, you could say. They tried to make me have talk therapy but I found that playing soccer was my real therapy and it worked. It made me happy and would get me out of the house. It was like an escape and I felt just pure joy when I was playing.

Athletes frequently expressed the unique and incomparable feeling they got from participating in their sport. When asked about her interest in other sports, Participant 10 discussed the adrenaline and excitement she is solely able to obtain from her sport: “I really like to do stunts especially. There is nothing else like that that would compare.” Participant 2 felt similarly: “It’s the one sport for me where I can’t get the same thing from other sports... Soccer is different. For me, nothing really compares to it.” The consideration of other sports was challenging for athletes contemplating retirement and athletes who were required to retire. Attempting to find another sport that paralleled the feelings of enjoyment and passion they experienced from their initial sport proved to be a difficult feat. Participant 8 expressed this as she recounts when her parents suggested pursuing a safer alternative sport such as swimming:

To me, it’s like ‘No. No. I don’t want to.’ In school, I have tried a lot of other sports that aren’t contact and aren’t team sports... I know the risks and I shouldn’t be going back but it’s fun. It’s my life and I can’t give up my passions.

Despite being aware of the potential dangers multiple concussions pose, many athletes remained committed due to the overpowering positive affect they got through playing their sport. This reflected their intrinsic desire and enthusiastic commitment.

### **Valuable Opportunities**

Valuable opportunities refer to the anticipated experiences and benefits an athlete obtains through engagement in the sport (Scanlan et al., 2016). Participants indicated the vital role this determinant played in motivating their continued involvement. One participant confirmed that it was the greatest influence inciting her to remain committed. Eight others identified it to be a strong source of commitment (i.e., among the top three sources for their continued commitment) (*Table 1*). The total score of 33 from the ranking question results indicates that valuable opportunities was tied as the second most influential source of sport commitment. Athletes cited



diverse opportunities they acquired from sport participation that continue to motivate them to remain committed (e.g., social opportunities, sense of recognition and feelings of success, future career opportunities, and mental and physical wellbeing).

**Social opportunities.** The social opportunities to build and maintain relationships were deemed to be highly important among the participants. Strong bonds and friendships were developed as a result of spending countless hours with teammates. Participant 4 reflected her feelings of being supported: “I have this sense and feeling of belonging to a team. You can connect with teammates so much more because they know exactly what you are going through.” The sense of unity and belonging was verbalized by several athletes. Through their continued dedication to their sport, they developed interpersonal relationships and lifelong friendships, which they did not want to relinquish. Many athletes considered their team to be a “second family”. This sense of family and unity within the team acted as a motivator for Participant 8 to return:

My teammates are my sisters. They protect me. We all protect each other. If I am not playing sports, I am not with them, I am not protecting them; I am not there to support them... We have come so far together and I don't want to leave them.

Discontinuing sport participation, however, remained a concern. Athletes who were required to retire or retired in order to preserve their future health discussed their continued desire to return in order to be with friends and teammates. Participant 2 said: “I don't feel as happy, I guess. That was the thing that made my day and I don't see the same people because I am not going to practices.” Some athletes expressed fear of losing friendships and spending less time with teammates. Participant 1, who was involuntarily required to stop due to his concussions, explained that having to stop playing his sport resulted in him losing friendships:

I guess maybe I lost a few friends. Soccer was what we had in common and we used to see each other a lot. After stopping soccer, we don't see each other as much and even though I still love soccer, we kind of lost that a little... I think I am a little excluded from that group that I used to be a part of.

**Recognition and success.** The recognition and success athletes experience from participating in their sport appeared to be a strong influence in their return. Several athletes discussed the feeling they get when they score goals, accomplish a skill for the first time, win medals, perform a unique skill, are recognized as one of the best, or are mentioned in local newspapers. Participant 9 expressed her desire to return to her sport to experience the sense of pride that she acquired from participating in her sport: "I have never felt so much pride. People recognize you and your team is in the sport papers where everyone can see you. I have never been recognized for anything. Hockey has really granted me those opportunities." The feelings deriving from her accomplishments played a major role in her desire to return to the sport despite the potential consequences associated with multiple concussions. Participant 8 was also motivated by her previous achievements: "For me, my sports are worth it because of the accomplishment I feel. It's feeling like we did something. We won that game." The aspiration to regain a sense recognition and feelings of success were a recurrent theme across the data.

**Future opportunities.** Another major valuable opportunity discussed by the youth athletes was the potential facilitation of future endeavours. These included job opportunities, scholarships, or making provincial or national teams. For participant 3, this was a major reason for which he wanted to remain committed to jiu-jitsu:

At the rate I'm going at, I will be a black belt by the time I am sixteen. Sixteen is the age where you are old enough to get a job. It is also the age that I can sign up to be a sensei for the dojo. So job opportunities, scholarships, and there are a lot of

opportunities to move on further. There are a lot of people in my dojo who have moved on to MMA and UFC and stuff like that.

Such opportunities were a strong influence for this athlete and a major motivation to not only remain committed but also work harder to succeed. Other athletes focused more on the potential opportunities their sport would provide through financial support as they head to university. Four participants (P3, P8, P9, P10) mentioned the opportunity of acquiring a scholarship in their sport. Other participants were not thinking about university or have relinquished the dream due to their retirement from the sport. Two of the athletes who had to stop due to their concussions mentioned that scholarships were a major goal for their continued involvement. For example, Participant 5 stated: “I was playing AA hockey so I had opportunities with universities”. Participant 6 who listed valuable opportunities as the most prominent reason for staying committed to her sport explained:

I wanted a scholarship somewhere in the States. That was my priority and my goal. Ever since I was little, I always said that I was going to play for team Canada but that’s a big dream, I guess you could say. I think the big priority was to get a scholarship to the States.

**Mental and physical wellbeing.** Although some athletes mentioned that their involvement in competitive sport made it difficult to balance academics, several argued that it helped them to become more physically fit and control their mental wellbeing. Participant 2 supported this idea by reflecting on her diminished fitness as she continued to experience protracted symptoms: “I just miss being fit and feeling good after whatever I do.” Alternatively, other participants agreed that their engagement in their sport acted as a coping mechanism for daily struggles. For example, Participant 3 acknowledged the power of his sport to bring balance and tranquility to his life:

It is just something that I love doing. It helps me get out my ADHD. It helps me get out rage or any anger I have from facing the day. It helps me take my mind off the day and just focus on something.

Sport was also perceived as an escape for other challenges encountered during one's life.

Participant 6 mentioned that she "went through a really bad phase of depression and soccer was the outlet." Having their sport as a distraction where athletes were able to gain a sense of freedom and control over their lives was an important factor for which athletes maintained a strong desire to return. According to the same athlete, the removal from sport following concussions and persistent symptoms resulted in maladaptive coping, further triggering negative emotions and cognitions. She expressed: "I became really depressed and wouldn't leave the house. I wouldn't even go to school because of how my anxiety was."

### **Other Priorities**

The majority of athletes acknowledged that they have encountered other priorities conflicting with their sport involvement. This determinant refers to the attractiveness or necessity to pursue other alternatives, which may counter full commitment to sport (Scanlan et al., 2016). Academics, health, and family/friends were the main priorities cited by the athletes, as described below. *Table 1* shows that although the participants recognized this source of sport commitment, they perceived it to have low importance in their decision to remain committed, compared to other sources.

**Academics.** The older adolescent athletes commonly perceived the pressures related to school as a main competing priority. Participant 4 confessed her diminished commitment to her sport as a result of the academic stress and concerns about post-secondary school:

I mean, sports were always so fun to me and my favorite thing to do but I've always been a perfectionist and I always knew that school came first and was my priority. With the

years at school getting harder and harder, it became difficult to fully commit to the sport because I was constantly tired and stressed with homework and projects.

Although this athlete remained committed to her sport in the school setting, she credited her need to focus on academics for why she gave up the busy schedule of competitive sport participation. Seven other athletes (P1, P2, P4, P5, P8, P10, P11) acknowledged that school was a competing priority for them as well.

**Health.** Given the concussion history of the athletes in this study, the idea of health was frequently declared to be a competing priority, even though the athletes also recognized the importance of sport for mental and physical wellbeing, as described above. . Since the majority of athletes were aware of the potential future implications associated with multiple concussions, greater consideration was placed on their health. Participant 2 credited her retirement from her sport to her prioritization of health and wellbeing: “I really wanted to go back but my health is an actual thing and I need to think about my future.” As the athletes were experiencing more intense symptoms following each concussion, their health became a prominent priority. Participant 5 explored the moment she realized her health demanded greater consideration:

The fifth one was getting a little worse and lasting longer. I was out of school for three or four weeks before I got back into it. It was really hard but the fifth one showed me that it isn't a good decision to go back.

Even among athletes who decided to remain committed, health concerns prompted the consideration of pursuing a safer sport. In the case of participant 10, she considered returning to a sport in which she was previously involved: “I thought about going back to gymnastics because it's not as dangerous”. Participant 11 also mentioned her contemplations about switching sports following her concussions: “I considered dance for a bit and touch football but I just decided to stay in gymnastics.” In the case of the athletes participating in this study, the thoughts about

pursuing other sports was not due to diminishing interest but the fear of unknown consequences multiple concussions pose to future health. Another factor for which athletes chose to remain committed to their initial sport was their perceptions of insufficient time and ability to succeed in another sport. For example, Participant revealed: “It felt like it was too late for me to join other sports or try other things.” After being involved in a sport for several years, athletes did not believe in their capability to be successful at another sport.

**Sport priority.** While some agreed that other priorities such as school, family, and friends played a weakening influence on sport commitment, nine athletes agreed that it had no influence on the decision to remain committed to sport. Athletes mentioned that their full commitment to sport was the main priority. Other attractive (e.g., hobbies) or pressuring (e.g., academics) alternatives often came second. Participant 3 argued that other priorities would not interfere due to the inherent enjoyment and excitement he experiences from his engagement in jiu-jitsu:

I suppose I would get to spend more time with my friends. I don't get to have very many sleepovers anymore because I have jiu-jitsu on Friday nights and Saturday mornings.

There are a lot of youth group things that happen during jiu-jitsu but I feel like there would be a lot less action though.

Despite more time to pursue other hobbies and spend time with friends and family, he perceived his participation in his sport to be necessary for his wellbeing: “I think I would be generally less calm though. Jiu-jitsu is something that helps me to calm myself and chill out.” Participant 7 echoed similar beliefs. Despite being involved in several external affairs at school and in the community, they did not counter his desire to focus on his sport: “Rugby was going to happen either way. If I had two events at the same time, I would most likely go to rugby... I totally had both at the same time and they were both at 100%.”

### **Personal Investments**

Personal investments was the fourth most influential source of sport commitment among the youth athletes in the study. This determinant refers to the personal resources invested in a sport that cannot be recovered if the athlete retires (Scanlan et al., 2016). Participants cited time (n=11), money (n = 7), and energy and effort to improve (n = 6) as strengthening agents to remain committed after multiple concussions.

After dedicating substantial time to their sport, athletes mentioned the fear of losing what they had worked to achieve. When considering the possibility that concussions may result in him not being permitted to return, Participant 3 revealed that his investments into the sport would not allow him to retire:

I put too much money, effort, and time to stop. I would be devastated if one day I thought I should try one of my old jiu-jitsu moves and I have forgotten how to do it. I would be completely devastated.

Some athletes admitted that regardless of their future in the sport and concussion recovery outcome, their investments and sacrifices into the sport were rewarding and worthwhile. For participant 10, sport participation and her investments enabled her to develop time management skills, a strong work ethic, and other life skills that were conducive to everyday life and future success. For this athlete, investments were not seen as a loss of personal resources: “I don’t know if I would say that I invested too much. I invested a lot of time into it but I don’t regret doing it even if I have to give it up. I got a lot from my sport.” This sense of benefiting through investments and sacrifices was a recurring theme across the data and resulted in many athletes being hesitant to refer to the time, money, and effort as a sacrifice.

Beyond the valuable life skills, participants believed that their personal investments were also mitigated by other important factors such as friendships, valuable opportunities, and

enjoyment of the sport. Participant 8 discussed her ability to overlook her sacrifices due to the positive experiences obtained from her sport: “I’ve invested a lot and that motivates me to stay but I don’t think it was worthless. I met so many friends and had so much fun playing.” For this athlete, her personal investments were a strengthening agent in her continued commitment; however, the investments were primarily viewed as antecedents to other positive factors related to her sport participation.

Participant 9 shared an alternative perspective. Her personal investments were viewed as a vital factor compelling her to remain committed to hockey. Her personal investments and sacrifices to become a better player and accomplish long-term goals were perceived to be irrelevant and worthless if she were to discontinue her sport participation:

It would be really hard to give up hockey. I have done so much to get better. I have done hockey camps and trained on the treadmill and done everything to be a better player. If I stop, I would feel like I wasted all that time, energy, and money for nothing.

Participant 11 felt similarly following her retirement from her sport after 13 years of participation and dedicating 20 hours per week to improving and developing skills: “It feels like I put myself through all that just to quit and never really go anywhere with it.”

### **Social Support**

Participants reported mixed reactions in regards to the support they received to return to sport following their multiple concussions and protracted symptoms. Social support pertains to the encouragement and support provided from significant others (Scanlan et al., 2016). This was perceived to be the weakest determinant in sport commitment with six athletes identifying it as the least important and a total score of 67 (*Table 1*). Although many athletes received support to return from at least one source, their desire to remain committed was diminished from other, less



supportive individuals. Participants provided examples of the varying support levels they received from parents, physicians, teammates, and coaches.

**Parents.** Parents and family were the most mentioned in terms of support in the decision to return to sport. The participants in this study, however, expressed varying experiences with the support that was offered. While three athletes mentioned full parental support in their decision, the remaining athletes experienced inconsistent support or no support to return to their sport following their most recent concussion. Several participants indicated that although their parents attempted to communicate their support to return, they recognized a sense of uncertainty and doubt. For example, Participant 4 stated: “They [parents] do support my decision. They wish that I wasn’t going back but they support it.” Following this athlete’s third concussion involving persisting symptoms, her parents were skeptical about her decision to return. She went on to explain:

I think my mom could tell how eager and excited I was to play again. I think she didn’t want to take that away from me but I’m sure if it would have been her choice she would’ve made me quit for sure...I know that now my family is dreading the day the soccer season begins.

By displaying this sense of doubt and fear pertaining to the recovery outcome, Participant 4 revealed that it made her more reluctant about her own decision to return and would likely only continue for one more year. Participant 8 also expressed the fear her concussions have instilled in her parents: “It really affects my parents. They are like ‘We don’t want to lose you. We love you so much. It’s just a game. You can play something else.’” Despite efforts to discourage a return to play, she later admitted that she understood the reasoning for her parents’ concern and lack of support.

The majority of the athletes acknowledged that despite parents conveying their worry for their wellbeing and mental health, they tentatively allowed them to return to the sport. In some cases, however, parents did not provide any support and thus prohibited their return to play. Two athletes in the current study were not permitted to return. Participant 1, who had been coping with post-concussion symptoms for nearly three years, explained that his mother was fearful and anxious about his wellbeing. Despite the pressure to stop, this athlete expressed continued desire to remain committed: “If it were my decision, I would be back playing soccer. My mom will not let me.”

**Physicians.** Similar to parental support, participants had differing perspectives pertaining to encounters with medical professionals. Physicians were not seen to be supportive in the athletes’ decision to return to play following the most recent concussion. In the case of Participant 2, 5, and 8, medical professionals exerted a great deal of pressure on them to retire from their sport. For example, Participant 8 explained: “The first doctor that we saw was like ‘You can’t play sports ever again...I highly recommend that you don’t play sports ever again and you should put your studies and your career path before anything else right now.’” Participant 2 and 5 experienced differing approaches from doctors who applied scare tactics to discourage their return to play. Their doctors stressed the possibility that a subsequent concussion may result in a coma or paralysis. Participant 5 explained that this statement elicited new fears that continued to affect her: “I am kind of scared to get hit in the head now.”

**Teammates.** Seven athletes discussed the prominent role teammates had in encouraging their return to play. Participant 10 mentioned that her teammates acted as her motivation to remain committed to despite sustaining multiple concussions and experiencing protracted symptoms: “Just your team kind of becomes a second family so everyone just supports you through everything.” For this athlete, the support went beyond her sporting participation and

enhanced her desire to return to her sport. Participant 8 also mentioned her desire to be with her team: “I missed my teammates and I missed my friends too.” As an athlete on the team, participants felt a sense of commitment and responsibility not only to the sport but also to their teammates. Participant 11 expressed the importance of receiving support from teammates to cope with the challenges associated with returning to a sport following a concussion. Being out of the sport for multiple months due to her concussion, she explained that having the support from teammates facilitated the return. She revealed that her teammates were willing to assist her and encourage her when she encountered performance nerves after being out of the sport. She explained that this was crucial in imparting confidence: “If they could tell that I was nervous to do something that I hadn’t done in a while, they would cheer for me and kind of boost my confidence.” This supportive environment was imperative to her success and desire to remain committed.

**Coaches.** Only three athletes mentioned not feeling sufficiently supported by their coaches. Coaches played a pivotal role in these athletes’ desire to return. Having a caring and supportive coach enhanced confidence in the return to play. This was a significant indication that the athlete would have the necessary support to make a safe and positive return. For example, Participant 8 mentioned: “My coaches were like ‘Take your time. We want you to be 100%. We don’t want you to come back, even if you are 99%.’” Having a coach who was understanding and provided the athlete with autonomy as to when to return proved to be an important factor in sport commitment that was shared by participants. Participant 3 also mentioned the important role of his jiu-jitsu instructors who provided necessary encouragement to motivate the athlete to continue pursuing his goals. When asked about who supported him in his return, he said: “My Sensei, my Sempai, my parents, and my friends. They all tell me to not give up on what you do. I agree with that and I have put too much time into it to give up on it.” He went on to say that his

Sensei was the most supportive in his recovery and return. Having a strong bond with his coach was motivated strong aspirations to continue in the sport.

### **Social Constraint**

Social constraints refer to the feelings of social obligation or expectation to remain committed (Scanlan et al., 2016). The participants perceived this determinant to have low importance in terms of sport commitment. Overall, this construct was perceived to be the fifth most influential source of the athletes' continued commitment. Given that the athletes experienced at least three concussions and persistent post-concussion symptoms, they had a low perceived obligation to return. Parents, doctors, and coaches were cautious and athletes received more social pressure to retire than to continue, as previously discussed. Nevertheless, some athletes perceived their parents, coaches, and teammates to serve as social constraints to remain committed to their sport.

**Parental pressure.** In the case of participant 7, he experienced pressure from both parents to return to his sport. Despite offering tangible support through financing treatment and physiotherapy sessions, he alleged: "The support is double sided because the second that there is a treatment, they want to give it to me so I can get back on the field." Following his sixth concussion, this participant made the autonomous decision to retire from his sport but continued to feel pressure from his parents to return over two years later. Participant 11 mentioned a different type of obligation to return related to her parents. She mentioned that her desire to return was strongly influenced by her father's involvement in the club: "My dad being the president; you kind of want to do all that and have a daughter in the sport and not do all of that and have a daughter sitting at home." This fortified her sense of obligation to return to the club.

**Coach pressure.** Three athletes cited that their coaches played a prominent role in the feeling of obligation to return following their concussions. Participant 11 expressed her feelings

of responsibility to her coaches and the pressures they placed on her: “They want to see you succeed. It looks good for them. They love you and they want you to reach your goals and everything. When you are away for a little while, it kind of hurts them.” She also mentioned that she considered quitting during her career but was influenced to remain committed: “I was going to quit two years before I did but then my coaches sort of convinced me to stay. Then they convinced me to stay again.” Similarly, participant 7 felt a sense of obligation to remain committed to his coaches after discussing his potential and the opportunities that were ahead of him:

They offered so much. When they accepted me at 16 as their scrum half, they were anticipating that I would play at 17 on a U18 team; at 17 starting to regroup the team; at 18 I would play captain; and at 19 follow up with the same guys and bring the team further.

Having coaches who were confident in his abilities and hopeful that he would become a great player resulted in this athlete feeling constrained within the sport. He did not want to disappoint his coaches or underperform based on their expectations and therefore remained committed until his seventh concussion.

### **Desire to Excel**

The desire to excel pertains to an athlete’s aspirations to achieve success. This may be through social achievement where the athlete desires winning and outperforming opponents, or mastery achievement where the athlete seeks personal improvement and strives to accomplish personal goals (Scanlan et al., 2016). Athletes described both mastery achievement and social achievement as strong motivators to return. Throughout the interviews, many athletes admitted that they did not believe that they had achieved their potential. Two athletes considered their desire to excel to be the most important factor motivating their return following multiple

concussions. Results from the ranking questions indicated that the participants' desire to excel was tied as the second most influential factor in their decision to remain committed to their sport.

**Social achievement.** In terms of social achievement, athletes suggested that their desire to go back was to win important games, make teams, place at major competitions, or gain recognition in the sport or within the team. Participant 6 discussed her goals and continued desire to remain committed to her sport even after sustaining seven concussions. Although she was obligated to stop she mentioned: "I still haven't accepted the fact that I can't play again. I wanted a future in soccer. I wanted to go somewhere with that." Other athletes had similar goals to eventually play professionally and make national teams. For example, Participant 7 stated:

The Canadian team was my goal and for a long time. If I go scrolling back in my feed on social media, I would find videos of the Canadian captains and things like that and me publishing 'this is where I am going to be later and this is what I will be doing'.

However, after experiencing multiple concussions and experiencing the negative repercussions of the injuries, he conceded: "Being on the Canadian team was not worth turning my brain into complete mush." Despite also experiencing multiple concussions and ongoing symptoms, Participant 1 indicated that he still believed it was worth the risk: "It's worth it because I know I'm good and that later on I will have a chance to really go far and become popular in the sport." His desire to continue was in large part due to the potential social benefits he could acquire from continued involvement. For this athlete, his ultimate goal was to gain notoriety and become one of the best players. Other athletes shared the same desire to excel in order to acquire recognition within the team. For example, Participant 8 explained:

Myself, for me to reach that top-notch, it would be for someone to recognize me. I don't want to talk myself up but I want someone to be like 'You're a great player. Here is a 'C'. Here is an 'A'. You're the captain.'

**Mastery achievement.** Although other athletes expressed similar desires to reach the top, some demonstrated more autonomy in these aspirations. For some, like Participant 3, it was the desire to master his sport:

I feel like I'm not where I could be. I am not done yet. I am only three quarters of the way to the black belt. When I get the black belt, there will still be 9 degrees of black belt I want to go for. There are people I want to meet. There are people I want to fight. I want to win.

Skill acquisition was another mastery goal mentioned by athletes. Participant 5 explained that her desire to return was largely influenced by her aspirations to become a better player: "I wanted to stop the pucks faster and to shoot faster... I really wanted to get better in the sport of hockey because it was what I knew. I didn't care if I had my fourth concussion."

### **Athletic Identity**

Athletic identity refers to the degree to which an individual relates to the athlete role (Brewer, Van Raalte, & Linder, 1993). When considering the decision between retirement and remaining committed to their sport, participants indicated that the sport had become part of their identity. The dedication and years invested into their sport had a major influence on the athletes and how they perceived themselves. When concussions threatened their identity, participants struggled with retirement considerations. This played a prominent role for the participants in this study to make a decision to persevere through the concussions and return to play. The youth athletes frequently mentioned the inability to see themselves without their sport. For example, Participant 5 explained: "I don't know anything else. I started when I was four and skated since I was two. It's a part of me and I don't know what else I would do." After investing time, money, and energy and sacrificing their social life and health, the athletes developed an identity that was strongly linked to their sport. The fear of having to give it up proved to be extremely difficult. Participant 11 reflected on this by discussing her feelings of being lost without her sport: "It's the

only sport that I have ever really known. I have done it since I was a child so basically, if I am not a gymnast, what am I going to be?"

Athletes who have been required to give up their sport also discussed the struggle with losing their sense of identity. Participant 6 stated:

Well, it's not like I have been able to play, but it's still a part of me. I guess I am trying to make track a priority now but I feel like I am still trying to kick soccer out of my life.

Despite pursuing a safer alternative sport, this athlete continued to define herself as a soccer player two years following her retirement from the sport. Participant 1 also described the sense of losing his identity as a soccer player: "It was kind of part of my identity. I was always known as a good soccer player". By giving up his sport as a result of concussions, the athlete felt that in addition to vanishing recognition and acknowledgments from others, he also lost the sport that was a significant part of how he perceived himself as an athlete and person.

### **Discussion**

The primary purpose of this study was to explore the determinants of youth athletes' sport commitment following multiple concussions and persistent symptoms using the SCM as a theoretical framework. The second purpose aimed to expand upon the current SCM by exploring other potential determinants specifically related to return to play after multiple concussions. The seven determinants of sport commitment outlined by Scanlan and colleagues (2016) in the SCM played varying roles in the youth athletes' desire to remain committed to their sport. The results highlighted key differences in the influence of SCM determinants for the youth athletes in the present study when compared to previous sport commitment literature. Furthermore, through an inductive thematic analysis, data supported the expansion of the SCM to include '*athletic identity*' as a potential novel construct.



The findings from this research offer valuable contributions to the existing sport commitment and injury literature. In addition to supporting our current understanding of sport commitment following major injuries, this research shows athlete perceptions regarding their sources of commitment despite sustaining multiple concussions. The findings emanated from this study will help to explain why athletes are able to overlook the potential health risks of engaging in their sport and the justification behind remaining committed to their sport.

*Sport enjoyment* emerged as the most salient source of motivation driving athletes to remain committed following multiple concussions and persistent symptoms. The participants in this study credited their intrinsic enjoyment and love for the sport to their continued enthusiastic involvement in the sport. These findings are consistent with previous sport commitment (Scanlan, et al., 1993; 2003; Weiss, Kimmel, & Smith, 2001; Weiss & Weiss, 2007) and injury (Bianco et al., 1999; Iñigo et al., 2015; Podlog & Eklund, 2005; 2006; 2009) literature. Iñigo and colleagues (2015) found that among athletes with musculoskeletal injuries, sport enjoyment was the most important factor prompting their return to sport. The present findings may suggest that despite the type of injury, the primary motivational factor inspiring athletes to remain committed to their sport is the enjoyment and positive affect they experience from it. Findings additionally confirm current understanding of the role of intrinsic motivation and enthusiastic commitment in satisfying one's desire to remain in his or her sport.

*Other priorities* were not an important determinant in the choice to remain committed to sport. While some athletes were not affected by other priorities in their lives, others confirmed that it reduced their level of commitment. Friends, family, academics and future career opportunities were acknowledged as competing priorities. Such findings are consistent with previous commitment literature (Scanlan et al., 2003; Iñigo et al., 2015) and common factors associated with sport dropout in youth (Crane & Temple, 2015).

One priority found in this study that is likely unique to athletes with multiple concussions and prolonged symptoms is the consideration of long-term mental health and wellbeing as a competing priority. Given that concussions are a brain injury associated with potential long-term mental and physical health risks (Semple et al., 2015; Stern et al., 2011; Caron et al., 2013), athletes were more aware of their future wellbeing. This greater awareness provoked concern and doubt, which weakened athlete desire to remain committed. In some cases, viewing health as a priority incited retirement and a transition to a safer alternative sport. This is contrary to most research suggesting the health and fitness benefits acquired through sport participation incite sport engagement and strengthen commitment (Iñigo et al., 2015; Weiss & Amorose, 2008; Williams 2013).

Perceiving long-term health as a priority may also have reduced the influence of *personal investments*, a construct typically viewed as a major antecedent and positive predictor of sport commitment (Carpenter & Coleman, 1998; Carpenter & Scanlan, 1998; Scanlan et al., 1993; 2003; 2009; Williams, 2013). While for some participants, the high investments in their sport motivated their return, for others these investments were associated with their concussions and subsequent health problems and hindered social life. This, in turn, lessened the desire to remain committed. Moreover, the time invested appeared to restrict athletes from pursuing other athletic endeavours. This sense of constraint thus arguably influenced their desire to remain committed. Alexandris, Zahariadis, Tsorbatzoudis, and Grouios (2002) explain that the willingness of athletes to invest more money, time, and effort reflects their desire to remain committed to their sport. Conceivably, when athletes begin to prioritize their long-term health, academics, and social life, the investments are perceived to be less important.

An interesting finding in this particular study was the lack of importance *social support* and *social constraint* played in the athletes' desire to remain committed to sport. *Social support*

from family, coaches, teammates, and sport medicine practitioners has frequently emerged as an important determinant in youth sport commitment (Carpenter & Coleman, 1998; Scanlan et al., 1993; Weiss & Weiss, 2007). Concussion and injury rehabilitation studies have also recognized social support to be instrumental in an athletes' positive psychological return to sport (Bianco, 2001; Caron et al, 2013; Iñigo et al., 2015; Rees, Mitchell, Evans, & Hardy, 2010). The present study, however, revealed that social support had a weak influence on athletes' sport commitment.

Findings from the present study indicated that feelings of obligation to conform to social expectations were not perceived as important sources of sport commitment. This is consistent with some of the existing sport commitment literature (Casper, Gray & Stellino, 2007; Sousa, Torregrosa, Viladrich, Villamarín & Cruz, 2007; Carpenter & Coleman, 1998). However, these findings differ from previous research pertaining to injury and sport commitment, which shows that feelings of pressure to return are significant factors in athletes' constrained commitment to their sport following an injury (Iñigo et al., 2015; Podlog, Dimmock & Miller, 2011). Past concussion literature additionally explains that pressure from family, teammates, and coaches are associated with premature return to sport (Echemendia & Cantu, 2003; Kroshus et al., 2015). Despite increased awareness about concussions, the feelings of obligation to return are often dictated by the significance of approaching games and the level of play (Sye, Sullivan, & McCrory, 2006). This was identified as a reason for returning to sport in the current study. While seven athletes experienced either social pressure or intrinsic, self-imposed feelings of obligation to their coaches and teammates, only three considered it influential in their choice to return.

The lack of importance of social influence for the youth athletes in this study may be attributable to the social apprehension and pressure to quit from significant adults. An overarching theme across the data showed that the family, coaches, and medical practitioners instilled fear within the athletes about their intent to remain in their sport by sharing their

concerns and outlining potential negative future consequences. This, as a result, countered the significance of social influence in the athletes' desire to remain committed. These findings are consistent with a comparison study between social support in the return from orthopedic injuries and concussions. Covassin and colleagues (2014) found that both concussion athletes and musculoskeletal injury athletes relied on family, friends, and teammates to provide support in their return. Findings, however, indicated that athletes with concussions were less satisfied with the support offered. Furthermore, when social support satisfied the athlete, it was found to reduce state anxiety and distress associated with return to play (Covassin et al., 2014). This may suggest that athletes with multiple concussions are not provided with the same level of support as athletes who have sustained musculoskeletal injuries. A potential justification for the varying levels of support offered may be attributed to the invisibility of concussions (Bloom et al., 2004). While musculoskeletal injuries are usually physical evident and attract support and care from others, the invisible nature of concussions may not attract the same level of attention and care from one's support network (Covassin et al., 2014).

Another possible explanation that can further shed light on the lack of support experienced by the young athletes may be the age and type of injury they experienced. In comparison to musculoskeletal injuries, which can be surgically repaired and often fully heal, there remains a great deal of uncertainty surrounding mild traumatic brain injuries and young athletes (Bloom et al., 2004; Caron et al., 2013; McCrea, Hammeke, Olsen, Leo, & Guskiewicz, 2004; Register-Mihalik et al., 2013). The youth brain is exposed to amplified dangers and heightened risks when traumatic biomechanical forces occur to the head because it remains in a developmentally sensitive stage (Field et al., 2003; Grady, 2010; Semple et al., 2015). In addition to the increased sensitivity of this population, given the number of concussions and the prolonged symptoms experienced by the participants in the present study, it is probable that

influential adults who are aware of the consequences and potential future implications are becoming increasingly concerned. This was evident in the athletes' perceptions of diminishing support following each concussion (e.g., parents, doctors, and coaches). These findings may expand current understanding of social influence following major injuries and offer a unique perspective on the support offered to youth athletes with multiple concussions and persistent symptoms.

Both *valuable opportunities* and *desire to excel* were found to be important determinants of athletes' commitment to their sport. According to Scanlan et al., (2016), along with sport enjoyment, valuable opportunities are the strongest source of athletes' continued involvement. The results from the ranking questions supported these findings. Social opportunities such as developing and maintaining friendships were identified as vital reasons motivating a return. This finding is compatible with previous sport commitment literature (Podlog & Eklund, 2006; Scanlan et al., 2003). The findings from the current study support the newest addition to the SCM (Scanlan et al., 2013), that is, desire to excel. This determinant was a priority for the athletes who strived to achieve both mastery and social achievement in their sport. The findings from this study indicate that youth athletes not only have the intrinsic motivation to achieve their full potential, they also long for social achievement through winning or being viewed as one of the best. This supports previous sport commitment findings which Scanlan and colleagues (2013; 2016) established with both elite athletes and youth athletes.

The findings from this study suggest the identification of *athletic identity* as a potential novel construct to be included in the SCM when applied to a population of concussed athletes. Athletes involved in competitive sport dedicate substantial time and effort to pursue and achieve challenging goals within their sport. Inevitably, this leads to the development of athletic identity where athletes begin to define themselves based on their athlete role (Brewer et al., 1993;

Wiechman & Williams, 1997). The participants in the present study frequently alluded to their feelings of being lost if they were to discontinue their sport participation. In previous literature, athletic identity has been established to instigate higher affective resilience and heightened motivation to return as athletes attempt to return to the sport that defines them (Brewer et al., 2010; Tracey, 2003). Apps and Walter (2011) discussed the motivation to return to sport post-concussion in the youth demographic in order to maintain a sense of identity and preserve their image in sport. Athletic identity, however, may be detrimental in the case of severe injuries resulting in poor adjustment and negative emotional responses such as re-injury anxiety, anger, frustration, and confusion (Brewer et al., 2010; Heijne, Axelsson, Werner, & Biguet, 2008). These findings are indicative of the vulnerability athletes with multiple concussions face as they struggle with the decision to remain committed to sport. Given findings from previous literature, which support athletic identity as a factor predicting continued involvement, and given the findings from the current study, it may be worthwhile to expand the current SCM to include athletic identity as a determinant, particularly to understand athletes' commitment post-concussion.

### **Practical Implications**

This research offers practical insights for athletes, teammates, parents, coaches, and medical practitioners by helping to understand why athletes choose to remain committed to a sport that may be potentially detrimental to future physical and mental health. By increasing awareness of the determinants of sport commitment following multiple concussions, social support agents will be better equipped to help athletes make informed decisions about their future in a potentially dangerous sport. Findings also suggest potential challenges associated with developing a strong athletic identity. To help prevent some of these challenges, it may be valuable to promote participation in different sports during athletes' younger years (Jayanthi,

Pinkham, Dugas, Patrick, LaBella, 2013). According to Coté and Vierimaa (2014), full commitment is unnecessary in most sports until the age of 16. By empowering athletes to commit to other sports and opportunities, they could learn to develop multiple identities, which could help ease transitions out of sport due to injuries. Furthermore, by increasing awareness of the factors involved in sport commitment following multiple concussions in youth athletes, this research offers important insight into challenges associated with the injury.

### **Limitations**

Despite the novel findings in this study, it is not without limitations. One such limitation may be the age range of the participants. The older participants were more future-oriented and conscious about their future decisions (e.g., academics, career) and they were engaged in their sport for a longer period of time. This may have influenced certain determinants such as *personal investments* and *other priorities*. Another limitation of this study is the competitive level of the athletes. Athletes' competitive levels ranged from school teams, competitive club teams, provincial teams, and national teams. It is therefore likely that the desire to remain committed for athletes from higher competitive level teams will be different from athletes from lower level teams. Given our recommendation to broaden the SCM to include *athletic identity*, another limitation is the low sample size of this study. Additional research must be conducted with other samples in order to include *athletic identity* as component of the SCM. Finally, the framework used in this study has predominantly been applied with healthy athletes. Only one other study (Iñigo et al., 2015) has utilized the SCM with injured athletes. Although this helps to fill necessary gaps in injury and sport commitment literature, little is known regarding how the application of the SCM may be different for injured athletes. Notwithstanding the aforementioned limitations, findings from the present study contribute to an unexplored topic that could potentially be transferred to other injury and sport commitment research.

## **Conclusion**

Overall, the findings from this study reveal how various determinants within the SCM affect the desire to remain committed to one's sport following multiple concussions and persistent symptoms. Three main findings Sport enjoyment, valuable opportunities, and desire to excel emerged as the most highly rated indicators of athlete sport commitment. Social influence constructs (social support and social constraints) played weak roles in motivating participants to return to sport following multiple concussions. Finally, athletic identity emerged as another important factor in the athletes' desire to remain committed. This potential new construct merits further investigation and consideration to be included in the SCM.

We suggest that more literature explores the decision to remain committed following multiple concussions. One interesting population to observe would be elite athletes. This will help to better comprehend the role of social influence following multiple concussions and recognize if age and competitive level influence the findings. It is likely that professional athletes would receive more support and pressure to return. Although extensive literature supports the role of athletic identity in sport resilience and return following injury (Apps & Walter, 2011; Brewer et al., 2010; Tracey, 2003), further research is necessary to investigate the role of athletic identity as a potential addition to the SCM. Finally, further research should examine changes in other priorities and social support following multiple concussions. This will contribute to a better understanding as to when the athlete and support systems begin to view personal health as the priority.



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**Article Two**

Youth Athletes' Psychosocial Challenges Associated with Recovery and Return to Play  
Following Multiple Concussions and Persistent Symptoms

### **Abstract**

The purpose of this study was to uncover the psychosocial challenges faced by youth athletes during recovery and return to play following multiple concussions and persistent symptoms. Individual semi-structured interviews were conducted with 11 pre-adolescent and adolescent athletes between 12 and 18 years of age ( $M = 15.25$ ). Participants competed in soccer ( $n = 3$ ), hockey ( $n = 3$ ), basketball ( $n = 1$ ), rugby ( $n = 1$ ), jiu-jitsu ( $n = 1$ ), gymnastics ( $n = 1$ ), and cheerleading ( $n = 1$ ). The participants all sustained a minimum of three sport-related concussions with symptoms lasting beyond 28 days following the most recent injury. Findings from an inductive thematic analysis revealed a multitude of psychosocial challenges influencing the athletes' decision to return to play and recovery outlook. The five major themes emanating from the data included frustration regarding: (a) symptom persistence, (b) re-injury anxiety, (c) perceived ability (d) social support, and (e) emotional turmoil and mental health. Findings suggest that youth athletes who have sustained multiple concussions and protracted symptoms experience several unique psychosocial challenges than previously reported in musculoskeletal injury research. Study findings additionally reveal potential implications psychosocial challenges may have on athlete wellbeing and mental health, and continued sport commitment.

*Keywords:* multiple concussions, persistent symptoms, youth sport, psychosocial challenges

Youth Athletes' Psychosocial Challenges Associated with Recovery and Return to Play  
Following Multiple Concussions and Persistent Symptoms

Athletic injuries are a devastating and demanding component of sport participation. Athletes are faced with a multitude of physical and psychosocial challenges as they cope with their injury and abide by, an often lengthy, rehabilitation protocol (Bauman, 2005; Glazer, 2009; Podlog & Eklund, 2007; Podlog, Dimmock, & Miller, 2011). Following major athletic injuries (i.e., injuries sustained within the sport context), athletes can experience negative emotional responses such as anxiety, anger, fear, confusion, and depression (Ardern, Taylor, Feller, Webster, 2013; Heijne, Axelsson, Werner, & Biguet, 2008). Despite athletes exhibiting increasingly positive cognitions, affect, and increased confidence in regards to injury as they near full physical recovery (Ardern et al., 2013; Langford, Webster, & Feller, 2009), additional negative emotions, self-doubt, and apprehension may emerge upon consideration of their return to play (Evans, Hardy, & Fleming, 2000; Glazer 2009). Common concerns that athletes communicate regarding injury and performance include re-injury anxiety, perceived or actual inability to achieve previous levels (i.e., reduced proficiency), self-presentational concerns, reduced sense of belonging, and feelings of external pressure to return prior to physical and psychological readiness (Podlog & Eklund, 2007; Podlog & Dionigi, 2010; Podlog et al., 2013). These concerns have been examined thoroughly, and in some literature, have been related to competence, autonomy, and relatedness within the self-determination theory (SDT) framework (Podlog & Eklund, 2007). The psychosocial challenges associated with athletic injury, and the subsequent decision to return to play, may prompt greater challenges for youth athletes, particularly those who have sustained multiple concussions and protracted symptoms.

A concussion is a mild traumatic brain injury in which a force transmitted to the head, neck, face, or body causes a rapid acceleration and deceleration of the brain within the skull that

results in temporary disturbances in brain functioning (Guskiewicz & Mihalik, 2011). Concussions evoke numerous somatic symptoms (e.g., headaches, dizziness, sensitivity to light, and nausea) and cognitive symptoms (e.g., attentional and concentration problems, memory problems, information processing difficulties) (Cantu, Guskiewicz, & Register-Mihalik, 2010; Guay et al., 2016). The consequences of concussion may be significantly detrimental to the youth athlete population in particular, due to the fact that developing brains have heightened vulnerability and sensitivity (Alexander, Shuttleworth-Edwards, Kidd, & Malcolm, 2015; Field, Collins, Lovell, Maroon, 2003). In contrast to musculoskeletal injuries, concussions are poorly understood hidden injuries that do not follow a predictable timeline (Chermann et al., 2014; McCrory et al., 2017). The lack of effective support and ambiguity in regards to the complex recovery process may augment the psychological and emotional strain experienced by the athlete (Caron, Bloom, Johnston, & Sabiston, 2013). Given the unpredictability of symptoms, the existing emotional sequelae related to a concussion (e.g., irritability, stress, anxiety, lack of motivation) may be further impacted with a subsequent concussion or persisting symptoms (Schatz, Moser, Covassin, & Karpf, 2011; Semple et al., 2015). This may result in the onset of more severe emotional and mental issues such as depression, anxiety, and feelings of isolation and alienation (Caron et al., 2013).

To date, research has yet to explicitly examine the psychosocial factors associated with multiple concussions and protracted symptoms in the athlete population. Given the brain vulnerability and unpredictable course of recovery in youth, concussions among the youth athlete population, specifically, constitutes an important matter requiring investigation (Alexander et al., 2013; Caron et al., 2013). The objective of this study was, therefore, to uncover the psychosocial challenges faced by youth athletes during the recovery and return to play period following multiple concussions and persistent symptoms.



### **Youth Vulnerability**

In recent years, there has been a drastic increase in diagnoses of concussions within the pre-adolescent and adolescent populations (Coronado et al., 2015; Gilchrist, Thomas, Xu, McGuire, & Coronado, 2011). This is likely due to increased awareness and better diagnosis. Nonetheless, the rapid uptick in concussion diagnosis is concerning (Bakhos, Lockhart, Myers, & Linakis, 2010; Zonfrillo, Kim, & Arbogast, 2015). In an analysis of U.S. traumatic brain injury (TBI) trends from 2001 to 2012, Coronado and colleagues (2015) found a 141% increase in sport and recreation-related TBI among 10 to 19-year-olds. Furthermore, in Canada, of all emergency department visits for sport and recreation-related head injuries among 10 to 18 year-olds, 39% were diagnosed as a concussion ( $n=39%$ ) and 24% were considered a potential concussion (Government of Canada, 2017).

The existing concussion literature supports heightened sensitivity and more persistent symptoms for children and adolescent athletes in comparison to adults (Buzzini & Guskiewicz, 2006; Field et al., 2003; Wilson, 2010). Substantial concern regarding youth concussions pertains to the prospective latent short and long-term damages resulting from the biomechanical forces to the developing brain (Choe, Babikian, Difiori, Hovda, & Giza, 2012). According to Shrey, Griesbach, and Giza (2011), biological vulnerability during late childhood and adolescence may be attributed to alterations in neural plasticity and immature axons, which have not achieved full myelination. Youth (i.e., under the age of 18) concussions are additionally related to diffuse and cerebral swelling, which may increase susceptibility to severe neurologic impairments if a subsequent concussion occurs during the recovery period (Field et al., 2003; McCrory, Davis, & Makdissi, 2012). Repeated concussions during the youth years inhibit regular neurocognitive functioning and impede the development of effective cognitive strategies (Alexander et al., 2015). Moreover, in a study comparing high school and university athletes, Field and colleagues

(2003) found that younger athletes exhibit more severe and prolonged memory problems after sustaining a concussion. Overall, in a great deal of literature, the growing diagnoses and amplified short and long-term health problems associated with youth-sustained concussions have been explored and underscore the importance of prioritizing research on this population.

### **Multiple Concussions**

Multiple concussions have been associated with both short and long-term negative implications. Following one concussion, injury threshold is decreased and susceptibility of sustaining a future concussion is increased by nearly six times (Graham, Rivara, Ford, & Spicer, 2014). Further supporting the evidence of a decreased injury threshold, Guskiewicz and colleagues (2003) conducted a longitudinal investigation of 2905 collegiate football players, and claimed that there was increased concussion vulnerability in athletes with more than three concussions. Researchers have stipulated that there may be a cumulative nature of symptom severity and persistence associated with repetitive head trauma (Collins et al., 2002; Ponsford et al., 2012). Collins and colleagues (2002) explored this potential cumulative nature of concussions, and found that athletes who had sustained at least three concussions displayed more abnormal and pronounced symptoms following the injury.

Recurrent concussions during athletes' career have been found to be potentially detrimental to their overall health-related quality of life and wellbeing. Prospective ramifications of multiple concussions involve cognitive deficits including memory troubles, attentional problems, the development of learning disorders; persistent concussion symptoms such as frequent headaches, migraines, photosensitivity, and spells of dizziness; mental health issues such as anxiety, depression, and suicidal ideations; and neurodegenerative disorders which may include chronic traumatic encephalopathy, dementia, and Alzheimer's disease (Caron et al., 2013; Manley et al., 2017; Schatz et al., 2011; Semple et al., 2015; Stern et al., 2011). The

exposure to the aforementioned adverse consequences, in addition to a continued lack of public understanding, have been associated with strained relationships and feelings of isolation from family, friends, teammates, and partners (Caron et al., 2013; Guskiewicz et al., 2007).

### **Psychosocial Challenges Associated with Injury**

Subsequent to athletic injuries, athletes face numerous challenges beyond physical rehabilitation. Recent empirical research has initiated a greater focus on the psychosocial factors involved in both injury rehabilitation and return to play (Bianco, 2001; Brewer, 2010; Podlog, Banham, Wadey, & Hannon, 2015; Podlog & Eklund, 2007). Concussions and other athletic injuries have been associated with a wide range of predominantly negative cognitions and emotions following injury. Athletes may experience altered self-perceptions (e.g., diminished self-esteem, lower sense of self-efficacy), emotional distress (e.g., frustration, confusion, anger, anxiety, depression), and issues related to the loss of athletic identity (e.g., confusion regarding the removal of the athlete identity; loss of recognition as an athlete by others) (Brewer, 2010; Grindstaff, Wrisberg, & Ross, 2010; Heijne et al., 2008; Mainwaring, Bisschop, Green, & Antoniazzi, 2004; Tracey, 2003). Removed from their sport, athletes have also reported feelings of isolation and alienation from the team (Bloom Horton, McCrory, & Johnston, 2004; Caron et al., 2013; Gould, Udry, Bridges, & Beck, 1997). Emotional responses to injury are likely amplified for athletes with persistent concussion symptoms due to the uncertain recovery timeline (Caron et al., 2013; Kontos, Covassin, Elbin, & Parker, 2012; McCrory et al., 2017). Given the need to base recovery on subjective symptom scores, it is difficult for health practitioners to successfully predict an athlete's return to play (McCrory et al., 2017). Kontos et al. (2012) suggest that depression becomes a concern when athletes are increasingly frustrated and socially isolated due to lingering concussion symptoms. Uniquely, athletes may also experience a perceived lack of support throughout their concussion recovery process. In a study

comparing athletes with concussions and athletes with musculoskeletal injuries, Covassin et al. (2014) suggested that the athletes who sustained concussions were generally less satisfied with the social support offered throughout their recovery. A potential justification for these findings may be the lack of physical evidence of the injury and lesser role of a support staff to guide rehabilitation (Bloom et al., 2004; Covassin et al., 2014). While many musculoskeletal injuries are visible and physically evident to one's support systems and require physical rehabilitation guided by a physiotherapist or athletic therapist, concussion treatment has been predominantly treated through NSAIDs to help the athlete cope with the concussion symptoms (Covassin et al., 2014; Thomas, 2012).

### **Return to play**

Following any type of injury, a positive and successful return to play is dictated by physical and psychological readiness. Physical and psychological readiness, however, do not always coincide (Glazer, 2009; Udry & Andersen, 2008; Wadey & Evans, 2011). As an athlete approaches rehabilitation termination and is cleared to return to play, there are several psychological barriers to overcome (Crossman, 1997; Glazer, 2009; Podlog et al., 2015). The existing literature has revealed immense challenges associated with returning to sport following musculoskeletal injuries (Johnston & Carroll, 1998; Kvist, Ek, Sporrstedt, & Good, 2005; Podlog et al., 2011; Podlog et al., 2013; Udry & Andersen, 2008). In a review of literature, Podlog and Eklund (2007) posited that athletes experience numerous difficulties and apprehensions associated with the return to sport, which can be linked to their needs for competence, relatedness, and autonomy. In fact, the basic psychological needs outlined in the Self-Determination Theory (SDT) framework (Deci & Ryan, 1985; 2012; Ryan & Deci, 2000; 2007) have frequently been used to inform previous studies exploring the psychosocial aspects of

injury and return to play (Ardern et al., 2013; Podlog & Eklund, 2007; Podlog et al., 2011; Podlog et al., 2013).

The apprehensions and concerns athletes can experience, related to their decision to return to play (such as re-injury anxiety, perceptions of reduced ability, self-doubt, fear of failure, etc.), contribute to *competence* issues (Podlog & Eklund, 2007; Podlog et al., 2013). The greatest source of pressure reported across the literature is the pressure to return from coaches, teammates, and family (Andersen, 2001; Bauman, 2005; Bianco, 2001; Gould et al., 1997; Podlog et al., 2011). This sense of external pressure can undermine the *autonomy* of the athlete, and in turn, can lead to premature return to play and negative recovery outcomes in both musculoskeletal injuries and concussions (Echemendia & Cantu, 2003; Kroshus et al., 2015; Murphy & Waddington, 2007; Podlog & Eklund, 2007). In a study looking at adolescent injury and return to play, Podlog and colleagues (2013) found that young athletes experienced more pressure to return from parents and teammates than from coaches. Individuals may additionally feel self-induced pressures to return due to guilt pertaining to feelings of letting teammates and coaches down, impatience with a prolonged recovery, or the desire to adhere to a personal recovery agenda (Kontos, Collins, & Russo, 2004; Podlog & Dionigi, 2010; Podlog et al., 2013; Roderick, Waddington, & Parker, 2000). Feelings of isolation and alienation from the team and loss of athletic identity are also prevalent among injured athletes (Brewer, Cornelius, Stephan, & Van Raalte, 2010; Broshek, De Marco, & Freeman, 2015; Gould et al., 1997). When athletes are injured, they are often removed from the sporting environment. This results in feelings of no longer belonging or becoming detached from the team (Grindstaff et al., 2010; Podlog & Eklund 2007; Podlog & Dionigi, 2010; Tracey, 2003). After dedicating substantial time and effort to their sport, athletes form an athletic identity (Brewer, Van Raalte, & Linder, 1993; Brewer et al., 2010; Wiechman & Williams, 1997). However, following injury, the challenges associated with

isolation and alienation from one's team diminishes an athlete's sense of social and athletic identity, thus shedding light on potential issues with *relatedness* during return to sport (Podlog & Eklund, 2007; Podlog et al., 2013). Despite extensive research looking at return to play with athletes with musculoskeletal injuries, little is known about the psychosocial challenges associated with returning to play following multiple concussions. Consequently, based on the aforementioned studies, there appears to be relevance to understanding psychosocial factors related to the return to play following multiple concussions.

### **Purpose and Rationale of the Study**

Overall, previous research has explored youth athletes' vulnerability to concussions and the potentially detrimental short and long-term consequences of sustaining multiple concussions with persistent symptoms. A variety of negative psychosocial challenges and responses associated with athletic injuries have also been reported. Furthermore, empirical research has established that athletes encounter numerous difficulties as they transition from rehabilitation to practice and competition.

Despite growing interest regarding the short and long-term consequences of concussions, no research, to our knowledge, has explored the psychosocial factors associated with multiple concussions and how they may intensify challenges and affect an athlete's motivation to return to play. The existing literature regarding the psychosocial barriers related to the injury and return to play transition has solely focused on musculoskeletal injuries. Furthermore, there has been little emphasis on the youth athlete population. Given the previous focus on musculoskeletal injuries, the psychosocial factors associated with multiple concussions and return to sport remains a significant gap to be observed. The current understanding of youth vulnerability to multiple concussions and the elevated number of diagnoses among the pre-adolescent and adolescent demographic also suggests a heightened necessity to observe this population. The purpose of this

study was therefore, as previously mentioned, to uncover the psychosocial challenges faced by youth athletes during recovery and return to play following multiple concussions and persistent symptoms.

## **Method**

### **Participants**

The current study comprised 11 pre-adolescent and adolescent athletes between 12 and 18 years of age ( $M=15.25$ ). Participants were predominantly recruited through purposeful sampling (Patton, 2002) from a sport medicine clinic in Ottawa, Ontario where they were receiving treatment from a concussion specialist. Provided the challenging demographic, snowball sampling (Miles & Huberman, 1994) was also employed to recruit three participants. Participants competed in soccer ( $n = 3$ ), hockey ( $n = 3$ ), basketball ( $n = 1$ ), rugby ( $n = 1$ ), jiu-jitsu ( $n = 1$ ), gymnastics ( $n = 1$ ), and cheerleading ( $n = 1$ ). To be eligible to partake in the study, athletes had to (a) be between the ages of 12 and 18, (b) currently or previously participated in a year-round competitive sport (c) have sustained a minimum of three concussions with the onset of persisting post-concussion symptoms lasting longer than one month following the most recent injury, and (d) remained committed to their initial sport after a minimum of three concussions. Despite displaying commitment to the sport, four participants in the present study made the decision to retire; two were required to retire; four intend to return to their sport; and one has returned to her sport. It must be noted that even though some participants decided to retire, they all exhibited sport commitment and motivation to return by remaining in their sport until it was deemed unsafe. Athletes who remained committed to their sport for at least three concussions but retired after additional concussions were deemed suitable for the study as they nevertheless demonstrated high levels of commitment to their sport.

**Participant Demographics***Table 1. Participant Demographic Information*

	Age	Number of Concussions	Most Recent Concussion	Symptoms (most recent concussion)	Symptom Durations as of April or May, 2017	Status
Participant 1 (Soccer)	12	3	June, 2014	- Dizziness - Headaches - Memory Problems	Ongoing	Required to stop (Mother)
Participant 2 (Soccer)	17	4	December, 2016	- Concentration problems - Dizziness - Headaches - Memory problems	Ongoing	Retired (Doctor recommendation) – Track/Skiing Currently
Participant 3 (Jiu-Jitsu)	13	4	February, 2017	- Blurred vision - Headaches - Sleep problems	Ongoing	Plans to Return
Participant 4 (Basketball)	16	3	November, 2016	- Daily Headaches/ - Dizziness - Memory problems - Ocular Migraines - Reduced tolerance to stress	Ongoing	Plans to Return
Participant 5 (Hockey)	17	5	June, 2014	- Concentration problems - Dizziness - Sensitivity to light	1 month	Retired (Doctor Recommendation)
Participant 6 (Soccer)	15	8	July, 2015	- Chronic myofascial pain - Daily headaches - Eye Problems - Light sensitivity - Light Headedness - Limited amounts of	Ongoing	Required to stop (Mother)



Participant 7 (Rugby)	18	7	February, 2017	physical activity (headaches) - Neck Pain - Balance problems - Dizziness - Headaches - Light sensitivity - Sensitivity to light	Ongoing	Retired (Personal decision)
Participant 8 (Hockey)	17	3	November, 2016	- Headaches - Light Sensitivity - Memory problems - Neck Pain - Positional vertigo	Ongoing	Plans to Return
Participant 9 (Hockey)	13	3	September, 2016	- Concentration problems - Dizziness - Headaches - Sensitivity to light	3 months	Returned
Participant 10 (Cheerleading)	15	4	November, 2016	- Dizziness - Headaches - Sensitivity to light	2 months	Plans to Return
Participant 11 (Gymnastics)	16	3	February, 2016	- Concentration Problems - Dizziness - Headaches - Nausea	2 months	Retired (Parents/Doctor)

**Procedure**

Approval to conduct the study was granted from the University of Ottawa’s Research Ethics Board. Participants were recruited from a medical clinic where the head physician specializes in pediatric concussions. The nurse in the sport medicine branch of the clinic distributed recruitment letters and consent forms to athletes and parents of minors who met the eligibility criteria of the study. Consent forms required the signature and contact information

(i.e., phone number and email) from athletes 18 years of age or a legal guardian for athletes under the age of 18. Signed consent forms were returned to the nurse and subsequently collected by the lead investigator. Consenting participants and parents were contacted by the lead researcher via email or phone call to establish a time and place to conduct the interview convenient for the young athlete. Prior to all interviews, athletes under the age of consent signed an assent form in compliance with the Research Ethics Board. The first author conducted two pilot interviews with athletes meeting the eligibility criteria. This allowed him to refine, reorganize, and ensure all questions were coherent. The second pilot interview was believed to be worthy of inclusion in the main sample. All participants voluntarily opted to participate in the study. Prior to interviews, each participant was informed of his or her rights to anonymity, confidentiality, and freedom to withdraw from the study at any point.

### **Data Collection**

An individual semi-structured interview was conducted with each of the eleven participants. The interviews ranged from 31 minutes to 85 minutes ( $M=50:21$ ). All interviews were audio-recorded and conducted face-to-face between the months of March and May of 2017. Interviews took place at participants' home or high school or the principal investigator's university office. The interview guide was framed to better understand the sources of sport commitment and challenges associated with remaining committed following multiple concussions and persistent symptoms. The participants were able to gain from their participation as it allowed them to explore and reflect on their personal struggles, psychosocial challenges, and their sources of motivation to return or to retire from their sport. Discussing their challenges, negative experiences with concussions, and mental health problems may, however, have also brought up underlying and suppressed emotions. The interview guide was divided into six sections: (a) introduction of the research and the purpose, (b) participant demographic questions,

(c) discussion about the individual experience with concussions, the challenges, and the athlete's knowledge of the injury, (d) exploration of the motivational sources inciting the athlete desire to remain committed to the sport, (e) concluding questions to further explore the athlete's reasons for remaining motivated and to inquire about the consideration of pursuing a safer alternative, and (f) a ranking question to evaluate the perceived importance of various sources of sport commitment. All sections derived important information that contributed to the findings of this study.

### **Data Analysis**

Each interview recording was transcribed verbatim by the lead researcher to facilitate the analysis of the data. This produced 201 single-spaced pages of data. Any identifying information or names shared during the interviews were changed in order to maintain the confidentiality and anonymity agreement. Interview transcripts were emailed to each participant for member checking. The athletes were granted two weeks to read their individual transcript and suggest any modifications or clarifications, and no modifications were requested. Transcripts were then uploaded to the qualitative data analysis software, NVivo (Qualitative Solution and Research 2012, version 10).

Braun and Clarke's (2006) six stage thematic analysis guided the inductive analysis. First, transcripts were read a number of times by the lead author to familiarize himself with the data. This provided an opportunity to record initial notes and ideas. Once familiar with the data, the second step involved developing preliminary codes (e.g., return anxiety, feelings of isolation, pressure to quit, depression) from the data that were both pertinent and interesting. Third, following the coding process, all codes were examined and compared in order to form relationships that contributed to the emergence of several potential themes (e.g. re-injury anxiety) and sub-themes (e.g. fear of return to play). At this stage of analysis, all transcripts were

revised in order to ensure no missing information relating to the athletes' psychosocial challenges was disregarded in the preliminary steps of analysis. In the fourth step of data analysis the potential themes and subthemes were further scrutinized to ensure they reflected the data and were appropriate for the purpose of the study. Fifth, the themes were solidified and final thematic map was produced. The final step of analysis consisted selecting rich quotes that represented the themes and producing the written report.

## **Results**

Five psychosocial challenges relating to recovery and intent to return to play following multiple concussions and persistent symptoms emerged from the current study. The five challenges inductively found within the data include concerns and frustrations regarding: (a) symptom persistence, (b) re-injury anxiety, (c) perceived ability (d) social support, and (e) emotional turmoil and mental health.

### **Symptom Persistence**

Participants in the current study claimed that their protracted concussion symptoms acted as a fundamental source of fear and worry. Athletes were not only concerned about the implications of these persistent symptoms on their daily life and future wellbeing, but also their capacity to return to their sport. While nine athletes disclosed experiencing minimal to moderate ongoing concussion symptoms, for seven athletes they continued to plague their everyday life. Participant 2 discussed her inability to endure a day without experiencing symptoms by describing an optimal day for her: "If I sleep well and have a good breakfast, I am usually fine for the first three or four hours, and then after the school day, I get tired and the headaches start." After experiencing eight concussions, Participant 6 also continues to experience a multitude of symptoms that have become her daily reality nearly two years later. Her days are often dictated by chronic neck pain, debilitating headaches, which result in swelling of the face and eyes,

chronic myofascial problems, eye problems, light sensitivity, and light headedness. With her most recent concussion occurring in July 2015, she exclaimed: “I don’t really know if it is ever going to get better. I don’t think the doctors know that either. They probably think that I am going to be dealing with the concussions for a long, long time.” The uncertainty and unknown recovery outcome for this athlete was a shared concern among several participants in this study.

The emotional toll associated with prolonged symptoms proved to be challenging to the athletes’ mindset when considering whether to remain in their sport. Despite the majority of concussion symptoms having dissipated, athletes’ experiences with ongoing symptoms further enhanced their distress about the future in their sport as well as their future health. Participant 1 explained the emotions and self-doubts his multiple concussions have generated and questioned his ability to safely return: “After 3 years of dealing with concussions, I am still noticing symptoms and it is still affecting me. I do not want it to get worse.” Participant 8 also disclosed her negative appraisals stemming from her growing awareness about the ongoing symptoms she is experiencing and the unknown threshold before they evolve into permanent symptoms:

At this point, I am starting to see the seriousness of concussions. I am looking at the actual facts and I am seeing what can happen. I read about it and I see that you can get daily headaches. I am starting to feel it, myself. I don’t want this and I wonder if it will ever go away. Have I passed the point where it won’t go away anymore? I am scared that I will never recover fully. I think it might be passed that point.

Despite a continued desire to return to her sport, the prospect of permanent damage and inability to fully recovery was a prominent barrier that added stress in regards to both her recovery outcome and intent to return to play.

**Re-injury Anxiety**

The participants identified four sources of anxiety related to their return to play or the prospect of returning following their experiences with repeated concussions. The following section was therefore separated into four subsections: (a) fear of return to play, (b) fear following return to play, (c) fear of potential sport removal, and (d) negative experiences of others.

**Fear of return to play.** The consideration of concussion outcomes proved to be significant in the athletes' decision to return to or retire from sport. Ten of the eleven athletes expressed being fearful about their future health and wellbeing and the potential to exacerbate the consequences of their multiple concussions by continuing their sport participation. Athletes frequently touched on their alleged decreased threshold to head impact stating that they felt more "prone" to the injury and that it had become "easier to get them". Participant 2 credited her concerns of potentially jeopardizing her future health to why she switched sports: "I really wanted to go back but my health is an actual thing and I need to think about my future. You have to realize that it's something important that is at stake." Participant 4 also revealed her anxiety associated with making a return to play and potentially exacerbating the consequences of her multiple concussions by sustaining an additional one:

I think I've been really lucky with the last three... and I'm really thankful for that but getting another might have a much bigger impact on me and affect my future not only in sports but in school as well. It does scare me.

**Fear following return to play.** Experiencing anxiety associated with the return to play caused the young athletes to approach their sport with more apprehension and overall awareness about concussion risks. Several athletes revealed a changed playing style and intentional efforts to protect themselves from potential threats. Participant 1 explained, "I know the concussion risk. I am a little more cautious and I try to protect my head all the time... If a ball is coming at my

head, I will block it with my hands or avoid it.” Participant 8 shared a similar perspective in which she insisted protecting her head has become a “natural instinct”. Other participants explained that their concussion history instigated new fears when engaging in the sport that they have played for several years. For example, Participant 4 stated: “I get scared of the ball now. I was never afraid in the past.”

**Fear of potential sport removal.** Beyond the distress about future health and wellbeing, several athletes revealed a different source of re-injury anxiety related to the prospect of no longer being permitted to return to their sport following a future injury. Following his third concussion, Participant 3 became fearful of no longer being granted permission to return to jiu-jitsu. This resulted in increased anxiety prior to and after sustaining a subsequent concussion: “When I first got my concussion, probably my worst fear was that I wouldn’t be able to do jiu-jitsu again.” Considering the potential loss of the sport that they enjoy and are passionate about made the young athletes more reluctant and in some cases prompted a change in their playing style and approach to the game. For example, Participant 9 declared: “Even when I went back, it was changing my life. I was scared because I didn’t want to get hit and get another concussion. That would mean that I wouldn’t be allowed to play hockey anymore.”

Participation in a sport for an extended period of time resulted in it becoming ingrained into the athletes’ identity. This sense of identity was predicated on their continued participation and was threatened when athletes considered the possibility that they would no longer be permitted to return. Participant 10 revealed: “I don’t really know anything else so it’s hard to give up.” Given the sport’s strong associations with athlete self-schema, they frequently expressed distress in not being able to return to the sport they love and feel most competent doing. For Participant 6, the anxiety associated with sustaining a future concussion and being removed from the sport she loved resulted in her refusal to report multiple concussions:

In grade 7, I was told after I got one from soccer that if I got another one, I would be done and not allowed to play. I got another one but I played for maybe a year and kept going and kept going after that. I didn't say anything to anyone. I couldn't see myself not playing.

For this athlete, the refusal to give up a sport she enjoyed and envisioned future success in was placed before her health and wellbeing. Despite being required to retire, the thought of sustaining another concussion and losing her sport was a significant source of anxiety throughout her soccer career.

**Negative experiences of others.** For many athletes, personal experiences were a major contributor to their self-doubts and apprehensions. Others derived their doubts from peers who continue to endure long-term concussion consequences. Six participants identified peers, teammates, or professional athletes who experience ongoing struggles after sustaining concussions. For many, this generated fears and concerns about their own decision to remain committed. Participant 4 attributed her reservations to the experience of a friend who lost consciousness for a period of time following her fourth concussion:

I think that I am taking a big risk playing right now. My friend was hospitalized after four and she was in a coma for a little while. That is one of the things that scares me a little bit right now... I think it makes me nervous because who knows if that could be me if I get another one.

The experience of Participant 4's friend, who has only sustained one more concussion than her, provided insight into the potential risks and complications that she may encounter by returning to her sport. This incited thoughts concerning the inability to foresee one's limit and unknown threshold before the injury develops into potentially life altering and perpetual consequences. Further, Participant 1 also disclosed his apprehensions by reflecting on the experience of an



acquaintance who has developed long-term physical and intellectual impairments: “I’m lucky. My grandmother works with someone whose son is in university and has been really affected by a concussion. He can’t even write anymore. I’ve had three and I can still do things. That was his only concussion.”

### **Social Support**

Athletes in the current study experienced varying perspectives in terms of social support provision from parents, teammates, coaches, and physicians. In compliance with the SCM, social support refers to the support and encouragement offered to the athlete that contributes to their continued involvement (Scanlan et al., 2016). While several athletes felt supported throughout their recovery, many encountered contrasting reactions pertaining to their decision to return to play. Only three athletes expressed full support to return to play from all support systems. Athletes also communicated a lack of understanding of the injury from teammates, friends, coaches, and parents. The following three sections will discuss (a) the perceived lack of physician support to return, (b) the lack of parental support to return, and (c) the widespread lack of understanding of the injury.

**Lack of physician support to return.** Many athletes expressed a lack of physician support when considering a return to play. Six of the eleven athletes acknowledged that at least one doctor vocalized concern about their recovery outcomes or placed pressure on them to retire. Scare tactics were frequently used in order to instill fear within the young athletes. Participant 2 recounted her experience with a physician who was cynical about her return to play outcome. She recalls him advising: “You can’t get hit again because you are going to have serious damage and you could go into a coma”. She reported this to be a major factor in her decision to retire from soccer. Participant 5 had a similar experience following her fifth concussion. She

mentioned that her doctor insisted she retire citing prospective paralysis with an additional head trauma.

Alternatively, some athletes were provided with more informational physician support, however, the return to play outlook was once again not expressed positively. Athletes were more understanding of this approach and revealed that it was effective in promoting greater awareness of the potential future consequences of their multiple concussions. Participant 7 mentioned that despite providing him with clearance to play, his doctor provided substantial information about the potential risks and future implications associated with his return: “I still have that paper saying that I can play rugby again but when he handed me the paper, he told me ‘[Participant 7] you should really consider focusing on school and maybe give up rugby.’” Although he was given permission to return, this conversation was an important factor in his decision to preserve his future health and wellbeing.

**Lack of parental support to return.** Athletes acknowledged the cautious approach their parents had when it came to their return to sport following multiple concussions. While two parents required their children to quit their sport altogether, six others vocalized their apprehensions. The potential negative long-term consequences multiple concussions present to the mental health and overall wellbeing of children concerned parents and resulted in unease regarding a return to play. Participant 10 revealed: “It’s not that my parents don’t want me to do the sport. They know how much I love it, but they are worried about the long-term consequences.” Other parents communicated their concerns by reflecting on the state of the athlete following previous concussions. Participant 2 revealed that her parents implemented this approach in order to discourage her return to play: “My parents would say ‘You know how much it hurt when you got hit and what it’s like after and how unhappy you were.’”

Despite the communication of their anxieties and concerns, the athletes understood the parents' cautious approach. Participant 8 stated: "My parents put the most pressure on me to stop. They are responsible for me. I am their child and I am under 18." Other athletes believed that the lack of support from parents was sensible and necessary for their wellbeing. Participant 6 admitted that she would remain in her sport until she was no longer capable of returning. She was therefore sympathetic to the difficult decision her mother made when she prohibited her return to the sport of soccer: "The consequences are so horrible that I think my mom just doesn't want me ending up with long-term damage. She's just scared. I don't blame her because I would be scared too if that was my kid."

**Lack of understanding.** Several athletes cited a lack of understanding, awareness, and proper support from coaches, teachers, teammates, peers, and family during recovery. A lack of understanding was a recurrent topic throughout data collection. The invisibility of the injury to other people was a common reason mentioned by the athletes. For example, Participant 5 stated: "I think people don't take it as seriously as other injuries because people don't see them. If someone has a broken ankle, you know she has a broken ankle...with concussions you don't know until you talk to the person." Participant 7 expressed similar struggles after mentioning the lack of awareness from his parents, teachers, and teammates. This contributed to his feelings of isolation following the injury: "If I have a concussion, I have an impairment that nobody sees and nobody believes unless I have a doctor's note". The lack of concussion familiarity additionally created a sense of disconnect between the young athletes and their teammates. Participant 8 conveyed the difficulty of having teammates who fail to understand the reality of her concussions: "My hockey coach told me that they [teammates] were talking about me saying 'She's faking it again to get out of stuff'. They have no clue what I was going through. They

have no clue how I was feeling.” This resulted in the young athlete feeling misunderstood and rejected by teammates.

### **Perceived Ability**

While some athletes maintained feelings of competence in their ability to return to their sport, other athletes discussed their decreased confidence in their ability to successfully return. However, the only participants to express such concerns and doubts were the six retired athletes. When asked about a prospective return to sport, during the interview, the athletes revealed a negative outlook pertaining to both their proficiency and their perceived ability to improve.

**Falling behind.** Being out of the sport for months and even years led athletes to acknowledge uncertainties pertaining to their returning level. One of the major concerns communicated by the athletes who retired was falling behind competitors and teammates. For many, this diminished the desire to return, however, for participant 1 it was a source of frustration. Although he was required to retire, he maintains a strong desire to return to his sport in the future. He explained: “I was always known as a good soccer player and the past three years other players have started playing and getting good.” Given his absence from the sport and the emergence of more skilled players, the self-efficacy and self-belief in his capability to return to a high level were negatively affected. Participant 7 shared similar speculations in which he admitted his skepticism regarding his ability to surpass his competitors and reach the high levels he had previously attained:

The players that I have played against are better. For all the other scrum halves that I was beating and making teams over, they are way past me now. It has been a year and a half so they have had two seasons on me to the point where I wouldn't be able to get back my fitness and beat them.

**Reduced proficiency.** Participant 6's return to play outlook was less dependent on the performances of previous teammates and competitors. After an extended absence from her sport, she perceived a decreased skill level that she would be incapable of restoring upon return: "I don't know if I could even get back to the level that I was at since it has been two years." This decreased skill level was shared by several athletes who have since retired from their sport. For example, Participant 11 stated: "I am losing all the skills that I learned. The longer I stay away, the more likely it is that I lose skills". For this particular athlete, however, losing her skills was not a major concern because she believes she made the sensible decision for her own health and wellbeing. Developing a negative outlook pertaining to the decreased ability levels largely originated from an extended absence from sport. Alternatively, participants who envisioned a return upon symptom dissipation remained positive about their skill level and competence following their return to play.

**Improvement capability.** Two athletes who made the decision to retire admitted that their perceived ability in their sport was diminishing prior to their final sport-related concussion. This played an influential role in the decision to retire. Participant 11, a gymnast, believed that because she was reaching her peak in her sport, her motivation and desire to return following the final concussion was poor: "Normally in gymnastics, your career is over when you are 16. When I was 14, I was like 'I'm reaching my peak. I can slow down now because I'm the best I am ever going to be.'" Despite having a high perceived competence level, she held a negative outlook on her potential to improve further. Participant 5 held a similar view: "I was getting better but I think I would have hit a plateau pretty soon. I was doing well but I don't think I could have gotten much further from that skill level." She also admitted that her decision was made easier due to the ability level of her team: "My team wasn't the best so I felt like I was doing all the work." Although she said that the concussions were the main reason for her retirement from the

sport, she acknowledged that the lack of ability within her team and her low perceived room for improvement prior to the injury also played a major role in her decision.

### **Emotional Turmoil & Mental Health**

The emotional turmoil associated with multiple concussions was significant during the recovery process. Some of the aforementioned psychosocial aspects related to the injury were frequently mentioned in accordance with emotional turmoil and mental health issues. Feeling unsupported, being confused about the injury, doubting their ability to fully recover, being removed from their sport, and experiencing ongoing symptoms contributed to greater emotional challenges encountered by the athletes. In this study, “stress”, “anxiety”, “feelings of isolation”, and “depression” were perceived to contribute to the emotional turmoil of the athletes. Ten of the eleven participants interviewed in this study discussed their ongoing struggles with episodes of anxiety, depression, or both. Only two of these athletes expressed dealing with mental illnesses prior to experiencing concussions.

**Development/Intensification of mental health problems.** Although the extent to which the concussions played a role in the athletes’ experiences with mental illness is unknown, some athletes attributed their multiple concussions to more pronounced experiences with mental health issues. Despite acknowledging being inherently stressed and anxious, Participant 4 stated: “I get nervous a lot faster and have panic attacks. They have gotten a lot worse after the concussions. I think that they have put me on edge and I have become less calm than I used to be”. Other participants attributed their concussion history to the development of new mental illnesses. Participant 8 shared her experience with the onset of anxiety: “I have a lot of anxiety, which I never had before. I think it’s because of the concussions”.

**Inability to comprehend the injury.** Having an injury to the brain was unlike any other injury. Not only did the people around the athletes struggle to comprehend the injury, but the

athletes did as well. Unlike musculoskeletal injuries where athletes are still functional, those who sustain a concussion struggle to function on a daily basis. Participant 5 explained her challenges to comprehend her injury:

Well after the concussions I was feeling alone. I couldn't go outside and I couldn't go into loud environments like school. I was excluded from the life I usually have and it's a big adjustment... Not understanding why I couldn't do stuff was really hard for me. I am so used to doing everything and then with the concussions I couldn't anymore.

The failure to understand the injury was a major challenge communicated by all participants.

Participant 7 further explored his feelings regarding his inability to lead his normal life:

Going from 100% energy into everything to a point where I can do nothing is extremely difficult. I am not able to use a computer; I am sensitive to light; and I really can't do anything. Often times, it leads to an anxiety and depression kind of feeling.

The same participant further exclaimed: "There was a part in my concussion where I was really troubled. I felt like I couldn't even move my arm when I was lying down. I was definitely depressed". Given the protracted symptoms experienced by the athletes, they were following an unpredictable and unknown timeline in which they felt impaired, isolated and alone. This inevitably led to depressed states and feelings of alienation.

**Loss of coping mechanism.** For many athletes, their sport was viewed as a coping strategy for life struggles and challenges. Sport was not only a passion, but it was also referred to as a "therapy" and "escape" from daily stressors, frustrations, and adversities. Experiencing concussions resulted in the removal of their sport as a coping mechanism and initiated further challenges related to mental health. Participant 9 discussed how the removal of the sport that she loved contributed to amplified stress and anxiety: "I have lots of anxiety. It didn't help that I got concussions and I couldn't do the stuff that I liked so it was causing me stress."

The emotional turmoil involved with people not understanding the injury, not knowing the recovery outcome, no longer being capable of doing things they could before, and being disconnected from the sport they love, led the youth athletes in this study to struggle to manage their mental health. Participant 8 discussed the combination of factors leading her to intensified emotions and feelings of hopelessness: “I was very depressed, very sad. Not only was I not playing my sport, but there was something wrong with me and I wasn’t seeing myself get better. I was feeling awful. I was sad and lonely.” Without her sport, she developed both depression and anxiety; she felt isolated and alone; and she could not comprehend the injury or whether she could successfully recover. This ultimately led this athlete to fall into a downward spiral to the point where she was experiencing “suicidal thoughts” and had to reach out to other support systems such as the Kid’s Helpline to conquer her negative thoughts.

### **Discussion**

The purpose of this study was to uncover the psychosocial challenges faced by youth athletes during recovery and return to play following multiple concussions and persistent symptoms. The findings indicated that symptom persistence, re-injury anxiety, social support, perceived ability, and emotional turmoil and mental health significantly influenced the athlete perspective of injury recovery as well as the return to play outlook. These perceived barriers should thus be considered when assisting concussed athletes in the rehabilitation process.

In line with previous injury literature (Bianco, Malo, & Orlick, 1999; Johnston & Carroll, 1998; Podlog & Eklund, 2007; Podlog & Dionigi, 2010; Podlog et al., 2013; Walker, Thatcher, & Lavallee, 2010), re-injury anxiety, diminished proficiency, inadequate social support, feelings of isolation from social groups and teammates, and the fear of failure emerged from the present data as factors preventing psychological readiness to return to play. Despite several comparable findings with previous injury research, a number of important differences are nonetheless



notable, and point to more prominent challenges for the youth athlete who has sustained repeated concussions and a protracted recovery.

Re-injury anxiety has been consistently reported as a significant factor and concern in the return to play following injury (Kvist et al., 2005; Podlog & Eklund, 2007; Podlog et al., 2011; Podlog et al., 2013). This emerged as one of the most salient worries for the participants in this study. Athletes feared for their personal safety both before and after their return. Factors in the literature commonly contributing to athletes' return to sport anxiety include: the severity of the trauma, the number of injuries to the same location on the body, the chronicity of the injury, and the type of sport the athlete plays (Taylor, Stone, Mullin, Ellenbecker, & Walgenbach, 2003). Furthermore, in a study with injured rugby players, Carson and Polman (2012) found that the primary aim for a successful return is to acquire confidence in the injured limb. Since the youth athletes in the present study had suffered at least three concussions and many continued to experience ongoing symptoms, the difficult task of regaining confidence that their head would withstand any level of impact was a major concern. This contributed to doubts about remaining injury free as well as initiated a different style of play and hypervigilance of potential threats within the sport. These parallel previous findings from studies looking at athletes with musculoskeletal injuries (Carey, Huffman, Parekh, & Sennett, 2006; Podlog & Eklund, 2007; Podlog et al., 2011).

Despite the similarities with previous injury research, participants discussed other sources of re-injury anxiety that are likely unique to youth athletes with multiple concussion. First, athletes were fearful that a subsequent concussion would result in a premature career termination as well as long term health complications. According to Purcell (2014), when there is evidence of heightened sensitivity to less force, when athletes experience cognitive deficiencies, when symptoms persist for longer periods of time than prior concussions, and when athletes play a

high-risk position or risky style of play, the athletes should consider career termination. Given the number of concussions and protracted symptoms as well as parental and physician pressure to retire, the players in this study were apprehensive about no longer being permitted or capable of returning following a subsequent injury. Fear associated with prospective sport removal has, to our knowledge, not been examined in previous literature.

Another important finding within the theme of re-injury anxiety was the consideration of others' negative experiences. This is a unique finding as the source of anxiety is largely dependent on other people rather than solely on the athlete. According to Covassin and colleagues (2014), modeling successful recovery by other athletes enhances confidence and positive perceptions in an athlete's recovery process. Athletes in the present study discussed experiences of teammates and athletes who have not been able to recover after sustaining multiple concussions. This created a negative outlook and intensified personal fears pertaining to the return to sport. This negative modelling may, however, be an important factor that can help youth athletes make informed and cautious decisions that will help preserve their overall wellbeing.

Another unique finding from this study is that a perceived post-injury performance deficit and inability to return to a pre-injury level was only communicated by athletes who decided to retire from their sport. The youth athletes who envisioned a return to play remained confident in regards to their ability to perform to previous standards and achieve future performance goals. The literature examining return to sport following musculoskeletal injuries, however, has consistently revealed that athletes experience apprehensions about their level of proficiency upon return (Evans et al., 2000; Gould et al., 1997; Podlog & Eklund, 2006; 2007; Walker et al., 2010). This may suggest that sustaining a concussion itself is unrelated to perceived diminished performance efficacy and confidence to perform to previous standards, and that the doubts

reported by the athletes who retired in this study may be solely provoked by the time away from the sport.

A further explanation that may shed light on the contrasting perceptions of athletes in this study and athletes with musculoskeletal injuries in previous studies may be attributable to the nature of the injury. Musculoskeletal injuries affect the normal physical functioning of a specific body part (Punnett & Wegman, 2004). Although concussions are associated with somatic symptoms (Cantu et al., 2010; Guay et al., 2016) and cervical pain from the initial impact (Blume, Lucas, & Bell, 2011), the physical functioning of the body usually remains unharmed. It may therefore be sensible to believe that athletes who must physically rehabilitate an injury will have added anxiety in regards to trusting the injured body part to perform to previous standards. According to Andersen (2001), the confidence of athletes to return to sport is dependent on severity, location, and history of injury. Given a diminished need to rehabilitate following a concussion, athletes may have fewer doubts about their body's ability to make a successful return. Further research is necessary to explore the supposition that athletes with concussions may be more confident in their abilities upon return to play.

Social pressure to retire emerged as a prominent issue shared by the athletes. In addition to scare tactics applied by some physicians, the frequent communication of uncertainty and apprehensions by both physicians and parents regarding the return to play resulted in the athletes feeling less volitional in their decision process to continue or retire from sport. It additionally created intensified fears of re-injury and worries about their inability to make a successful return. The provision of effective social support has been found to be vital in mitigating re-injury anxiety, alleviating performance anxiety, and improving self-belief and confidence (Johnston & Carroll, 1998; Podlog et al., 2011; Rees, Mitchell, Evans, & Hardy, 2010). The lack of effective social support to return and perceived pressure to quit represents a distinct finding in the present

study. Previous concussion research (Broshek et al., 2015; Echemendia & Cantu, 2003; Kroshus et al., 2015; Sye, Sullivan, & McCrory, 2006) and injury research (Andersen, 2001; Bianco, 2001; Podlog & Eklund, 2007; Podlog et al., 2013) suggest that youth athletes more commonly feel a sense of pressure to return to sport. This finding may suggest an importance for parents and physicians to be aware of the influence they have on athlete outcomes and perceptions.

In addition to receiving minimal support to return, the lack of understanding from teammates, peers, parents, and coaches throughout the injury recovery is a distinctive finding in this study. Previous studies have addressed social isolation and insensitivity following injury (Podlog et al., 2011); however, athletes in the current study expressed a belief that people do not sufficiently understand the injury to offer proper support. Despite the majority of athletes maintaining a sense of belonging to the team, several athletes identified frustrations with having teammates and friends who do not comprehend the challenges they are facing. This contributed to feelings of isolation from the team. The general lack of understanding was paralleled in Caron and colleagues' (2013) study with retired professional hockey players who expressed feelings of being alone after their teammates and other sources of support could not understand what they were experiencing. This sense of being alone may be explained by the invisibility of the injury in comparison to musculoskeletal injuries, which are frequently evident from the outsider's perspective (Bloom et al., 2004). Furthermore, current reports confirm a lack of understanding in regards to the severity of concussions and effectiveness of concussion education despite the implementation of concussion legislations (Carroll-Alfano, 2017; Miyashita et al., 2014). The findings from the present study support the continued need for improved concussion education for youth athletes, parents, and coaches.

Moreover, beyond the return to play outlook, the youth participants revealed long-term concerns and apprehensions associated with the persistence of their symptoms and their future

mental health and wellbeing. As suggested in previous research, the inability to effectively predict when or if full recovery will occur remains a psychologically difficult component of concussions (Chermann et al., 2014; McCrory et al., 2017). Given a typical youth recovery timeline of 14-28 days (Corwin et al., 2014; Graham et al., 2014), when symptoms persist for longer, athletes become increasingly frustrated and impatient (Leddy, Sandhu, Sodhi, Baker, & Willer, 2012). This was evident in the current study in which the athletes discussed how the symptoms plagued their everyday life and contributed to distress associated with return to play and future consequences.

Indeed, mental health problems and emotional turmoil emerged as an important finding from this research. Extensive concussion literature has reported associations between concussions and the onset of mental health issues. A well accepted justification for the development of depression, anxiety, and mood disorders among individuals who have sustained a concussion is related to the impairment of the mood centres of the brain (i.e., amygdala, hippocampus, and the prefrontal cortex of the brain) (Harmon et al., 2013; Kontos et al., 2012). Multiple concussions further intensify the severity of this risk (Leddy et al., 2012; Semple et al., 2015). The participants in the current study reported high levels of anxiety and depression as well as isolation and confusion. Although the impairment of mood centres associated with multiple concussions may serve as one account for the development of mental health issues and isolation among the participants in this study, other psychosocial challenges discussed above arguably played a contributing role in exacerbating negative emotions and mental illness.

Previous musculoskeletal injury literature posits that depression, anxiety, reduced self-esteem and feelings of isolation are common occurrences among injured athletes (Schwab Reese, Pittsinger, & Yang, 2012; Walker, Thatcher, & Lavalley, 2007). This suggests that beyond the brain injury itself, the psychosocial challenges experienced likely affect athletes' wellbeing.

First, the persistence of symptoms has been associated with mental health issues. Empirical research has shown that experiencing persistent symptoms in which athletes are not capable or permitted to engage in activities they previously did may be associated with depression and negative emotions (Halstead & Walter, 2010; Kutcher & Eckner, 2010; Leddy et al., 2012; Zemek et al., 2016). Second, social support plays a vital role in mitigating negative emotions and enhancing athlete wellbeing during injury recovery for athletes with concussions and musculoskeletal injuries (Covassin et al., 2014; Robbins & Rosenfeld, 2001). Given the substantial amount of pressure to retire and a lack of understanding from social support groups, it is reasonable to believe that negative emotions were increased for the youth athletes and contributed to the onset of mental health problems. Finally, re-injury anxiety inevitably contributed to the athletes' overall wellbeing. According to Walker and colleagues (2010), re-injury anxiety not only creates internal doubts prior to the return but also a tentative and apprehensive playing style following the return. Despite maintaining a strong desire to remain committed, athletes were uncertain about whether it would be sensible and feared potential detrimental consequences upon a subsequent concussion. These findings suggest that in addition to the disruptions in the brain, athletes faced numerous psychosocial challenges that contributed to their mental health and wellbeing. The mental health of youth athletes with multiple concussions and persistent symptoms should therefore be a priority.

### **Practical Implications**

In terms of practical contributions, the findings will help to educate health practitioners, parents, athletes, and coaches to better understand the psychosocial barriers athletes encounter throughout the recovery process following multiple concussions and persistent symptoms. This fills an important gap within the literature as no research, to our knowledge, has looked at the barriers that counter athletes' continued commitment following repeated concussions and

prolonged recovery. As a result, this research helps to better understand key differences between athletes with musculoskeletal injuries and concussions, which may provoke better care and better management for the injured athlete. Findings support the necessity to prepare athletes to encounter psychosocial challenges and offer support that will contribute to improving their overall psychological wellbeing as they attempt to recover from the injury. This may be possible through athlete interventions and the provision of sport psychology services to better prepare them to cope with the challenges and make the decision that suits their individual needs (Williams, Potter, & Ryland, 2010). Athletes who receive proper support and discuss concerns with a specialist will be better equipped to deal with the multiple athletic concussions and the ensuing challenges. Another practical implication derived from this research supports the necessity to implement better return to play guidelines for athletes with multiple concussions that ensure the athlete is both physically and psychologically prepared to make a return to sport. Current guidelines solely ensure the physical readiness, however the results from this study show the high importance of athlete psychological readiness for positive return to play experiences. Finally, the substantial lack of proper support and understanding demonstrates a necessity to better educate support systems about the invisible nature and the short and long-term consequences of the injury. This will help athletes to foster a more understanding environment that will contribute to athletes feeling less isolated and misunderstood by parents, teammates, and coaches throughout their injury recovery.

### **Limitations and Future Research**

In understanding the results from the current study, it is important to address the limitations. First, the participants have not all sustained the same number of concussions. It is reasonable to believe that athletes who have sustained more concussions encountered additional psychosocial challenges in comparison to athletes with fewer injuries. Although having athletes

who are in different stages of recovery and who have made opposing decisions regarding the decision to return provides a broad scope in regards to the psychosocial challenges and their influence on the athlete decision, it may be beneficial to focus on one specific group (e.g., athletes who have made the decision to return). This would aid to gain more specific results for why athletes make the decisions they do. Furthermore, since only one athlete returned to play, it was difficult to assess the persistence of the psychosocial challenges following injury and whether the athlete's fears and doubts dissipated. This may be an important direction for future research.

Future research regarding the psychosocial factors associated with multiple concussions and return to play decision should examine both positive and negative dimensions of these factors. This will offer a more comprehensive understanding as to why athletes remain committed to their sport despite the existing negative psychosocial challenges. Findings from the current study additionally support the need to further explore the factors involved in the onset of mental issues in athletes with multiple concussions beyond the disruptions within the brain caused by the injury. Another potential direction for future research may be to establish differences in psychosocial barriers between athletes with multiple concussions and athletes with musculoskeletal injuries. This may offer more practical insight into how to better help athletes cope with the psychosocial challenges associated with the injury. Extensive research with athletes with musculoskeletal injuries has relied on the self-determination framework (Deci & Ryan, 1985; 2012; Ryan & Deci, 2000; 2007) to better understand psychosocial factors involved with injury and return to sport. This may provide an important avenue to further explore psychosocial challenges related to concussions. Finally, research should address differences in perceived ability upon return between athletes with multiple concussions and athletes with musculoskeletal injuries.



## **Conclusion**

Overall, the findings from this study reveal numerous psychosocial challenges youth athletes with multiple concussions and persistent symptoms face in their recovery and decision-making process to return to play. Consistent with previous literature (Bianco, Malo, & Orlick, 1999; Johnston & Carroll, 1998; Podlog & Eklund, 2007; Podlog & Dionigi, 2010; Podlog et al., 2013; Walker, Thatcher, & Lavallee, 2010), re-injury anxiety, diminished proficiency, inadequate social support, feelings of isolation from social agents, and the fear of failure. This suggests that some psychosocial challenges may be universal across various types of injury. Second, the findings from this study highlighted many key differences from the musculoskeletal injury literature. Athletes reported fears regarding their future health and wellbeing, anxiety deriving from the negative concussion experiences of peers, and substantial pressure to retire from social agents. This suggests that athletes with multiple concussions and a prolonged recovery may encounter unique challenges in comparison to other injuries. Finally, the findings additionally shed light on youth athlete wellbeing and how the consequences of multiple concussions and ensuing psychosocial challenges may play an important role in the onset of athlete mental health issues.

The current study, to our knowledge, is the first to investigate the psychosocial challenges encountered by youth athletes with multiple concussions and persistent symptoms during the recovery and return to play transition. This investigation helps to fill a gap in comparisons between musculoskeletal injuries and concussions through the introduction of novel psychosocial challenges pertaining to the multiple concussions and how they may influence athletes' decision to remain committed or retire.

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### **General Discussion**

The purpose of this Master's research was to explore factors involved in the youth athletes' commitment to pursue or retire from sport following multiple concussions and persistent symptoms. Article one provided insight into the determinants of youth athletes' sport commitment and offered support for the expansion of the SCM. Study findings surfaced through a deductive analysis guided by Scanlan and colleagues' (2016) SCM as well as an inductive approach to discover potential new determinants that merit inclusion into the SCM. Three main findings emerged from this study. First, sport enjoyment, valuable opportunities, and the desire to excel were the most salient reasons for sustained sport commitment. Another important finding was that social support and social constraints were perceived to be minimally important. Finally, a strong athletic identity proved to be a significant reason for youth athletes' continued sport commitment. Findings therefore suggest athletic identity as a novel construct to be considered in the current SCM.

The second article of this research uncovered the psychosocial challenges faced by youth athletes during recovery and return to play following multiple concussions and persistent symptoms. Findings suggested that the youth athletes faced a variety of psychosocial challenges that undermined their positive recovery and return to play outlook. This study showed that athletes with multiple concussions share many similarities with athletes who have sustained musculoskeletal injuries. Re-injury anxiety, diminished perceived ability, lack of effective support, and factors associated with mental health were all consistent with past literature (Johnston & Carroll, 1998; Podlog & Eklund, 2007; Podlog et al., 2013; Walker et al., 2010). However, it was determined that several psychosocial challenges may exist that are unique to athletes who have sustained multiple concussions and experience a protracted recovery. These include: heightened anxiety about their future mental health and wellbeing, re-injury anxiety

resulting from negative concussion experiences of others, and an overall pressure to retire and lack of effective support from support agents. Finally, the findings shed light on youth athlete wellbeing and how psychosocial challenges stemming from concussions may play a significant role in mental health and emotional wellbeing.

Together, the findings from both articles demonstrate that despite reporting multiple sources of sport commitment, athletes experience numerous psychosocial challenges that amplify fears and hinder their return to play outlook. High levels of sport commitment and the presence of various psychosocial barriers may not be conducive to athletes' mental wellbeing or the return to play decision-making process. The evidence presented in this research suggests that following multiple concussions and protracted symptoms, the mental health of youth athletes may be at significant risk. Another important outcome showed that there remains a need to better prepare youth athletes for two important decisions: the decision to return to play and the decision to retire. Finally, findings suggest a need for athletes to feel sufficiently supported by family, physicians, teammates, and coaches throughout recovery. This discussion will focus on three main sections. The first section will address the aforementioned return to play decisions youth athletes with multiple concussions face. The second section will discuss the mental health of youth athletes and help to better understand the implications of high sport commitment and psychosocial challenges for athlete overall wellbeing. The final section will present the need for effective support and how it may contribute to improved wellbeing and preparation to either return to play or retire.

### **Return to Play Decision**

The decision to remain committed was a significant challenge for the participants in this study. Despite maintaining love and enjoyment for the sport, appreciating valuable opportunities, feeling like they had invested too much, having a continued desire to excel, and developing an

athletic identity, the athletes felt reluctant as they considered the potential to compromise their future wellbeing. This contributed to a difficult decision: returning to their sport and risk further negative consequences or terminate their career and preserve their health. When athletes wish to return to play, they must be equipped with effective coping strategies to overcome psychosocial challenges and be psychologically prepared to persevere through inevitable adversity (Evans et al., 2000; Walker, Thatcher, Lavalley, & Golby, 2004). It is also vital for athletes to be empowered to make a decision to retire when returning to play is detrimental to future health and no longer perceived to be safe (Park, Lavalley, & Tod, 2013).

**Psychological Readiness to Return to Play.** Previous research postulates that a lack of *psychological* readiness to return to play contributes to negative and unsuccessful return to play outcomes (Ardern, Taylor, Feller, & Webster, 2013; Kvist et al., 2005). Regardless of *physical* readiness to return, when athletes are not psychologically prepared, they will experience negative affect, decreased confidence, diminished self-efficacy, the emergence of new fears, risk appraisals, and an altered style of play (Glazer, 2009; Podlog, Heil, & Schulte, 2014; Walker et al., 2004). This is consistent with the concerns brought forth by the youth athletes in this research. The psychosocial challenges (i.e., concerns about persistent symptoms, re-injury anxiety, perceptions of diminished ability, lack of effective support, and mental health and emotional wellbeing) discussed in article two resulted in apprehension, distress, and overall feelings of not being prepared to successfully return to play. Athletes who were able to return expressed cautious playing styles and fears associated with the potential to exacerbate the challenges they experienced during recovery. According to Walker and colleagues (2004), hesitation and a changed playing style may additionally enhance the risk of re-injury. In order to ensure a more successful return to play, it is therefore essential for athletes to feel



psychologically ready to return to play. If they cannot personally bring themselves to this state of mind, they may benefit from the help of a sport psychology specialist.

**Consideration of Career Termination.** The multitude of psychosocial challenges disclosed by the youth athletes raised questions regarding sport retirement. While some athletes eventually retired due to external pressures and fears for their personal safety, many refused to give up their initial sport. Even among the participants who made the decision to retire and pursue a safer alternative, the motivation and desire to return remained. This suggests that athletes may not be sufficiently prepared to retire from their sport. Sport commitment can provide important insight into the difficulty of retiring following injury. From the findings in article one, sport enjoyment, valuable opportunities, desire to excel, and athletic identity were important reasons for which athletes desired remaining committed. Purcell (2014) recommends that young athletes should retire when they display a decreased concussion threshold; they develop more prolonged symptoms; new cognitive impairments appear, or when athletes play a risky sport and position. Given this recommendation and the reality of the participants in this study, career termination was a foreseeable outcome. According to Baillie (1993), the fear of sustaining an injury that will terminate one's career is one of the worst fears an athlete can experience. Although there is minimal research pertaining to youth career-ending injuries, the literature suggests that premature career termination is associated with anxiety, depression, isolation, loss of identity, anger, and frustration (Alfermann, Stambulova, & Zemaityte, 2004; Lally, 2007). Given our findings, youth athletes may not have the capacity and resources to effectively cope with the decision to retire. This is perhaps a primary reason for which they remain committed to their sport.

## **Mental Health**

Another important factor when taking into consideration study findings is the mental health of the youth athletes following multiple concussions and persistent symptoms. Athlete mental health likely has implications on both the return to play outlook as well as the desire to remain committed to one's sport. The nature of the concussion and harm to important brain regions related to mental wellbeing serves as one explanation for the development of depression, anxiety, and other mental health issues (Harmon et al., 2013; Kontos et al., 2012; Leddy et al., 2012). The psychosocial challenges participants faced in the present study regarding their future health and the return to play shed light on additional factors relating to mental health. This was supported by previous musculoskeletal injury research which stipulate that re-injury anxiety, insufficient support, perceived inability to achieve previous standards, and self-presentational concerns contribute to athlete mental illness during recovery and the return to play transition (Covassin et al., 2014; Kutcher & Eckner, 2010; Podlog et al., 2013; Schwab Reese, Pittsinger, & Yang, 2012; Walker et al., 2004).

In addition to the psychosocial challenges encountered, the sources of sport commitment found in article one may further our understanding of athletes' diminished psychological wellbeing. In a study with elite male athletes, Doherty, Hannigan, and Campbell (2016) posited that an athlete's strong sense of athletic identity and a desire to excel may be linked to the onset of depression following injury. Removal from a sport that is the foundation of an athlete's identity is associated with negative affect, anxiety, frustration, and confusion (Brewer et al., 2010; Heijne et al., 2008). The presence of strong athletic identity was an important factor communicated by athletes in this research; hence, it was suggested to be included in the SCM. Furthermore, the desire to excel was also one of the most salient determinants of sport commitment for the youth athletes. Overall, these findings may suggest heightened susceptibility

to the onset of mental health problems for athletes who sustain multiple concussions and persistent symptoms. Provided the links between both sport commitment and psychosocial challenges to one's mental health and emotional state, it is evident that the mental health of youth athletes should be a priority following multiple concussions and persistent symptoms. Athletes must be sufficiently prepared to cope with the psychosocial challenges resulting from an injury and to regulate sources of commitment that may hinder their wellbeing.

### **Need for Effective Support**

An overarching finding from this Master's research showed that athletes perceived insufficient support following injury and in their decision to return to play. Findings suggested that parents, physicians, teammates, and coaches remain uncertain about how to effectively support youth athletes following multiple concussions and persistent symptoms. This initiated feelings of disconnect from teammates, self-doubts, anxiety pertaining to successful return to play outcomes, and fears about future wellbeing. Taking into consideration the mental health of the athletes and the potential lack of resources to make a decision to return to play or retire, the provision of support may be vital to ensure successful concussion outcomes.

Extensive research has established that social support aids athletes to comprehend the injury, acquire more confidence, improve self-efficacy, and reduce re-injury anxiety (Johnston & Carroll, 1998; Podlog et al., 2011; Rees, Mitchell, Evans, & Hardy, 2010). Consequently, when athletes feel supported, they are more psychologically ready to return to play with a positive outlook (Bianco, 2001; Caron et al, 2013; Iñigo et al., 2015; Rees et al., 2010). Informational support (i.e., support provided through valuable guidance, advice, and information), emotional support (i.e., support provided through encouragement, empathy, and understanding), and instrumental support (i.e., support provided through tangible assistance) are important areas to improve the wellbeing of injured athletes (Bianco, 2001; Müller, Perter, Cieza, & Geyh, 2012;

Ponsford et al., 2001). The provision of informational support to youth athletes following concussions has been found to ensure better symptom comprehension, alleviate injury stress, and reduce attributions to previous problems (Kirkwood, Yeates, & Wilson, 2006; Ponsford et al., 2001). Research has found that emotional and tangible support is additionally important to athlete wellbeing (Bianco, 2001; Covassin et al., 2014; Podlog et al., 2014). According to Covassin and colleagues (2014), however, the inability to notice physical signs of a concussion may explain the perceived ineffective emotional support and tangible support offered to athletes. Despite recent efforts through the implementation of guidelines, laws, and educational resources, research suggests that efforts have largely been ineffective (Carroll-Alfano, 2017; Miyashita et al., 2014).

All participants in this study experienced significant consequences associated with their multiple concussions. As a result, the youth athletes were uncertain about their future in their sport. Their retirement was a conceivable reality following a subsequent concussion, however, as previously mentioned, they were unprepared to make the decision. The retirement decision is likely the most difficult with which athletes must effectively cope (Baillie, 1993), however, studies have found that effective social support and goal setting are fundamental to a successful sport transition process (Park et al., 2013; Stambulova, Alfermann, Statler, & Coté, 2009). Given the high levels of athletic identity among the athletes in the current study, it also seems to be important to develop multiple personal identities beyond sport by exploring other interests (Stambulova et al., 2009). This will allow athletes to be more prepared to cope with retirement from sport. Furthermore, according to Park and colleagues (2013), proactive support (i.e., conscious efforts to prepare the athlete for potential outcomes) from parents, physicians, and coaches may be optimal to effectively prepare athletes for career termination. It is imperative that this be completed early in the initial recovery process. By doing this, athletes can become

more prepared for a potential career termination and have a positive retirement outcome (Park et al., 2013; Stambulova et al., 2009).

Previous injury literature and the findings from this study show that positive social support must be provided to youth athletes with multiple concussions in order to improve athlete wellbeing and provide them with the necessary confidence to retire or remain committed to their sport. It is therefore essential for young athletes, parents, and coaches to be better educated about the injury and how to sufficiently support athletes with a concussion (Carroll-Alfano, 2017; Covassin et al., 2014; Miyashita et al., 2014). Psychological interventions may additionally provide athletes with the necessary support they require to establish better coping strategies for the negative emotions and psychosocial challenges encountered throughout recovery and retirement transitions (Evans et al., 2000; Glazer, 2009; Stambulova et al., 2009; Walker et al., 2004). According to Evans and colleagues (2000), injured athletes benefit from goal setting, imagery, and verbal persuasion. Interventions have been recognized to be valuable in aiding athletes to overcome mental health problems following a concussion as well as maintain a positive recovery outlook (Kirkwood et al., 2006; McCrea et al., 2009).

Overall, the findings from article one and article two bring awareness to the motivations behind athletes' desire to remain committed and the psychosocial challenges that may undermine full commitment. When commitment is compromised, athletes may experience new fears and apprehensions related to their return to play and recovery outcome, which potentially hinder their mental health and challenge their return to play decision. The findings suggest a need to effectively support athletes throughout the concussion recovery as this has proven to be vital in the improvement of mental health following injury. Moreover, the supported athletes will be better prepared to make a decision between retirement and remaining committed.

### **Future Research**

The novelty of looking at athletes' sport commitment following multiple concussions and persistent symptoms suggests that there are several avenues through which future research could be conducted. First, based on the findings from article one, future research should explore the potential addition of athletic identity as a determinant in the SCM. Although athletic identity has been extensively explored in previous literature, it may be important to better understand its involvement in the sport commitment of healthy athletes or athletes who have sustained fewer injuries. All the athletes in the current study remained committed to their sport following multiple concussions; therefore, it is conceivable that their athletic identity might be greater than other athletes. Through exploring commitment of healthy athletes or athletes returning from their first major injury, the influence of athletic identity will be more accurately portrayed.

Second, future research may benefit by looking at athletes with multiple concussions and athletes with multiple musculoskeletal injuries. No research, to our knowledge, has looked at the enhanced challenges of returning to sport following multiple musculoskeletal injuries. A comparative that looks at athletes with musculoskeletal injuries and athletes with concussions, would help to extend current knowledge of the psychosocial challenges involved in multiple injuries as well as establish concrete findings that will shed light on key differences between the different types of injuries.

Third, future researchers should explore different methods to support athletes with multiple concussions and persistent symptoms. Despite efforts to educate the public about the injury itself, the findings suggest that little is known in terms of how to effectively support athletes with multiple concussions who are considering returning to play. By developing strategies to improve the understanding of athletes' circumstances, they may better cope with the psychosocial challenges associated with the injury and recovery outlook. Effective social support

may also better prepare athletes who return to play as well as those who must manage the challenges of an early career termination.

### **Conclusion**

Overall, this Master's research advances the current understanding of sport commitment following multiple concussions and persistent symptoms. Specifically, the findings from this research provided insight into the reasons athletes maintain a strong desire to remain committed as well as the challenges that potentially undermine continued commitment. These may have significant implications on the overall wellbeing of athletes and their recovery outlook. The findings from this study may be useful for parents, physicians, coaches, and athletes to better understand the circumstances and difficulties associated with concussions and foster a more supportive environment. Future research should seek to explore strategies that will better support youth athletes who have sustained multiple concussions and persistent symptoms.

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## Appendix A

### Interview Guide

I am conducting research to gain a better understanding as to why young athletes return to their sport following multiple concussions. I would like to know more about your sources of commitment and reasons as to why you plan to return to your sport. Through this research, I would like to find out what drives young athletes to remain committed to or active in their sport following multiple concussions. Your participation in this interview will be greatly helpful to achieve the goals of this research.

I would like to let you know a few things about this interview before we start. First and foremost, there are no right or wrong answers. I would like you to share anything you feel might add insight into the topic by sharing your own, real experience related to concussions. I would also like to note that all the information you disclose or share with me will remain strictly confidential. Your name as well as any names you might talk about during this interview will not be mentioned in the study. Your participation is entirely voluntary. If you are feeling uncomfortable at any point throughout this interview, we can take a break. If you do not wish to answer a question, you can decide to skip it. Furthermore, at any point, you may choose to withdraw from the study. In this case, no information you shared will be used. You should be able to feel really relaxed during this interview and we can treat it like a normal conversation. Do you have any questions for me before we start? Should you have any at any point, I would be happy to answer them.

**Demographic**

1. How old are you?
  - What grade are you in right now?
2. Can you describe your sporting experience?
  - Involvement in sport from early years
  - What sports did you play?
  - What sport(s) do you currently focus on?
    - How long have you played this sport?
  - When did you begin to really focus on playing this sport?
3. How often do you practice/train every week?
4. Why is this sport important for you?
  - What is your goal in participating in this sport?

**Parents**

1. Were your parents involved in competitive sports? To what extent?
2. Do you believe your parents influence your sporting behavior?

**Concussion**

1. Describe your journey with concussions.
2. Can you tell me about your concussion history?
  - How many concussions have you had?
  - When and how were your concussions sustained (game play/practice/collision/etc.)?
  - Did you report all your concussions? Why/Why not?
  - What symptoms did you display and how long did they last?

- What was the worst concussion you had? How was that different from the others?
3. Are you aware of any long-term health risks or implications associated with multiple concussions? If yes, what?
    - How does that make you feel?
    - Does this concern you going forward in your sport?
    - How has this influenced your desire to remain committed to your sport?
  4. Would you consider yourself familiar with concussions? Why or why not?
  5. Are you aware of any professional athletes who have sustained multiple concussions throughout their career?
  6. Are you aware of any athletes who have come forward blaming concussions for their health problems? If yes, what do you think about this?
  7. What do you think motivates or influences you the most to remain committed to your sport?

### **Sport Commitment**

#### Sport Enjoyment

1. What attracts you to your sport?
2. What do you like best about your sport?
3. How much do you enjoy playing your sport? Explain.
  - Scale of 1-10

#### Valuable Opportunities

1. What are some opportunities you have experienced from participating in this sport throughout your career?

2. Describe positive opportunities from your sport that you would miss out on if you decided not to return?

#### Other Priorities

1. What are the main priorities right now in your life?
2. What, if any, are other attractive alternatives or priorities that nearly convinced you to not return to your sport?
3. What, if any, priorities were or would be facilitated through your participation in the sport (i.e., scholarships)?

#### Personal Investments

1. What have you invested in your sport through your years of participation?
  - What was your greatest sacrifice?
  - What was your greatest gain?
2. Did you ever feel like you invested too much into your sport to give it up (i.e., money, time)? Explain.

#### Social Constraints

1. Did you ever feel any pressure from anyone to return following your recovery from your concussions? If yes, describe the pressures you experienced.
  - Family?
  - Coach?
  - Teammates?
  - Friends?
  - Other?
2. In what ways did you feel pressured to return?

3. Who would you say put the most pressure on you to remain committed to your sport?
  - Did this sense of obligation play an influential role in your decision to remain committed? If yes, explain how.

#### Social Support

1. Did you feel encouragement and support to return to your sport after having had so many concussions?
  - Family?
  - Coach?
  - Teammates?
  - Friends?
  - Other?
2. How was this support offered? In what ways were they supportive?
3. Who would you say was the most supportive in your decision to return to your sport?
  - Describe how important their support was in making your decision to return following your recovery from the concussions?
  - Was the support offered in the same way after every concussion? If not, explain.
4. Did anyone's level of support change following your most recent concussion? How?

#### Desire to Excel

1. Talk to me about your goals or feelings of unfinished business that impacted your decision to remain committed and return to your sport?
2. Do you feel like you have achieved your potential in your sport? Explain why or why not.
3. Is the need to excel stronger than the need to quit? Why?

#### **Concluding Questions**

1. What was your primary source of motivation to continue playing your sport following so many concussions?
  - Rank 1-7 determinants of sport commitment (enjoyment, valuable opportunities, other priorities, personal investments, social constraints, social support, desire to excel, other) – briefly explain the order.
2. What has led you to have such a strong desire to continue following multiple concussions and prolonged persistent symptoms?
  - What makes this sport worth it for you?
  - If you decided to stop, describe other activities or hobbies where you get the same feeling you get from your sport, if any.
3. Discuss whether you ever considered pursuing a safer and less risky sport to protect your future health and well-being?
4. Have you ever sought other support systems to help you with your concussion recovery (mental consultant, psychologist, etc.)?
  - If yes, how has this helped you make the right decision for you?
5. Would you continue playing if you sustained another concussion? Explain.
6. Is there anything else you would like to share?

Thank you.

## Appendix B

## Ethical Approval Notice

File Number: H11-16-11

Date (mm/dd/yyyy): 11/30/2016



**Université d'Ottawa** **University of Ottawa**  
 Bureau d'éthique et d'intégrité de la recherche Office of Research Ethics and Integrity

**Ethics Approval Notice****Health Sciences and Science REB****Principal Investigator / Supervisor / Co-investigator(s) / Student(s)**

<u>First Name</u>	<u>Last Name</u>	<u>Affiliation</u>	<u>Role</u>
Terry	Orlick	Health Sciences / Human Kinetics	Supervisor
Scott	Hancock	Health Sciences / Human Kinetics	Student Researcher

**File Number:** H11-16-11**Type of Project:** Master's Thesis**Title:** Adolescent Athlete Sport Commitment Following Multiple Concussions and Persisting Symptoms

<b>Approval Date (mm/dd/yyyy)</b>	<b>Expiry Date (mm/dd/yyyy)</b>	<b>Approval Type</b>
11/30/2016	11/29/2017	Approval

**Special Conditions / Comments:**  
N/A

File Number: H11-16-11

Date (mm/dd/yyyy): 11/30/2016



**Université d'Ottawa**      **University of Ottawa**  
Bureau d'éthique et d'intégrité de la recherche      Office of Research Ethics and Integrity

This is to confirm that the University of Ottawa Research Ethics Board identified above, which operates in accordance with the Tri-Council Policy Statement (2010) and other applicable laws and regulations in Ontario, has examined and approved the ethics application for the above named research project. Ethics approval is valid for the period indicated above and subject to the conditions listed in the section entitled "Special Conditions / Comments".

During the course of the project, the protocol may not be modified without prior written approval from the REB except when necessary to remove participants from immediate endangerment or when the modification(s) pertain to only administrative or logistical components of the project (e.g., change of telephone number). Investigators must also promptly alert the REB of any changes which increase the risk to participant(s), any changes which considerably affect the conduct of the project, all unanticipated and harmful events that occur, and new information that may negatively affect the conduct of the project and safety of the participant(s). Modifications to the project, including consent and recruitment documentation, should be submitted to the Ethics Office for approval using the "Modification to research project" form available at: <http://research.uottawa.ca/ethics/submissions-and-reviews>.

Please submit an annual report to the Ethics Office four weeks before the above-referenced expiry date to request a renewal of this ethics approval. To close the file, a final report must be submitted. These documents can be found at: <http://research.uottawa.ca/ethics/submissions-and-reviews>.

If you have any questions, please do not hesitate to contact the Ethics Office at extension 5387 or by e-mail at: [ethics@uOttawa.ca](mailto:ethics@uOttawa.ca).





## Appendix C

## Recruitment Letter (Youth)

## Project Title:

- Youth Athlete Sport Commitment Following Multiple Concussions and Persistent Symptoms

Scott Hancock (principal investigator) and Dr. Terry Orlick (supervisor) are currently conducting a study at the University of Ottawa School of Human Kinetics. The study's objective is to explore youth athletes' motivation to remain committed to a sport following multiple concussions and persisting symptoms given the potential consequences to future health and wellbeing.

The purpose of this letter is to encourage your participation in this research given the experiences you have had with multiple concussions and your continued commitment to your sport. The principal investigator is currently recruiting 10-12 pre-adolescent and adolescent athletes in Ottawa and surrounding locations in Ontario. Athletes eligible for the study will must (a) be between the ages of 12-18, (b) participate in a year-round competitive sport (c) have sustained a minimum of three concussions with the onset of persisting post-concussion symptoms lasting beyond 28 days following the most recent injury, and (d) have made the decision to remain committed to their initial sport for a minimum of three concussions. Participants will be selected based on a first come, first served basis.

Participation would consist of taking part in one interview lasting approximately 45-60 minutes. The interview will focus on (a) your athletic background, (b) your experience with multiple concussions, and (c) the sources of sport commitment involved in the decision to remain in your sport or pursue a safer alternative sport.

The researcher guarantees that all data will remain strictly confidential and will solely be used for the purpose of this research project. Anonymity will be ensured by removing any identifying information. Participant names, other names shared, or team names will all be replaced by pseudonyms (false names). Contextual details gathered that may potentially reveal the identities of the participants will also be altered to remove any prospect of identifications being made. Furthermore, the audio recordings and interview transcriptions will be stored in Dr. Orlick's research laboratory at the University of Ottawa where only the principal investigator and supervisor will have access. Parents will not have access to review the interview transcripts of their children. Participants may choose to discontinue their participation in the study at any point or refuse to answer any questions during the interview. The goal of this research is to gain insight as to why youth athletes who have sustained multiple concussions choose to remain committed to their sport.



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Given the project's focus on the youth population, please discuss with your child to verify his or her interest in participating in the study. Participation in this study is entirely voluntary. Your child's participation will have no effect on the services provided by the clinic. If you have any further questions regarding the participation in this study or wish to participate, please contact the researcher directly:

**Principal Investigator:**

Scott Hancock  
School of Human Kinetics, University of Ottawa  
(XXX)-XXX-XXXX; @uottawa.ca



## Appendix D

## Recruitment Letter (18 Years of Age)

## Project Title:

- Youth Athlete Sport Commitment Following Multiple Concussions and Persistent Symptoms

Scott Hancock (principal investigator) and Dr. Terry Orlick (supervisor) are currently conducting a study at the University of Ottawa School of Human Kinetics. The study's objective is to explore adolescent athlete motivation to remain committed to a sport following multiple concussions and persisting symptoms given the potential consequences to future health and wellbeing.

The purpose of this letter is to encourage your participation in this research given the experiences you have had with multiple concussions and your continued commitment to your sport. The principal investigator is currently recruiting 12 adolescent athletes in Ottawa and surrounding locations in Ontario between the ages of 13 and 18. Athletes eligible for the study will have (a) sustained a minimum of three (3) concussions and intend on returning to the sport following recovery from the most recent concussion, (b) be involved in a year-round competitive sport, and (c) will have persisting concussion symptoms lasting beyond one month after the most recent injury. Participants will be selected based on a first come, first served basis.

Participation would consist of taking part in one interview lasting approximately 45-60 minutes. The interview will focus on (a) your athletic background, (b) your experience with multiple concussions, and (c) the sources of sport commitment involved in the decision to remain in your sport.

The researcher guarantees that all data will remain strictly confidential and will solely be used for the purpose of this research project. Anonymity will be ensured by removing any identifying information. Participant names, other names shared, or team names will all be replaced by pseudonyms (false names). Contextual details gathered that may potentially reveal the identities of the participants will also be altered to remove any prospect of identifications being made. Furthermore, the audio recordings and interview transcriptions will be stored in Dr. Orlick's research laboratory at the University of Ottawa where only the principal investigator and supervisor will have access. Interview transcripts will not be shared with parents or anyone other than the participant. Participants may choose to discontinue their participation in the study at any point or refuse to answer any questions during the interview. The goal of this research is to gain insight as to why adolescent athletes who have sustained multiple concussions choose to remain committed to their sport.



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Participation in this study is entirely voluntary and will have no effect on services received at this clinic. If you have any further questions regarding the participation in this study or wish to participate, please contact the researcher directly:

**Principal Investigator:**

Scott Hancock

School of Human Kinetics, University of Ottawa

(XXX)-XXX-XXXX; @uottawa.ca



## Appendix E

## Parental Consent Form

**Principal Investigator:**

Scott Hancock - M.A. Candidate  
School of Human Kinetics, University of Ottawa  
Tel: (XXX)-XXX-XXXX    Email: @uottawa.ca

**Supervisor:**

Terry Orlick, PhD  
School of Human Kinetics, University of Ottawa  
Tel: (XXX)-XXX-XXXX (ext. XXXX)    Email: @uottawa.ca

**Title of the Study:** Youth Athletes' Sport Commitment Following Multiple Concussions and Persisting Symptoms

The purpose of this study is to explore youth athlete motivation to remain committed to a sport following multiple concussions and persisting symptoms given the potential consequences to one's future health and wellbeing. This master's thesis research is led by Scott Hancock from the University of Ottawa School of Human Kinetics.

Participation in this study will involve one (1) individual interview that will last approximately 45-60 minutes. This interview will be audio-recorded and will focus on a) my child's athletic background, b) concussion experiences, c) and the sources of commitment motivating his/her return to sport. The interviews will be conducted at a time and location that is convenient for my child. The interview will be transcribed verbatim and will be emailed to my child in order for him/her to verify that all information from the interview is accurate and correct. He/she will be given 2 weeks to make revisions and clarifications to his/her interview transcript. The transcription will be protected by a password to ensure privacy and confidentiality. Participation in the study will help to understand why athletes are resilient and choose to remain committed to a sport despite experiencing multiple concussions and persistent symptoms.

Data from this study will contribute to sport commitment research by looking at why athletes who have experienced multiple concussions and persisting symptoms choose to remain committed and return to their sport or choose to pursue safer athletic endeavours. Given the potential implications concussions pose to mental health, this research looks beyond the current understanding of sport commitment following musculoskeletal injuries. The knowledge derived from this research project can potentially enhance health professionals', athletic trainers', coaches', and parents' understanding of what is involved in the athlete decision to remain committed to their sport following multiple concussions. They will thus be better equipped to help athletes weigh their options and make informed decisions between continuing the sport and exploring alternative avenues to remain active.

The contents of my child's participation will only be used by Scott Hancock and Dr. Terry Orlick. Participation in this study is completely voluntary and my child may refuse to answer questions during the interview or withdraw from the study at any point. If he/she decides to withdraw, the data collected from his/her interview until the withdrawal will be immediately destroyed and not used in the study. I recognize that my child will not receive any monetary

compensation for his/her participation in this study. I have been assured by the researcher that the information my child shares will remain strictly confidential. In order to maintain anonymity, my child's name, any names mentioned in the interview, and any other information that may reveal his/her identity will be replaced by pseudonyms (false names) in all documents involved in the project, including original transcripts. Audio recordings of the interviews and all documents associated with my child's participation will be kept in a locked filing cabinet and on password protected computers for five (5) years after which the data and recordings will be deleted and destroyed. The findings emanating from this research will be published in peer-reviewed journals and presented at conferences.

If I have any questions pertaining to the research, I may contact the researcher. If I have any questions regarding the ethical conduct of this project, I may contact the Office of Research Ethics and Integrity, University of Ottawa, Tabaret Hall, 550 Cumberland Street, Room 154, Ottawa, ON K1N 6N5; tel.: 613-562-5387; email: [ethics@uottawa.ca](mailto:ethics@uottawa.ca).

I, \_\_\_\_\_, agree for my child to participate in the research project conducted by Scott Hancock from the University of Ottawa School of Human Kinetics. As a parent or legal guardian, I authorize \_\_\_\_\_ (child's name) to be a participant in the research study described in this form.

Child's date of birth: \_\_\_\_\_

The principal investigator may contact me at the following to establish a time to conduct the interview with my child:

- Email: \_\_\_\_\_
- Phone: \_\_\_\_\_

\*There are two copies of the consent form, one of which I may keep.

Parent signature: \_\_\_\_\_ Date: \_\_\_\_\_

Principal investigator: \_\_\_\_\_ Date: \_\_\_\_\_



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## Appendix F

## Athlete Consent Form

**Principal Investigator:**

Scott Hancock - M.A. Candidate  
School of Human Kinetics, University of Ottawa  
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**Title of the Study:** Youth Athletes' Sport Commitment Following Multiple Concussions and Persisting Symptoms

The purpose of this study is to explore youth athletes' motivation to remain committed to a sport following multiple concussions and persisting symptoms given the potential consequences to one's future health and wellbeing. This master's thesis research is led by Scott Hancock from the University of Ottawa School of Human Kinetics.

Participation in this study will involve one (1) individual interview that will last approximately 45-60 minutes. This interview will be audio-recorded and will focus on a) my athletic background, b) concussion experiences, c) and the sources of commitment motivating my return to sport. The interviews will be conducted at a time and location that is convenient for me, the participant. The interview will be transcribed verbatim and will be emailed to me in order for him/her to verify that all information from the interview is accurate and correct. I will be given 2 weeks to make revisions and clarifications to my interview transcript. The transcription will be protected by a password to ensure privacy and confidentiality. Participation in the study will help to understand why athletes are resilient and choose to remain committed to a sport despite experiencing multiple concussions and persistent symptoms.

Data from this study will contribute to sport commitment research by looking at why athletes who have experienced multiple concussions and persisting symptoms choose to remain committed and return to their sport. Given the potential implications concussions pose to mental health, this research looks beyond the current understanding of sport commitment following musculoskeletal injuries. The knowledge derived from this research project can potentially enhance health professionals', athletic trainers', coaches', and parents' understanding of what is involved in the athlete decision to remain committed to their sport following multiple concussions. They will thus be better equipped to help athletes weigh their options and make informed decisions between continuing the sport and exploring alternative avenues to remain active.

I understand that the contents related to my participation will only be used by Scott Hancock and Dr. Terry Orlick. Participation in this study is completely voluntary and I may refuse to answer questions during the interview or withdraw from the study at any point. If I

decide to withdraw, the data collected from my interview until the withdrawal will be immediately destroyed and not used in the study. I recognize that I will not receive any monetary compensation for my participation in this study. I have been assured by the researcher that the information I share will remain strictly confidential. In order to maintain anonymity, my name, any names mentioned in the interview, and any other information that may reveal my identity will be replaced by pseudonyms (false names) in all documents involved in the project, including original transcripts. Audio recordings of the interviews and all documents associated with my participation will be kept in a locked filing cabinet and on password protected computers for five (5) years after which the data and recordings will be deleted and destroyed. The findings emanating from this research will be published in peer-reviewed journals and presented at conferences.

If I have any questions pertaining to the research, I may contact the researcher. If I have any questions regarding the ethical conduct of this project, I may contact the Office of Research Ethics and Integrity, University of Ottawa, Tabaret Hall, 550 Cumberland Street, Room 154, Ottawa, ON K1N 6N5; tel.: 613-562-5387; email: [ethics@uottawa.ca](mailto:ethics@uottawa.ca).

I, \_\_\_\_\_, agree to participate in the research project conducted by Scott Hancock from the University of Ottawa School of Human Kinetics, whose research is under the supervision of Dr. Terry Orlick.

My date of birth: \_\_\_\_\_

The principal investigator may contact me at the following to establish a time to conduct the interview:

- Email: \_\_\_\_\_
- Phone: \_\_\_\_\_

\*There are two copies of the consent form, one of which I may keep.

Participant signature: \_\_\_\_\_ Date: \_\_\_\_\_  
Principal investigator: \_\_\_\_\_ Date: \_\_\_\_\_





## Appendix G

### Youth Assent Form

#### **Project Title**

- Youth Athletes' Sport Commitment Following Multiple Concussions and Persisting Symptoms

#### **Clarity**

This form may include words you are perhaps unfamiliar with. Please ask the researcher to explain any words that you do not know.

#### **What is this study about?**

The purpose of this research is to explore youth athletes' motivation to remain committed to a sport following multiple concussions and persisting symptoms given the potential consequences to one's future health and wellbeing.

#### **What happens to me if I choose to be in this study?**

You will take part in an individual interview lasting approximately 45-60 minutes. The interview will be audio-recorded. In the interview, you will be asked to talk about your athletic background, your experience with concussions, and the reasons why you intend to return to your sport following your recovery from your most recent concussion. You may choose to not answer questions or to stop the interview if you do not feel comfortable. You may also decide to withdraw from the study at any point. In this case any information you have provided through your interview will be deleted and not used in the study.

#### **What happens after the interview?**

What you share throughout the interview will be typed word for word and will be emailed to you. This will be an opportunity for you to verify that all information from the interview is accurate and correct. You will be given 2 weeks to make any changes or clarifications to the transcript. This transcript will be protected by a password to ensure privacy and confidentiality.

#### **Will you tell anyone what I say?**

We will not tell anyone the answers you give us. We will not share your answers with your parents, coaches, teammates, or anyone else. Also, when writing the research results, we will never use your name, any names you mention, or other information that would associate you to this project.

#### **Questions?**

If you have any questions about your participation in this study, you or your parent can contact me at (XXX)-XXX-XXXX or my supervisor Dr. Terry Orlick at [@uottawa.ca](mailto:@uottawa.ca)

For any questions about the ethical nature of this project, you can contact the Protocol Officer for Ethics in Research; University of Ottawa, 550 rue Cumberland, Room 154, Ottawa, ON, K1N 6N5, (613)-562-5387 or [ethics@uottawa.ca](mailto:ethics@uottawa.ca)

**Consent:**

I have read this form and I understand the nature of my involvement in this study. I am willing to be interviewed for this study.

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Youth name printed

Youth signature

Date

---

Youth Email

## Appendix H

## Determinants of Sport Commitment

Rank 1-7 the following reasons for remaining committed to your sport from most important to least important (1 = most important, 7 = least important)

\*No source should have the same number (rank from the most influential to the least influential in the decision to return to sport.

**Enjoyment - \_\_\_\_\_**

- Refers to intrinsic feelings and positive affect when engaging in the sport. This may include joy, pleasure, fun, and love and passion for the sport.

**Valuable Opportunities - \_\_\_\_\_**

- Anticipated experiences and benefits that engagement in the sport creates.
  - Examples: intrinsic (fitness, skill mastery, positive interactions, friendships) and extrinsic (scholarships, travel, career opportunities, recognition)

**Other Priorities - \_\_\_\_\_**

- Refers to the attractiveness or necessity to pursue other alternatives (school, other sports, family, significant other, etc.) that may potentially counter full commitment to the sport and directly conflict with sport involvement.

**Personal Investments - \_\_\_\_\_**

- Athlete perceptions of the quantity of time, money, effort, and training they have put into a sport to improve and become more competitive strengthen commitment. (Feeling as though you have invested too much to quit)

**Social Constraints - \_\_\_\_\_**

- Feelings of obligation and expectations from others to remain committed to the sport

**Social Support - \_\_\_\_\_**

- Refers to encouragement and support significant others provide to an athlete.

**Desire to Excel - \_\_\_\_\_**

- Refers to feelings of unfinished business, goals that are unachieved, wanting to be better.