Mild to Moderate Work-related Traumatic Brain Injury: A Pilot Study

by

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A thesis submitted in conformity with the requirements for the degree of Master of Science
Graduate Department of Rehabilitation Science
University of Toronto

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Abstract

Traumatic brain injury (TBI) is the leading cause of death and disability in the industrialized world. This pilot study investigated demographic, clinical and environmental factors associated with return to work (RTW) among workers who sustained a mild to moderate work-related TBI (WrTBI). Using a retrospective cohort design, participants were recruited through an outpatient clinic dedicated to evaluating injured workers after a WrTBI. A mailed survey and medical record abstraction tool were used for data collection. Of the 40 injured workers who participated in this study, 19 reported working at time of follow-up. Those who were unable to RTW scored significantly lower on measures of emotional well-being; there were no significant between-group differences in cognitive or physical impairments. Gradual RTW and workplace accommodations were reported as key factors facilitating RTW. Our findings provide information that addresses improved rehabilitation and management of WrTBI as well as better education and support for employers.
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# Table of Contents

<table>
<thead>
<tr>
<th>Title</th>
<th>Page Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>ii</td>
</tr>
<tr>
<td>Acknowledgments</td>
<td>iii</td>
</tr>
<tr>
<td>Table of Contents</td>
<td>iv</td>
</tr>
<tr>
<td>List of Tables</td>
<td>vii</td>
</tr>
<tr>
<td>List of Figures</td>
<td>viii</td>
</tr>
<tr>
<td>List of Appendices</td>
<td>ix</td>
</tr>
<tr>
<td>List of Abbreviations</td>
<td>x</td>
</tr>
<tr>
<td>Chapter 1 Introduction</td>
<td>1</td>
</tr>
<tr>
<td>1 Background</td>
<td>1</td>
</tr>
<tr>
<td>2 Literature Review</td>
<td>4</td>
</tr>
<tr>
<td>2.1 Epidemiology of TBI</td>
<td>4</td>
</tr>
<tr>
<td>2.2 Personal Factors</td>
<td>7</td>
</tr>
<tr>
<td>2.3 Injury-Related Predictors</td>
<td>8</td>
</tr>
<tr>
<td>2.4 Psychosocial Indictors</td>
<td>9</td>
</tr>
<tr>
<td>2.4.1 Neuropsychological Indicators</td>
<td>10</td>
</tr>
<tr>
<td>2.5 Environmental Factors</td>
<td>13</td>
</tr>
<tr>
<td>2.6 Rationale of Current Study</td>
<td>14</td>
</tr>
<tr>
<td>3 Research Objectives and Conceptual Framework</td>
<td>17</td>
</tr>
<tr>
<td>3.1 Study Objectives</td>
<td>17</td>
</tr>
<tr>
<td>3.2 Conceptual Framework</td>
<td>17</td>
</tr>
<tr>
<td>4 Study Design</td>
<td>19</td>
</tr>
<tr>
<td>4.1 Participants and Procedures</td>
<td>19</td>
</tr>
</tbody>
</table>
4.2 Instruments and Variables Measured
   4.2.1 Return to Work Survey
   4.2.2 Personal and Environmental Factors
   4.2.3 Body Structure and Function
   4.2.4 Activity Limitation and Participation

4.3 Abstraction Tools
   4.3.1 Personal and Environmental Factors
   4.3.2 Body Structure and Function
   4.3.3 Activity Limitation and Participation

4.4 Ethics

4.5 Data Entry and Analysis

5 Description of the Sample
   5.1 Response Rate
   5.2 Personal and Environmental Factors
      5.2.1 Pre-injury Occupation Classification
      5.2.2 Sociodemographic Characteristics and RTW Outcomes
      5.2.3 Return to Work Outcomes
      5.2.4 No Return to Work Outcomes
      5.2.5 Safety Climate Scale
   5.3 Body Structure and Function
      5.3.1 Pre-injury Characteristics at time of assessment
      5.3.2 Post-injury Characteristics at time of assessment
   5.4 Activity Limitation and Participation

6 Discussion
   6.1 Personal and Environmental Factors
      6.1.1 Sociodemographics
6.1.2 RTW Facilitators  
6.1.3 Therapies and Services that facilitated RTW  
6.1.4 RTW Barriers  
6.2 Body Structure and Function  
6.3 Activity Limitation and Participation  
6.4 Strengths and Limitations  
7 Conclusion  
7.1 Implication of Results and Relevance to Rehabilitation  
7.2 Future Directions  
References  
Appendices
List of Tables

Table 1: Description of Study Instruments and Variables Measured ........................................ 26

Table 2: Sociodemographic characteristics .............................................................................. 31

Table 3: Perceived factors that facilitated RTW .................................................................. 32

Table 4: Therapies and services that facilitated RTW ......................................................... 32

Table 5: Perceived barriers of RTW .................................................................................. 33

Table 6: Safety Climate Scale ............................................................................................ 34

Table 7: Incident-related symptoms reported at time of assessment .................................. 37

Table 8: Summary of neuropsychological factors by return to work status ..................... 38

Table 9: Participants’ ratings on the MOS SF-36 subscales and component scores at time of follow-up ........................................................................................................... 39
List of Figures

Figure 1: Graphical representation of the study population in comparison to US general population normalized MOS SF-36 domain scores. ................................................................. 40
List of Appendices

Appendix A: Contact Sheet
Appendix B: Contact Letter
Appendix C: Information Sheet/Consent Form
Appendix D: Return to Work Survey
Appendix E: Brain Injury Associations & Injured Worker’s Support Groups located in Ontario
Appendix F: Thank you Letter
Appendix G: Letter Requesting Participants’ Consent
Appendix H: Second mail out Invitation Letter
Appendix I: Medical Record Review Abstraction Tool
Appendix J: Neuropsychological Assessment Abstraction Tool
Appendix K: TRI and U of T REB Approval Letters
# List of Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>Body Mass Index</td>
</tr>
<tr>
<td>CT</td>
<td>Computed Tomography</td>
</tr>
<tr>
<td>ENT</td>
<td>Ear Nose Throat Specialist</td>
</tr>
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<td>GCS</td>
<td>Glasgow Coma Scale</td>
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<tr>
<td>ICF</td>
<td>International Classification of Functioning, Disability and Health</td>
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<td>IWH</td>
<td>Institute for Work and Health</td>
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<td>LOC</td>
<td>Loss of Consciousness</td>
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<td>mild TBI</td>
<td>Mild Traumatic Brain Injury</td>
</tr>
<tr>
<td>MOS SF-36</td>
<td>Medical Outcomes Study 36-item Short Form Health Survey</td>
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<tr>
<td>MRI</td>
<td>Magnetic Resonance Imaging</td>
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<tr>
<td>PCS</td>
<td>Post-concussion Syndrome</td>
</tr>
<tr>
<td>PTA</td>
<td>Post-traumatic Amnesia</td>
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<tr>
<td>PTSD</td>
<td>Post-traumatic Stress Disorder</td>
</tr>
<tr>
<td>RTW</td>
<td>Return to Work</td>
</tr>
<tr>
<td>TBI</td>
<td>Traumatic Brain Injury</td>
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<td>TRI</td>
<td>Toronto Rehabilitation Institute</td>
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<tr>
<td>WrTBI</td>
<td>Work-related Traumatic Brain Injury</td>
</tr>
</tbody>
</table>
Chapter 1
Introduction

1 Background

Traumatic brain injury (TBI) is a leading cause of death and disability throughout the industrialized world. The Ontario Brain Injury Association (2011) defines TBI as an insult to the brain, caused by an external force that may produce a diminished or altered state of consciousness, resulting in a temporary or permanent impairment in cognitive, emotional, psychosocial and physical functioning. This definition has recently been broadened to incorporate the long term signs and symptoms of TBI that may surface over time. As such, the revised definition characterizes TBI as “an alteration in brain function, or other evidence of brain pathology, caused by an external force” (Brain Injury Association of America, 2011).

TBIs can range in severity from mild to severe depending on the duration of altered consciousness, clinically categorized by the Glasgow Coma Scale (GCS). The GCS is a 15-point scale that measures the best motor response, verbal response and eye-opening response of an injured patient and yields a score of 3-15. Mild TBI scores range from 13-15, while moderate TBI and severe TBI range from 9-12 and 3-8, respectively (Teasdale & Jennett, 1974). Regardless of the severity of injury, TBIs may result in acute and/or chronic debilitating consequences. In fact, even those with a mild TBI sometimes continue to report ongoing head trauma-related health problems years after the injury (O’Connor, Colantonio, & Polatajko, 2005).

Individuals with mild, moderate and severe TBIs often present with symptoms such as lowered physical, cognitive, communication, emotional, and social functioning skills (deGuise et al., 2008; Devitt et al., 2006). Additionally, individuals with milder injuries are at risk for developing Post-concussion Syndrome (PCS), defined as a “constellation of symptoms in physical (e.g., fatigue, headaches), cognitive (e.g., difficulties with concentration and memory) and emotional (e.g., irritability, anxiety) domains that persist for weeks, months and even years” (Williams, Potter, & Ryland, 2010). PCS, in turn, can contribute to persistent activity limitations, reduced productivity and quality of life (McCrea, 2008). TBI is often followed by employment loss, which can in turn lead to significant challenges with identity, autonomy, and emotional well-being (Ownsworth & McKenna, 2004; van Velzen, van Bennekom, Edelaar, Sluiter, & Frings-
Dresen, 2009). Not surprisingly, employment outcomes are one of the best indicators of real world function post-TBI and often, the ultimate goal of rehabilitation programs is to enable patients to return to work (Shames, Treger, Ring, & Giaquinto, 2007).

Return to work (RTW) is defined by the Institute for Work and Health (IWH) (2007) as a “proactive, employee-focused approach of assisting injured or ill employees to return to safe and productive work activities as soon as they are physically and mentally ready, and do not pose a safety risk to themselves and others in the workplace”. It is best considered a process, rather than a single event; following TBI, RTW can be a complex endeavor, varying on an individual basis and across levels of injury severity. A recent systematic review of RTW following TBI found that across all levels of injury severity, 40.7% of 4709 TBI survivors returned to work 1 year post-injury (van Velzen et al., 2009). However, this rate appears to vary depending on injury factors. Stambrook and colleagues found that individuals with mild and moderate TBI have higher RTW rates (i.e., 53% and 52%, respectively) compared to those with more severe forms of injury (i.e., 34%) (Stambrook, Moore, Peters, Deviaene, & Hawryluk, 1990). Furthermore, other researchers have found that many other factors contribute to successful RTW, such as sociodemographic, psychosocial and cognitive characteristics of the injured worker, as well as the environmental factors surrounding their workplace (Shames et al., 2007).

A recent study explored the personal experiences of mild to moderate TBI survivors who have returned to work post-injury (Gilworth, Eyres, Carey, Bhakta, & Tennant, 2008). Thirty-three interviews were conducted four to six months post-injury and participants reported key emerging issues such as the invisibility of their injury and lack of advice and guidance upon returning to work. Despite the fact that most participants returned to work, these TBI survivors reported experiencing symptoms that affected their ability to perform their job. Lastly, participants felt that RTW support systems were poorly coordinated and managed.

The goal of this thesis is to provide an overview of the factors associated with successful RTW and to further explore perceived factors that might facilitate or hinder RTW in a group of workers who sustained a work-related traumatic brain injury (WrTBI) and reported experiencing post-TBI symptom persistence. To this end, we examined the sociodemographic, psychosocial, cognitive and environmental factors that were positively or negatively associated with the successful RTW of a sample of injured workers referred by the Workplace Safety and Insurance Board (WSIB) of
Ontario to the Neurology Services Specialty Clinic at the Toronto Rehabilitation Institute (TRI). Though these factors have been extensively explored in military populations that sustained a WrTBI in the Iraq/Afghanistan wars, the RTW outcomes identified in the military TBI literature may not be generalizable to similar civilian populations. For example, the military TBI literature explores the outcomes of non-impact blast-induced mild TBI, which is different than what is likely to be the cause of injury in most civilian cases. Given the prevalence of the problem, there is a relative paucity of research on WrTBI and RTW in civilian populations.
Chapter 2

2 Literature Review

2.1 Epidemiology of TBI

The prevalence of TBI is notably high worldwide. In Ontario alone, Colantonio and colleagues used a conservative definition of TBI to document over 17,000 hospitalizations and/or emergency room visits that took place in 2006 (Colantonio et al., 2010a). Furthermore, trends in TBI hospitalization from 1992 to 2002 revealed that the proportion of mild TBI cases decreased from 75% to 54%, whereas the proportion of moderate injuries increased from 19% to 37% (Colantonio, Croxford, Farooq, Laporte, & Coyte, 2009). With the inclusion of TBI cases from emergency room visits in surveillance data, Colantonio and colleagues (2010a) showed that the number of TBIs in Ontario have increased over time.

In the United States (US), approximately 1.7 million people are estimated to sustain a TBI annually and a reported 275,000 of them are hospitalized (Centers for Disease Control and Prevention, 2011). Additionally, TBI is a contributing factor to nearly one third (30.5%) of all injury-related deaths in the US and about 75% of TBIs that occur each year are concussions or other forms of mild TBI. These are profound underestimates of TBI incidence, however, as many individuals with minor injuries may not seek medical attention, or might only visit their family physician, which may not be captured in administrative data (Ryu, Feinstein, Colantonio, Streiner, & Dawson, 2009). Risk factors for TBI are age (adolescence, young and older adulthood), male gender and lower socio-economic status, while common causes of TBI include motor vehicle crashes, falls, sporting injuries and assaults (Williams et al., 2010).

Tiesman, Konda, and Bell (2011) conducted a review of occupational TBI fatalities occurring in the US between 2003 and 2008. Their findings revealed that 7294 occupational TBI fatalities occurred during 2003-2008, which accounted for 22% of all work-related injury fatalities during this time (N=33,641). Additionally, 31% of all work-related TBI fatalities were motor vehicle-related (n=2240), while 21% were due to falls (n=2130) and 18% were due to contact with objects and equipment (n=1293). Furthermore, eight industries accounted for all work-related TBI fatalities: agriculture, forestry, fishing, and hunting; mining; construction; transportation and warehousing; administration and support services and waste management; public administration;
wholesale trade; and arts, entertainment and recreation. Lastly, cause of injury differed by industry. For example, the leading cause of WrTBI fatalities in the mining and agricultural industries were contact with objects and equipment (n=279, 37% and n=88, 47%), whereas falls were the leading cause of death in the construction industry, accounting for more than half of all TBI fatalities in this industry (n=1038, 57%). On the other hand, 60% of occupational TBI fatalities in the transportation and warehouse industries were caused by motor vehicle accidents (n=489).

In another study, Wrona (2006) used the Washington State worker’s compensation administrative data to identify injury scenarios and quantify the cost of WrTBIs. He identified 928 cases of TBI that occurred between 1994-2001 and totaled to a lifetime claim cost of $159 million from the Washington State Fund. About 11% of TBIs occurred in females and the age at time of injury ranged between 15-71 for females and between 14-78 for males. There were 62 deaths for an annual case fatality rate of 6.7 per 100. The underlying causes of death were related to TBI in 85% of the deaths. Injuries from falls, motor vehicle crashes, and violence were listed as causes of death in 37%, 21% and 11% of deaths, respectively. Specifically, falls from elevation were the most frequent exposure/event (39%), while being struck by/against an object was the cause of 21% of TBIs, followed by motor vehicle crashes at 18%. The highest TBI frequencies were as reported in the transportation (10%), construction (6%) and primary industries.

In Ontario, brain injuries occurring in the workplace are a serious concern and rank fourth in the WSIB lost-time claims after back, upper and lower extremity, and trunk injuries (Workplace Safety Insurance Board, 2004). Reports from statistical supplements of the Ontario WSIB have shown that claims involving brain injury diagnoses have doubled over the last 10 years. For example, a diagnosis of TBI has been found in almost half of Ontario workplace fatalities (Tricco, Colantonio, Chipman, Liss, & McLellan, 2006). Industries with the highest rate of Work-related TBI mortality expressed per 100,000 working population included primary industry (59.1), agriculture (24.5), construction (20.0) and transportation/ communications/utilities industries (13.9).

Kristman and colleagues (2010) also showed that a brain injury diagnosis comprised 54% of work-related injury admissions in Ontario’s lead trauma hospitals and accounted for 608 hospital
admissions between 1996 and 2001 (Kristman et al., 2010). Kim, Colantonio, and Chipman (2006) used the Ontario Trauma Registry to identify the rate and cause of TBIs that occurred in the workplace between 1999 and 2001. A total of 950 work-related TBIs were identified and clinical information (i.e., injury severity) was obtained about these injured workers who were seen at a major trauma centre in Ontario. WrTBIs accounted for 7.3% of all TBIs identified (N=12991) in this study. Four major mechanisms of injury were identified: falls (n=431, 45%), motor-vehicle crashes (n=197, 20%), struck by objects (n=148, 15%) and other (e.g., machinery accidents) (n=174, 18%); injured workers who sustained an occupational TBI belonged to the following occupational categories: construction (n=271, 28%), primary industry (i.e., mining, forestry, farming, fishing, and hunting) (n=104, 10%), transportation and equipment operation (n=114, 12%) and sales and services (n=82, 8.5%).

Colantonio, Mroczek, Patel, Lewko, Fergenbaum and Brison (2010b) examined records of the Ontario WSIB for one year across all levels of severity for WrTBIs and showed that 57.8% of claims for occupational TBIs involved males. The most common mechanism of injury was being “struck by or against” an object, followed by “falls”. Most of the occupational traumatic brain injuries were from the manufacturing industry as well as government and related service sectors. The highest rate of WrTBIs, however, were found in the transportation and storage industries (81.5/100,000), followed by government and related services (56.6/100,000) and primary industries (47/100,000). Kristman and colleagues also examined data from the Ontario WSIB lost-time claims database and determined that approximately six out of every 1000 claims were associated with mild TBI (Kristman et al., 2008).

TBI is often a highly complex diagnosis with multiple consequences occurring across individuals with diverse employment backgrounds. As such, a large body of literature has examined the factors most consistently related to employment outcomes following TBI. These factors can be categorized into the following four clusters: personal demographic factors (e.g., age, sex, education, and marital status), injury-related predictors (e.g., time since injury, coma duration, post-traumatic amnesia, GCS, length of hospital stay), psychological indicators (e.g., emotional status, post-traumatic stress, memory, executive functioning, attention/processing speed) and environmental factors (e.g., litigation involvement, insurance status, social support, employer and work environment and rehabilitation/vocational support). In the following section, the
existing literature is reviewed to explore the factors that are associated (positively or negatively) with returning to vocational productivity post-TBI in each of those four clusters.

2.2 Personal Factors

The most common pre-injury and demographic predictors examined in the RTW literature following a TBI include age, sex, marital status, pre-injury education level and occupational status (Ownsworth & McKenna, 2004). Some of this literature has suggested that individuals returning to work or school after sustaining a TBI tend to be younger (Rao et al., 1990). When compared to their younger counterparts, adults over 40 were generally found to experience poor vocational outcomes, and were less likely to be employed 2 years post-injury (Ponsford, Olver, Curran, & Ng, 1995). In contrast, in military studies, older, experienced and high ranking individuals were more likely to be employed after a TBI, compared to younger, low-ranking, and inexperienced soldiers (Drake, Gray, Yoder, Pramuka, & Llewellyn, 2000). Though there is mixed empirical support for the relationship between age and RTW, most of the TBI literature comparing different age categories and vocational outcome demonstrate that poor employment outcome is associated with older age at time of injury, namely for those over age 40 (Drake et al., 2000; Keyser-Marcus et al., 2002; Tiesman et al., 2011).

Sex does not appear to be a significant predictor of successful RTW. For example, in a study of vocational outcomes following TBI, Deutsch, Kendall, Daninhirsh, Cimino-Ferguson, & McCollom (2006) found that sex did not play a significant role in predicting RTW. In a meta-analysis of RTW following TBI, Crepeau and Scherzer (1993) found that males were more likely to return to work following less severe injuries compared to females. However, most of the evidence indicates that sex is not a significant predictor of vocational outcome following TBI (Ownsworth & McKenna, 2004).

The relationship between employment outcome and marital status is less clear. For example, Ip, Dornan, and Schentag (1995) found that those with mild TBI who were married at time of injury were less likely to return to work than single individuals. Conversely, Friedland and Dawson (2001) found that those who were married at time of injury were more likely to return to work post-mild TBI. Given the discrepancy in the literature, further research is necessary to elucidate the relationship between marital status and RTW.
Pre-injury educational status has been investigated in a large number of studies and found to be a predictor of employment outcome (Dikmen et al., 1994; Sherer et al., 2002; Sherer et al., 2003). For example, Ip et al. (1995) found a trend in which those with higher education were more likely to return to work, with pre-injury occupation acting as a predictive factor. Specifically, those individuals who were previously employed in skilled jobs such as administrative assistants, plumbers and dental hygienists were more likely to return to work compared to general labourers. In contrast, Fraser, Dikman, and McLean (1988) reported that individuals who worked in occupations such as construction and trades were more likely to return to their previous occupation compared with those who worked in management, clerical, professional, or service occupations. Fraser postulated that this may be because those in the construction industry require less contact and communication with others and as a result can better tolerate post-TBI challenges which often tend to be cognitive and behavioural in nature (Fraser et al., 1988). In contrast, higher levels of processing, communication, cognition, and behavioural control are required for professional and managerial positions, so that even minor deficits could be significantly debilitating. Not surprisingly, a systemic review of long term functional prognosis after TBI found that patients with pre-injury unemployment, substance abuse history and additional disability at the rehabilitation admissions stage were less likely to successfully return to paid employment (Ownsworth & McKenna, 2004; Willemse-van Son, Ribbers, Hop, & Stam, 2009). Though pre-injury demographics are fixed for individuals and not subject to change, clinicians can use these factors to identify vulnerable individuals with poor vocational outcomes and address their needs accordingly (Ownsworth & McKenna, 2004).

2.3 Injury-Related Predictors

The most commonly researched injury-related predictors of RTW following TBI are injury severity indices such as length of coma/loss of consciousness (LOC), duration of post-traumatic amnesia (PTA) and GCS. Specifically, individuals who experience a longer period of unconsciousness, have a longer PTA, and have a lower GCS are less likely to return to work (Ownsworth & McKenna, 2004). On the other hand, patients with a mild TBI (high GCS), who do not experience LOC and do not suffer from PTA, or have shorter LOC and PTA durations, are more likely to return to work. Yasuda, Wehman, Targett, Cifu, and West (2001) also identified duration of LOC, injury severity, and length of stay in a hospital as variables that played an important role in predicting successful RTW. Specifically, TBI patients who had a
more favourable clinical profile with shorter duration of LOC were more likely to return to work (Ip et al., 1995; Rao et al., 1990). These individuals spent less time in inpatient rehabilitation and had greater functional status compared to those who did not return to work.

Injury severity and recovery time have also been examined in several studies. For example, Dikmen et al. (1994) found that individuals with moderate and severe TBI were less likely to return to work compared to those who suffered a mild TBI, and the highest rate of RTW took place at 1-6 months post-injury. Similarly, in a follow-up study of 27 individuals who sustained a severe TBI, 78% were unemployed one year after the injury, while at the 5-year mark approximately 70% were reported to be unemployed (Yasuda et al., 2001). From the remaining 30% who were able to return to work, only 18% worked full-time. Other studies have found that, 80-88% of individuals who sustained a mild TBI were able to return to work 1 to 2 years post-TBI (Dikmen, et al., 1994; Rao et al., 1990). These findings suggest that TBI severity inversely predicts employment outcome with the highest rate of RTW occurring at 1-6 months post-injury.

Studies on the relationship between mechanism of injury and vocational outcomes have yielded mixed results in the TBI literature. For example, Hanlon, Demery, Martinovich, and Kelly (1999) found that TBI caused by assault (such as injuries involving an object striking the head) was strongly associated with poor employment outcomes. On the other hand, Greenspan, Wrigley, Kresnow, Branche-Dorsey, and Fine (1996) found that the relationship between violent injuries and poor vocational outcomes diminished when controlling for the influence of demographic variables such as race and education.

Overall, then, there are mixed results in the TBI literature regarding the relationship between injury-related indices and vocational outcomes. Certainly, however, as brain injury severity increases, the likelihood of RTW decreases.

2.4 Psychosocial Indicators

An individual’s capacity to find and sustain work is strongly influenced by their emotional, psychosocial and neuropsychological well-being. The literature suggests that impairments in these domains act as barriers to RTW for individuals with TBI. Specifically, many if not most TBI survivors suffer from either temporary or permanent cognitive deficits, impaired emotional functioning, and personality changes (Yasuda et al., 2001). For example, Stambrook, Moore,
Peters, Deviaene, and Hawryluk (1990) found that TBI survivors’ scores on standardized measures of emotional and psychosocial functioning, such as depression, anxiety, helplessness and other forms of psychopathology, were strongly associated with vocational outcomes and concurrent employment status. Similarly, Hanlon et al. (1999) found that the level of depressive symptoms reported by TBI survivors was associated with employment outcomes at 1 year post-injury. Unemployment at 2 years post-discharge was also predicted by high levels of distress at 6-months post-injury (Felmingham, Baguley, & Crooks, 2001). Furthermore, Friedland and Dawson (2001) found that those individuals who reported post-traumatic stress symptoms after sustaining a mild TBI were less likely to return to work compared to mild TBI patients who did not report such symptoms.

While psychosocial factors have been extensively investigated in the literature, research on the relationship between vocational outcomes and metacognitive indicators such as self-awareness and self-regulation is scarce. A multivariate study conducted by Sherer et al. (1998) investigated the relationship between employment outcomes and awareness deficits, while controlling for demographic and injury predictors. The authors found that impaired awareness accounted for a significant amount of variance in predicting vocational outcomes following TBI. They also found that early impaired awareness was significantly predictive of vocational outcomes and employability at discharge. Further research is required to more conclusively clarify the link between metacognitive factors and vocational outcomes.

2.4.1 Neuropsychological Indicators

A large body of research exploring the neuropsychological sequelae following TBI has demonstrated that neuropsychological evaluation can yield sensitive measures of outcome related to TBI (Iverson & Binder, 2000). Studies investigating the effects of neuropsychological factors on RTW have found a strong relationship between early cognitive impairments and poor employment outcomes (Sherer et al., 2002). Onsworth and McKenna (2004) found that most studies of cognitive function and RTW identify executive functioning as the most reliable indicator of RTW. A review of the TBI literature demonstrated moderate empirical support for the relationship between vocational outcome and the following three cognitive domains: verbal and language functioning, memory functioning and attention/processing speed (Ownsworth & McKenna, 2004). In a meta-analysis of neurocognitive studies of patients with mild TBI,
Belanger, Curtiss, Demery, Lebowitz, and Vanderploeg (2005) measured eight cognitive domains and found that verbal fluency and delayed memory had the largest influence on TBI outcomes. Specifically, TBI survivors who had less impairment in these cognitive domains were more likely to return to work. To date, empirical studies have shown that cognitive impairments play a role in predicting RTW; however, the specific cognitive domains that most significantly contribute to vocational outcomes are not entirely clear.

In addition to measuring cognitive changes after TBI, neuropsychological tests are sensitive to the effects of test-taker effort. Just as individuals vary in terms of their cognitive abilities, so do they vary in the amount of effort they may exert when they participate in neuropsychological testing. Lack of effort can be seen in a number of circumstances, but is most obvious in cases of intentional symptom exaggeration or malingering. A large body of research has been conducted to investigate the validity and reliability of measures of neuropsychological function in detecting symptom exaggeration and malingering (Iverson & Binder, 2000). Malingering is defined as the intentional production of false or greatly exaggerated symptoms to attain some identifiable external reward (American Psychiatric Association, 1994). That is, a patient who wishes to appear impaired can control test performance and symptom reporting on neuropsychological measures. For example, a person might decide to malinger to avoid criminal responsibility or military duty, receive financial benefits from a lawsuit, receive worker’s compensation and disability benefits, and/or to avoid returning to work (Iverson & Binder, 2000). The literature suggests that symptom exaggeration is a significant source of variability in how patients present in settings where there is the possibility of secondary gain. Mittenberg, Patton, Canyock, and Condit (2002) surveyed 144 neuropsychologists (who saw a total of approximately 33,351 patients annually) who estimated the rates of malingering at 30-33% in disability or workers’ compensation cases, 29-30% in personal injury cases, and 19-23% in criminal cases. Additionally, in a meta-analysis directly examining test data to determine the prevalence of symptom exaggeration in these settings, Larrabee (2003) compiled 1363 subjects from 11 studies. He found that 548 out of the 1363 subjects in these studies were identified with “motivation performance deficit [on testing] suggestive of malingering” (p. 411).

In addition to examining effort in cognitive testing, psychologists also utilize self-report measures to examine the possibility of symptom exaggeration in terms of psychopathology, such as difficulties commonly seen post-trauma, which might include depression, anxiety, and post-
traumatic stress disorder. (Iverson & Binder, 2000). One such measure is the gold standard Multiple Minnesota Multiphasic Personality Inventory-2 (MMPI-2), which is also used to detect symptom distortion. Lees-Haley (1997) presented base rates for MMPI-2 clinical and validity scales for 492 personal injury plaintiffs who were trauma victims presenting with a wide range of injuries or combinations of injuries including TBI, spinal cord injury, amputations, burns, and musculoskeletal injury. Results showed that most participants presented with normal profiles; however, 19-33% of the 492 participants appeared to be malingering as indicated by the clinical and validity subscales of the MMPI-2. Furthermore, these results were consistent with findings from other malingering measures and taken together indicated that 20-30% of plaintiffs should be considered as possible malingers. As such, the investigators concluded that the pathology associated with such scale evaluations may be the product of the injury and the tendency to seek litigation and compensation.

Not surprisingly, substantial research has shown a relationship between financial compensation seeking and greater likelihood of a poor outcome after mild TBI (Binder & Rohling, 1996; Reynolds, Paniak, TollerLobe, & Nagy, 2003). For example, in a meta-analysis of the relationship between financial incentives and TBI outcome, Binder and Rohling (1996) reported a moderate effect size of 0.47 for financial incentives across multiple studies and dependent variables using patients with varying TBI severity. Specifically, on outcome variables such as symptom reports, neuropsychological test scores, clinical ratings and return to work, patients with financial incentives scored more poorly, compared to those without such incentives, by an average of almost one-half of a standard deviation. Furthermore, the effect size was even stronger when mild TBI patients were compared to the other groups, suggesting that the former were particularly likely to have poor outcomes when financial incentives were present. The authors concluded that in the setting of financial incentives for illness behaviour, presenting severe cognitive deficits many months after a mild head injury (as evident by symptom exaggeration and poor effort on neuropsychological measures) raised the possibility of malingering or other nonorganic explanation. Despite these findings, the existing literature does not yet provide evidence to show that symptom distortion or malingering among TBI populations predict RTW.

Although there is undoubtedly a proportion of TBI survivors who are motivated by a desire to abstain from work and/or obtain compensation, as Reynolds and colleagues suggest, there may
also be cases in which “the need to repeatedly convince skeptical insurers that one is ill sometimes leads to the adoption of disability mentality and an associated delay in return to work” (Reynolds et al., 2003, p.146). The effect of litigation on vocational outcome is discussed in the following section.

2.5 Environmental Factors

In the mild TBI literature, there is evidence that insurance factors, type of occupation, and autonomy of decision-making are associated with outcomes of RTW (Guerin, Kennepohl, Leveille, Dominique, & McKerral, 2006; Ruffolo, Friedland, Dawson, Colantonio, & Lindsay, 1999). Johnstone, Vessell, Bounds, Hoskins, and Sherman (2003) found that vocational services offered to injured individuals by their insurance company was a key factor in determining successful or unsuccessful RTW post-TBI. The authors determined that those who received vocational rehabilitation services (i.e., vocational guidance and on the job training) were more successful in returning to work than those who did not have these services available to them. In a review of studies of RTW after injury, MacEachen, Clarke, Franche, and Irvin (2006) found that the complex interaction between the injured worker, co-workers, employers, unions, health care professionals, as well as the post-injury modified working conditions, were important predictors of successful RTW. More specifically, several studies demonstrated that workers were more likely to return to work if early contact was established between employer and employee, and modified working hours were offered to the worker once their functional status was determined by health care professionals (Ownsworth & McKenna, 2004).

In a longitudinal study, Reynolds et al. (2003) found that compensation-seeking or -receiving after a mild TBI was associated with delayed RTW. Furthermore, those seeking compensation either from legal or administrative sources (workers' compensation benefits, disability or sick leave) took a longer time to return to full-time vocational activity (median of about 6 weeks to RTW) compared to mild TBI patients who were not seeking compensation (who typically returned to work within a week after injury). The authors also opined that individual differences such as injury severity, pain, cognitive problems, and feelings of victimization and the injury event must also be taken into account when determining factors that influence RTW.
2.6 Rationale of Current Study

Though the positive and negative factors associated with RTW have been quite widely investigated in the general TBI population, there is a need for further research on individuals who sustain their TBIs in the workplace, especially mild and moderate TBIs. The literature has shown that individuals with a mild to moderate TBI have the greatest potential to return to work; however, there are few studies that examine the profiles of workers that have sustained a mild to moderate WrTBI. For a number of reasons, WrTBIs may differ from non-WrTBIs. For example, the WSIB of Ontario enables injured workers with a TBI to access additional services via their compensation benefits. Therefore, those with WrTBI may possess greater access to rehabilitation resources that can assist in RTW. However, the availability of compensation for loss of income while disabled may also influence return to work. A recent study by Kristman et al. (2010) showed that younger workers came off of benefits faster than older workers, while sex had no effect on RTW following WrTBI; further, 87% of workers with a mild TBI had one episode of benefits lasting a median duration of 11 days, while 50% were off of benefits after 17 cumulative days. The results of this study indicate that injured workers’ decisions to return to work was more strongly influenced by the workplace compensation system, regardless of experiencing symptom persistence post-TBI.

As previously stated, PCS has been reported by a large number of TBI survivors of all severity (Williams et al., 2010). Symptoms of PCS may include headache, fatigue, vertigo, sleep problems, irritability, depression and other mood/personality changes as well as a reduction in cognitive function. More specifically, in a meta-analysis, Petchprapai and Winkelman (2007) found 24 studies that suggested these symptoms are reported by 11-80% of those experiencing mild TBI. Most studies of mild TBI indicate that in the majority of cases, a pattern of gradual symptom recovery during the first one or two weeks follows the injury, extending to several weeks in some instances (McCrea, 2008); however, in some cases, symptoms appear to persist beyond three months after mild TBI. On one hand, prior studies of injured workers in Ontario have shown that workers may be pressured by the compensation system and their employers to return to work and, as a result, return before they have fully recovered (MacEachen et al., 2006). On the other hand, injured workers may be rewarded, financially and otherwise, for maintaining the sick role and avoiding RTW.
Issues related to the safety of the workplace may also be a factor unique to the WrTBI population. A worker may be less inclined to return to a workplace where they were injured when perceived workplace safety risks persist. Yet, there is limited information on environmental variables that affect pre- and post-injury outcomes of injured workers with a mild to moderate TBI in the Canadian context. Overall, most of the research has focused on characteristics of the individual with TBI and little literature exists on environmental factors. Thus, specific questions about the safety culture of the working environment are important to consider in a study such as this.

To this end, we conducted a hypothesis-generating pilot study that investigated the factors that facilitated and hindered injured workers in Ontario who sustained a mild to moderate WrTBI and reported post-TBI symptom persistence. As a result of the reported TBI sequelae, the Workplace Safety and Insurance Board (WSIB) of Ontario referred these workers to the TRI Neurology Services Specialty Program, where they were assessed. The first aim of this study is to compare the profile of individuals who sustained a mild to moderate WrTBI and have successfully returned to work with those who have not returned to work. The second aim of this study is to analyze (from the worker’s perspective) the facilitators and barriers of return to work in order to identify important factors such as those related to the workplace environment and type of occupation. Also, the literature on general TBI has clearly demonstrated that injured individuals are at greater risk for future injuries, including head injuries. For those who have sustained a TBI in the workplace setting, it is imperative that the causes of re-injury be examined with the goal of reducing the risk for subsequent injuries. This research will therefore also examine the rate of re-injury at the workplace among individuals who have successfully returned to work following a mild to moderate WrTBI, with a view towards prevention.

The overall purpose of this pilot study is to inform a larger study on return to work after mild to moderate TBI and identify factors that facilitate or hinder RTW. Particularly, this study will inform the feasibility of recruitment, overall methodology and budget allocation for a larger scale prospective study at the TRI's Neurology Services Specialty Clinic. This study was intended to assess the feasibility of our proposed methodology and guide future iterations of the variables used in our data collection measures, such as the return to work questionnaire as well as the medical record and neuropsychology assessment abstraction tools. The end goal of this research is to outline the pre- and post-injury characteristics of individuals who sustained a mild to
moderate WrTBI and to compare the profiles of these individuals who successfully returned to work to those who were unsuccessful in returning to work.
Chapter 3

3 Research Objectives and Conceptual Framework

3.1 Study Objectives

1) Examine RTW outcomes for persons who sustained a mild to moderate WrTBI and report post-TBI symptom persistence.

2) Identify perceived facilitators and barriers of successful RTW, such as clinical, psychosocial, environmental, and occupational-related factors.

3) Examine the personal, environmental, body structure and activity characteristics of injured workers with mild to moderate WrTBI by level of participation (i.e., RTW).

4) Evaluate the feasibility of study design and assess implications for a larger scaled study.

3.2 Conceptual Framework

To better understand the outcomes of TBI, namely, functioning, disability and health following a sustained head injury, Bernabeu et al. (2009) initiated a task force to develop Core Sets for TBI based on the International Classification of Functioning, Disability and Health (ICF). According to the World Health Organization (2011), the ICF is a classification of health and health-related domains that are classified from body, individual and societal perspectives by means of two lists: a list of body functions and structure, and a list of domains of activity and participation. Since an individual’s functioning and disability occurs in a context, the ICF also includes a list of environmental factors (World Health Organization, 2011). ICF Core Sets for TBI allow clinicians and researchers to classify and describe the outcomes of TBI using an internationally recognized language. As such, this study was framed within the context of the ICF, which has also been utilized by Colantonio et al. (2004) to address disability issues and assess outcomes of TBI. An overview of the use of this model in the present study is presented below.

Environmental and Personal Factors: Personal factors examined included sociodemographic characteristics such as age, sex, height and weight (used to calculate body mass index), education level, marital status, immigration status, and employment-related information. This information was obtained using the medical record abstraction tool and the Return to Work Survey. The Medical Outcome Study Short Form-36 health survey (MOS SF-36) was also used; this survey is
a 36-item generic instrument (as opposed to one that targets a specific age, disease or treatment group) that measures physical and psychosocial health in a standardized way from the participant’s perspective (Ware, Snow, Kosinski, & Gandek, 2000). Environmental factors included RTW factors, barriers, therapies and services as well as workplace safety climate. These variables were drawn primarily from the follow-up survey, although some were obtained from the medical record abstraction tool.

Body Structure and Function: The set of variables under this domain included participants’ history of medical and psychiatric conditions, brain injury severity, incident-related head symptoms and neuropsychological complaints as well as subsequent injuries. The bodily pain domain of the MOS SF-36 was also included. The medical record abstraction tool and the neuropsychological report abstraction tool were utilized to obtain information about these variables.

Activity Limitation and Participation: The MOS SF-36 domains of physical functioning, and physical and emotional role limitations were used to determine the participant’s engagement in activities of daily living and participation. RTW was the main outcome of the present study, which was categorized in the participation domain of the ICF by describing the extent to which study participants take part in society and engage in social activities. These variables were primarily obtained using the return to work survey.
Chapter 4
Research Methodology

4 Study Design

This exploratory pilot study utilized a retrospective cohort design. Quantitative data collection consisted of information obtained from the following: (i) abstraction tool of clinical records at time of assessment (Appendix I), (ii) neuropsychological abstraction tool at time of assessment (Appendix J) and (iii) return to work survey, which consists of the return to work questionnaire, Medical Outcomes Study Short Form-36, and 6-item Safety Climate Scale (Appendix D), all from the time of follow-up. Data were also collected about perceived factors that facilitated or hindered RTW using open-ended questions on the Return to Work survey, at time of follow-up.

4.1 Participants and Procedures

The participants for this study were recruited from a consecutive non-random sample of injured workers who were referred to the Neurology Services program at the TRI by the Ontario WSIB, after reporting a head injury incurred in the course of their work-related duties. These injured workers underwent a comprehensive assessment by the Neurology Services assessment team, and were discharged between 2007 and 2009. In Ontario, neurologically injured workers who submit claims to the Ontario WSIB and continue to experience persistent symptoms following their work-related TBI are referred to this hospital by their WSIB case-management worker. The workers referred for assessment to TRI travelled to this specialty clinic from across Ontario.

Initially, a list of all the WSIB patients discharged between 2007-2009 was compiled. Once the files were located by the health records staff, the medical charts were reviewed for eligible participants. Patient recruitment commenced with reviewing medical files of patients discharged by the Neurology Services assessment team in 2009. Initially, 294 charts were reviewed, which included patients discharged between 2007-2009, and contact information (name and address) was obtained for eligible participants (Appendix A). Of these, 200 patients met eligibility requirements and were selected for survey mailing.

Patients were considered eligible if they met the following inclusion and exclusion criteria:

Inclusion criteria:

- Males and females aged 18-65 years who sustained a WrTBI.
Individuals who had a diagnosis of TBI, as determined by the TRI neurology assessment team.

Individuals who provided informed consent.

Exclusion Criteria:

- Individuals without a diagnosis of concussion or brain injury (determined by the neurology assessment team and stated on their medical health record discharge report).
- Individuals with a diagnosis of severe traumatic brain injury (as determined by GCS of 8 or lower).
- Individuals who had incomplete or missing medical health records (i.e., lacking neuropsychological assessment report and/or discharge report).
- Individuals who required the use of an interpreter while completing their assessment as stated in their medical health records.

Subsequently, a survey package was mailed out to all 200 potential participants. The content of the survey package included a letter from the medical director of the TRI Neurorehab Program, inviting potential participants to participate in the study by informing them about the research study’s purpose and what their involvement entailed (Appendix B). An information letter and consent form was also provided, which explained the risks and benefits of participation, and provided an outline of the procedure and contact information for study personnel (Appendix C). Details concerning how to decline from participating in the study were also outlined in the information letter and consent form, and a phone number was provided for individuals to call if they had questions or wished to be removed from the research contact list. The survey package also included a return to work questionnaire, MOS SF-36 Health Survey and a 6-item Safety Climate Scale (Appendix D), a list of injured worker support groups in Ontario and provincial and national brain injury support groups (Appendix E), and a stamped envelope with return address for individuals to send their signed consent forms and completed survey packages back to the research team.

For those participants who returned the signed consent form and completed survey package, baseline demographic and clinical information was abstracted from participants’ files. The abstraction tool (Appendix I) was used to obtain clinical information about the participants,
including diagnoses, prior conditions, work status, and other relevant variables. The first 10 files were reviewed by two investigators in order to determine inter-rater reliability. The simple kappa was calculated to be 0.8 based on 6 variables, indicating a strong agreement between the two abstractors. The 6 variables were the following: sex, post-traumatic amnesia (PTA), loss of consciousness (LOC), concussion classification, return to work status at time of admission, and a history of depression. The variables were selected based on the ICF categories, with sex, PTA, LOC and concussion classification representing the personal factors, while RTW status and history of depression represented the activity limitation and body structure and function categories, respectively.

A neuropsychologist (a co-investigator) then reviewed the neuropsychological assessment files of patients, which were stored separately from their medical health records. Information about specific neuropsychological tests was abstracted using a neuropsychological abstraction form (Appendix J).

Participants who provided consent were mailed a thank you letter (Appendix F) on behalf of the primary investigator as well as a copy of their signed consent form and a $10 Tim Horton’s gift card.

If a copy of the signed consent form was not included in the returned package, a letter was mailed out to those participants inquiring whether their omission of this form was intentional or not (Appendix G). The letter explained that without the participant’s consent, the investigators could not access the participant’s file kept at TRI Health Records. Also, the letter included another copy of the consent form explaining the purpose of the study, procedures, possible risks and benefits, confidentiality and their right to withdraw from the study at any time. A return envelope was also included in the letter for participants to send back their signed consent, should they choose to do so. Without a signed consent form the clinical records were not accessed.

The survey package was mailed out in September 2010 and by December the anticipated response rate of 25% was not met. As such, a second mail-out of the survey package took place 4 months after the initial mail-out; this package included a letter explaining the purpose of the second mail-out (Appendix H) as well as all the content of the original survey package: contact
letter, information letter and consent form, return to work questionnaire, MOS SF-36, Safety Climate Scale, brain injury and injured worker’s support group contact information, and stamped return envelope. The second mail-out package was not sent to participants who had already provided signed consent forms, who had declined to participate in the study, or whose addresses had changed and packages were returned to sender.

4.2 Instruments and Variables Measured

4.2.1 Return to Work Survey

The main outcome variable of interest in this study was RTW post-WrTBI, which was captured using the Return to Work Survey. This survey included a return to work questionnaire, the MOS SF-36 Health Survey, as well as a 6-item Safety Climate Scale. The return to work questionnaire (Appendix D) was developed for this research project based on a literature review of return to work factors (Franche et al., 2005; Oppermann, 2004; Ruffolo et al., 1999). This custom designed questionnaire included the following sections: current work status, return to work, no return to work, new injuries, and sociodemographic characteristics.

4.2.2 Personal and Environmental Factors

Participants were asked to provide the following personal information as part of the survey: age, sex, height, weight, current marital status and highest education level. The height and weight variables were used to calculate Body Mass Index (BMI). BMI is a simple index of weight-for-height used to classify underweight, overweight and obesity in adults (World Health Organization, 2011a). Adults with a BMI ranging from 18.5-24.99 are in the normal range, adults with a BMI >25 are overweight, and obese adults have a BMI of >30.

Participants were asked to complete the MOS SF-36 questionnaire – a validated measure of health function, well-being and quality of life – as part of the survey package (Appendix D). This self-reported survey yields an 8-scale profile of functional health and well-being scores ranging from 0 (worst health) to 100 (optimal health) including physical functioning and mental health, as well as psychometrically-based physical and mental health summary measures (Ware & Kosinski, 2001). The MOS SF-36 domains of general health, vitality, social functioning, mental health and mental and physical component scores were also included in this category for
hypothesis generating purposes. Perceived general health, vitality, social functioning, mental health and the mental and physical component scores of the MOS SF-36 were also included.

Participants were also asked to complete a 6-item safety climate scale, which was developed by the National Institute for Occupational Safety and Health of the Centers for Disease Control and Prevention (National Institute for Occupational Safety and Health Centre for Disease Control and Prevention, 2011). This scale was used to assess participants’ perception of their workplace health and safety practices, policies and procedures, as well as the organizational climate and workplace stressors. For example, participants were asked if they had been informed about the safety protocol at their current workplace, and if they felt comfortable reporting safety violations to their supervisors. This scale helped to further inform the environmental and psychosocial factors of the workplace.

4.2.3 Body Structure and Function

Under this category, the bodily pain subscale of the SF-36 was included.

4.2.4 Activity Limitation and Participation

The RTW portion of the questionnaire ascertained whether individuals were currently working and if so, whether they were working on a full- or part-time basis, and whether they were offered modified duties. The location of their employment was also ascertained. For example, the questionnaire asked if they were working with the pre-injury employer, if they had returned to their pre-injury job or another job, and whether they had made more than one attempt to return to work. Sustained RTW was defined as persons who were continuously employed sometime after discharge. Those who were currently working were asked about their pre-injury employment, current employment, factors that they felt had influenced their RTW, and any therapies and services they deemed helpful in the RTW process. These participants were also asked about their post-injury awareness of safety issues, and perceived barriers for RTW.

Those who had not returned to work completed the ‘No RTW’ section and listed reasons for not returning to work. They were also asked two open-ended questions about details relating to their self-generated list of RTW barriers. The results of these variables will be discussed in the first part of the Results section, given that RTW outcome is the main variable of interest in this study.
The remaining items of the MOS SF-36, which were the physical functioning, physical role and emotional role limitations, also fall into this category. The analysis of the 8 domains of the MOS SF-36 as well as the two summary scores will be discussed under the Activity Limitation and Participation of the Results Section.

4.3 Abstraction Tools

Two separate abstraction tools were utilized for this study. The first was the medical record abstraction tool, which is a standardized and validated tool that was utilized in a similar population of injured workers at the TRI to ascertain information from each patient's medical record on pre-injury demographic, environment characteristics and occupation and work-related characteristics (Engel, Henderson, Fergenbaum, & Colantonio, 2009). The tool includes items on diagnoses, symptoms and neuropsychological profile. This tool has been developed and pilot tested using a similar WSIB-WrTBI population that was referred to TRI between the years of 1999 and 2001. Previous work has shown that this measure has substantial inter-rater reliability; in the earlier study the agreement was ≥85% and the unweighted kappa statistic was ≥0.55 for most variables. Length of the abstraction process is approximately one hour per participant. In brief, the custom designed abstraction tool includes the following sections: abstractor identification, client program status form, discharge/case conference summary report, neuropsychological assessment report, occupational therapy and physiotherapy report and WSIB employer’s report of injury/disease (Appendix I).

The neuropsychological test abstraction tool was developed by neuropsychologist Dr. Angela Carter who facilitated access to these records and abstracted the necessary information for each consenting participant, with the help of the student investigator. The neuropsychological abstraction tool, as well as a complete list of the 16 domains routinely assessed and the tests used to assess them is provided in Appendix J. For a description of the measures used in this study, which are all well-validated measures used in standard neuropsychology practice, see Lezak, Howieson, & Loring (2004).

4.3.1 Personal and Environmental Factors

The medical records abstraction tool ascertained the patient’s sex, date of birth, marital status, education level and immigration status as well as occupation description, industry sector and classification of occupation at time of injury.
4.3.2 Body Structure and Function

The medical records abstraction tool was utilized to obtain the history of medical and psychiatric conditions for consenting participants, as well as the mechanism that caused the brain injury. Time since injury was determined by subtracting the injury date from the patient’s admission date for assessment. Injury severity was determined by the GCS score, when available, as well as LOC, length of PTA and results from external exams that included CT Scans of the head, and MRI of the head. Results of neuro-otological and neuro-ophthalmology evaluations were also included where available. The tool also obtained information about the incident-related injuries such as facial lacerations, neck or spine injuries, as well as incident-related head symptoms, which were reported by the patient at time of assessment (e.g., cognitive, emotional and physical symptoms).

Neuropsychological data that addressed cognitive skills, such as memory, attention, executive functioning, as well as emotional and psychological well-being was abstracted in order to determine their predictive value for post-discharge function. Test batteries were tailored to each participant depending on the discretion of their assigned neuropsychologist, thus not all the tests were found in each patient’s file.

4.3.3 Activity Limitation and Participation

At time of assessment, patients were asked if they had returned to work in any capacity at time of admission, or whether they had attempted to return to work in any capacity since their injury. The student investigator abstracted this information from the occupational therapy/RTW Coordinator report in the medical charts using the medical record abstraction tool.
### Table 1: Description of Study Instruments and Variables Measured

<table>
<thead>
<tr>
<th>Variable</th>
<th>Measurement Tool and Data Source</th>
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<tbody>
<tr>
<td><strong>Personal and Environmental Factors</strong></td>
<td></td>
</tr>
<tr>
<td>Sociodemographic</td>
<td>MRAT- at time of assessment and RTWQ- at time of follow-up (Age, Sex, Education, Marital Status)</td>
</tr>
<tr>
<td>Body Mass Index</td>
<td>RTWQ-Height and Weight</td>
</tr>
<tr>
<td>Pre-injury Occupation</td>
<td>MRAT- Industry and Occupational Classification</td>
</tr>
<tr>
<td>Employment Status</td>
<td>RTWQ- Working Full/Part time, Employer Information</td>
</tr>
<tr>
<td>RTW Factors</td>
<td>RTWQ- Personal-Good/Partial Recovery from Injury Environmental- Job Modification, etc.</td>
</tr>
<tr>
<td>Services and Therapies</td>
<td>RTWQ</td>
</tr>
<tr>
<td>Barriers of RTW</td>
<td>RTWQ-Open-ended Question Summary</td>
</tr>
<tr>
<td>Awareness of Safety Issues</td>
<td>RTWQ</td>
</tr>
<tr>
<td>No-RTW Reasons</td>
<td>RTWQ- Personal Factors- physical impairment, etc Environmental Factors- Transportation, Unsupportive Co-workers/Employer</td>
</tr>
<tr>
<td>Safety Climate Scale</td>
<td>RTWQ- Safety Climate Scale Summary Table</td>
</tr>
<tr>
<td>General Health (GH)</td>
<td>RTWQ-SF-36 (GH)</td>
</tr>
<tr>
<td>Vitality (V)</td>
<td>RTWQ-SF-36 (V)</td>
</tr>
<tr>
<td>Social Functioning (SF)</td>
<td>RTWQ-SF-36 (SF)</td>
</tr>
<tr>
<td>Mental Health (MH)</td>
<td>RTWQ-SF-36 (MH)</td>
</tr>
<tr>
<td>Mental and Physical Component Scores</td>
<td>RTWQ-SF-36 (MCS, PCS)</td>
</tr>
<tr>
<td><strong>Body Structures and Functions</strong></td>
<td></td>
</tr>
<tr>
<td>History of Medical and Psychiatric Conditions</td>
<td>MRAT</td>
</tr>
<tr>
<td>Brain Injury Mechanism</td>
<td>MRAT-Event of incident</td>
</tr>
<tr>
<td>Brain Injury Severity</td>
<td>MRAT-GCS, LOC, PTA, CT, MRI, ENT, Neuro-opthalmology assessment</td>
</tr>
<tr>
<td>Incident-related Injuries</td>
<td>MRAT-other injuries</td>
</tr>
<tr>
<td>Time Since Injury</td>
<td>MRAT-(Incident date-admission date)</td>
</tr>
<tr>
<td>Incident-related Head Symptoms</td>
<td>MRAT-Patient self report (Psychiatric/Neuropsych/OT Assessment Reports)</td>
</tr>
<tr>
<td>Neuropsychological Assessment</td>
<td>Neuropsychological Report-Neuropsychological Abstraction Tool</td>
</tr>
<tr>
<td>Bodily Pain (BP)</td>
<td>RTWQ- SF-36 (BP)</td>
</tr>
<tr>
<td>Subsequent Injury</td>
<td>RTWQ- Re-injury at workplace</td>
</tr>
<tr>
<td><strong>Activity Limitation and Participation</strong></td>
<td></td>
</tr>
<tr>
<td>Working at time of Admission</td>
<td>MR-OT/RTW Coordinator Report</td>
</tr>
<tr>
<td>RTW Attempt since Injury</td>
<td>MRAT- OT/RTW Coordinator Report</td>
</tr>
<tr>
<td>RTW at time of follow-up</td>
<td>RTWQ- Are you currently working (Yes/No)</td>
</tr>
<tr>
<td>Physical Functioning (PF)</td>
<td>RTWQ-SF-36 (PF)</td>
</tr>
<tr>
<td>Physical Roles</td>
<td>RTWQ-SF-36 (PR)</td>
</tr>
<tr>
<td>Emotional Roles</td>
<td>RTWQ-SF-36 (ER)</td>
</tr>
</tbody>
</table>

MRAT=Medical Record Review Abstraction Tool, RTWQ=Return to Work Survey, RTW=Return to Work
4.4 Ethics

This research was approved by the Ethics Review Board of the Toronto Rehabilitation Institute and the University of Toronto Ethics Review Board (Appendix K).

4.5 Data Entry and Analysis

The data were entered and analyzed using SAS® Software version 9.2.

At time of assessment, the time since injury was calculated from the date of admission minus the date of injury taken from the abstraction tool. The time of follow-up was determined by subtracting the discharge date from the date of survey completion.

Age at time of follow-up was determined by subtracting date of survey completion from date of birth taken from the abstraction tool. For data analysis, marital status categories were combined to describe each participant’s status as either (a) married/living with someone, or (b) single/widowed/divorced/separated. Similarly, participants’ education level was described as having some high school education/high school diploma or higher than high school education, which included college, university or vocational education.

Univariate statistics such as frequency distributions and measures of central tendency were used to describe the profile of injured workers including age, sex, BMI, history of medical and psychiatric conditions, injury severity, injury-related symptoms and injury event description. Bivariate analyses were generated to demonstrate the factors that might differentiate between individuals who had successfully returned to work from those who had not, such as person, environment, occupation and work, injury, and previous medical history factors obtained from the abstraction tool. Between-group Chi-square tests were performed for categorical variables (e.g., RTW as a categorical variable) and t-tests analyses for continuous variables (e.g., age). Fisher’s exact test was used in between-group categorical comparisons where the cell size was <5.

The items on the history of medical and psychiatric conditions and the injury-related head symptoms and the items on the neuropsychological report abstraction tool were categorized as dichotomous variables (Impairment/No impairment vs. RTW/No-RTW) to simplify between group comparisons using Chi-square/Fisher’s exact test. For example, the items on the scales
that were scored as a 0, 2 or 9 were re-coded as zero scores or no impairment, and the impairment category remained as a score of 1 (see Appendix 10). Cognitive and emotional impairments and symptom exaggeration scales of the neuropsychological report abstraction tool were summarized in the same way by creating summary scores from the items in each category; the summary scores were used for between group comparisons (Chi-square/Fisher’s exact test).

The six questions on the Safety Climate Scale (National Institute for Occupational Safety and Health Centre for Disease Control and Prevention, 2011) contain the following four response choices: strongly agree, agree, disagree and strongly disagree. However, to simplify analyses, they were dichotomized into agree/disagree and statistically analysed in comparison to RTW outcomes, using Chi-Square test of significance.

Physical and mental health, as well as the mental health, general health, social function, vitality, physical function, bodily function, emotional role limitation and physical role limitation subscales as determined from the MOS SF-36, were compared using t-tests between the RTW vs. No-RTW groups. Missing data on the health survey was replaced according to guidelines in the scoring manual, which uses a (modified) pro-rating procedure. (For a complete description see SF-36 Health Survey Manual and Interpretation Guide by Ware et al., 2000).

Finally, qualitative data analysis was performed by categorizing responses to open-ended questions into similar groups. The number of times each response was repeated by participants was quantified to generate descriptive tables of facilitators and barriers of RTW.
Chapter 5
Results

5 Description of the Sample

5.1 Response Rate

Initially, 294 charts were reviewed, which included patients discharged in 2009-2007. Of these, 200 charts met eligibility requirements and were selected for survey mailing. Contact information (name and address) was obtained for eligible participants (Appendix A). The 94 patients who were not selected did not meet eligibility criteria for the following reasons: 1) they did not have a mild or moderate TBI (this includes no TBI diagnosis and severe TBI patients), 2) they had a partial or incomplete medical chart, and/or 3) a translator was necessary to complete the assessment, meaning that the patient did not have strong command of English.

From the 200 patients that met eligibility requirements, 14 survey packages were returned-to-sender due to changes in address, while 10 people called the investigators or sent letters declining to participate in this study. Forty two participants returned their completed surveys and signed consent forms (20% response rate). One of these 42 potential participants completed the RTW survey, but did not send in their consent form, even after a reminder package was mailed out. Another completed the survey, but upon re-examination of the medical record, it was determined that the TBI diagnosis was severe and therefore the person was not in fact eligible for the study; however, they received the honoraria for completing the survey. Overall, 40 participants were included in the following analyses, unless it was stated that a different sample size was used for a particular analysis, because each participant might not have had the exact same data in their medical record or neuropsychological report and as such, were exempt from a part of the data analysis.

5.2 Personal and Environmental Factors

5.2.1 Pre-injury Occupation Classification

Of the 40 study participants, at time of injury, 42.5% of participants worked in the manufacturing, transportation and storage, construction or other primary industries, while 57.5% worked in government and related services, retail and wholesale or other services. The participants’ occupation classification at time of injury was as follows: 25% worked as trades,
skilled and intermediate transport and equipment operators and performed installations/maintenance of equipment; 17.5% had professional occupations in social sciences, education and government services; 17.5% worked as professionals or assisting occupations in health and health-related services; 12.5% had intermediate occupations or were labourers in primary industries or worked in the manufacturing industry as supervisors, machine operators and assemblers or labourers; 10% worked as trades helpers, construction labourers and related occupations; 10% were clerical workers or were in skilled or elemental sales and services occupations, while the remaining 7.5% worked as middle and other management occupations.

5.2.2 Sociodemographic Characteristics and RTW Outcomes

Participants were followed up at a mean of 4.4 years post-injury (SD= 6.5, range 2 to 10 years) and a mean of 1.1 years after discharge from TRI assessment (SD=0.9, range 7 months to 3 years). At time of assessment, 29 (72.5%) of the 40 study participants were not working, though 18 of the 40 (45% of all participants) had attempted to return to work at some point between the time of their injury and their assessment. At time of follow-up, 19 (47.5%) participants had successfully returned to work while the remaining 21 (52.5%) had not returned to work. Thus, after discharge, only 8 of the 29 patients who had not been working at the time of their assessment were subsequently able to return to work, indicating a 28% rate of success of the program in returning injured workers to work.

The sociodemographic characteristics of the study participants and between group comparisons are presented in Table 2. The mean age of participants at injury was 44.8 years (SD=12.3) with a range of 17-61. At time of follow-up, the mean age of participants was 48.6 years (SD=11.7, range 21-64). There was no significant relationship between RTW status and age at injury. Similarly, there were also no between-group differences in the RTW and no-RTW groups in terms of sex or marital status. Height and weight, collected from the survey, were used to calculate Body Mass Index (BMI). The mean BMI of the group was 27.5 kg/m², with no significant between-group differences. The sample’s mean BMI was greater than 25 kg/m², with 69% of the participants falling in the “overweight” and “obese” categories.

The only significant sociodemographic variable to differentiate the RTW and no-RTW groups was pre-injury education (p <0.05). Injured workers with higher education were more likely to
RTW. Furthermore, 27% of participants had immigrated to Canada, though there was no significant between-group difference in immigration status and RTW.

Table 2: Sociodemographic characteristics

<table>
<thead>
<tr>
<th></th>
<th>Total (N= 40)</th>
<th>RTW (N=19)</th>
<th>No-RTW (N= 21)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (mean in years)</td>
<td>48.6 ±11.7</td>
<td>47.9 ±10.9</td>
<td>49.2 ±12.6</td>
<td>0.903</td>
</tr>
<tr>
<td>Range</td>
<td>21-64</td>
<td>24-63</td>
<td>21-64</td>
<td></td>
</tr>
<tr>
<td>Sex, n (%)</td>
<td></td>
<td></td>
<td></td>
<td>0.601</td>
</tr>
<tr>
<td>Male</td>
<td>25 (63)</td>
<td>9 (47, 36)</td>
<td>16 (76, 64)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>15 (37)</td>
<td>10 (53, 67)</td>
<td>5 (23, 33)</td>
<td></td>
</tr>
<tr>
<td>Marital Status, n (%)</td>
<td></td>
<td></td>
<td></td>
<td>0.192</td>
</tr>
<tr>
<td>Married/Common Law</td>
<td>31 (78)</td>
<td>16 (84, 52)</td>
<td>15 (71, 48)</td>
<td></td>
</tr>
<tr>
<td>Single/Divorced/Widowed</td>
<td>9 (22)</td>
<td>3 (16, 33)</td>
<td>6 (29, 67)</td>
<td></td>
</tr>
<tr>
<td>Education, n (%)</td>
<td></td>
<td></td>
<td></td>
<td>0.032*</td>
</tr>
<tr>
<td>&lt;High School/Diploma</td>
<td>13 (32)</td>
<td>3 (16, 23)</td>
<td>10 (48, 77)</td>
<td></td>
</tr>
<tr>
<td>&gt;High School</td>
<td>27 (68)</td>
<td>16 (84, 59)</td>
<td>11 (52, 41)</td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>27.5 ±3.9</td>
<td>27.8 ±3.8</td>
<td>27.1 ±3.9</td>
<td>0.564</td>
</tr>
<tr>
<td>Range</td>
<td>18.2-35.2</td>
<td>20.1-35.2</td>
<td>18.1-32.5</td>
<td></td>
</tr>
</tbody>
</table>

(*p≤0.05, Chi Square Test), **bold**=column percent, *italics*=row percent

5.2.3 Return to Work Outcomes

Following discharge from TRI Neurology Services’ assessment, out of the 19 workers that were successful in returning to work, 37% were working less than 30 hours, while 63% worked full-time (> 30 hrs/week) (See Appendix D, Question 1). Fifty-three percent of the 19 participants were working for more than one year since discharge from TRI.

When the participants first returned to work, 89% worked part-time, with the majority of workers returning to their pre-injury employer. Sixty-seven percent of those who returned to the same employer worked at the same job title:description as before their WrTBI, and 94% of those who had been successful in RTW were offered accommodations and job modifications upon their return.

At time of follow-up, of the 19 participants that had successfully returned to work, 74% were working full time, while 26% worked part-time (See Appendix D, Question 2). Eighty-four
percent of the employed workers were working with the same employer and 42% worked the same job as before their WrTBI. Table 3 lists all the reported environmental and personal factors, in order of frequency that participants endorsed as facilitating their return to work.

Table 3: Perceived factors that facilitated RTW

<table>
<thead>
<tr>
<th>Return to Work Factors</th>
<th>RTW N= 19 [n (%)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job Modification</td>
<td>15 (79)</td>
</tr>
<tr>
<td>Partial Recovery From Injury</td>
<td>10 (53)</td>
</tr>
<tr>
<td>Communication between Health Care providers &amp; Employers (with consent)</td>
<td>9 (47)</td>
</tr>
<tr>
<td>Good Recovery From Injury</td>
<td>8 (42)</td>
</tr>
<tr>
<td>Access to RTW Planner/RTW Coordinator</td>
<td>8 (42)</td>
</tr>
<tr>
<td>Workplace Commitment to Health and Safety</td>
<td>8 (42)</td>
</tr>
<tr>
<td>Early/Considerate Contact from Employer</td>
<td>7 (37)</td>
</tr>
<tr>
<td>Support of TRI Neurology Services’ Team</td>
<td>6 (31)</td>
</tr>
<tr>
<td>Counseling and Guidance</td>
<td>6 (31)</td>
</tr>
<tr>
<td>Supervisor Trained in RTW Planning/On-the-Job Training/Job Replacement Services</td>
<td>6 (31)</td>
</tr>
</tbody>
</table>

Other facilitators of RTW as described post hoc by the participants were the support of their family physician and the WSIB, as well as “will power” and personal motivation to RTW.

Table 4 lists all the services and therapies that participants endorsed as helpful in facilitating their RTW.

Table 4: Therapies and services that facilitated RTW

<table>
<thead>
<tr>
<th>Services and Therapies</th>
<th>RTW N= 19 [n (%)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physiotherapy</td>
<td>14 (74)</td>
</tr>
<tr>
<td>Exercise Therapy/Weight Management</td>
<td>11 (57)</td>
</tr>
<tr>
<td>Counseling for Emotional Adjustment</td>
<td>10 (53)</td>
</tr>
<tr>
<td>Chiropractics</td>
<td>7 (37)</td>
</tr>
<tr>
<td>Assessment and Treatment of Sleep</td>
<td>7 (37)</td>
</tr>
<tr>
<td>Pain Management</td>
<td>6 (31)</td>
</tr>
<tr>
<td>Occupational Therapy/Sleep Language Therapy</td>
<td>5 (26)</td>
</tr>
<tr>
<td>Cognitive Skills Training</td>
<td>4 (21)</td>
</tr>
<tr>
<td>Vocational Counselor/Work Hardening</td>
<td>3 (15)</td>
</tr>
</tbody>
</table>

Other therapies that participants subsequently listed as helpful included acupuncture, cranial-sacral therapy, vision therapy and vestibular therapy.

Of the participants that returned to work, 68% reported that they were more aware or conscious of safety issues at the workplace since their head injury.
5.2.4 No Return to Work Outcomes

As mentioned, 21 participants did not return to work (no-RTW group). Of this group, the majority (81%) indicated that they had not returned to work because of long term disability or sick leave, whereas the remaining 19% were volunteering or had returned to school post-injury. Table 5 lists all the reasons participants endorsed as reasons for not returning to work and the percentage of participants endorsing each factor (in parenthesis).

Table 5: Perceived barriers of RTW

<table>
<thead>
<tr>
<th>Reasons for No Return To Work</th>
<th>No-RTW N= 21 [n (%)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficulty Thinking and Concentrating</td>
<td>16 (76)</td>
</tr>
<tr>
<td>Physical Impairment</td>
<td>15 (71)</td>
</tr>
<tr>
<td>Pain</td>
<td>15 (71)</td>
</tr>
<tr>
<td>Sleep Disturbance</td>
<td>15 (71)</td>
</tr>
<tr>
<td>Headaches</td>
<td>15 (71)</td>
</tr>
<tr>
<td>Fatigue</td>
<td>15 (71)</td>
</tr>
<tr>
<td>Emotional/Psychological Issues</td>
<td>14 (67)</td>
</tr>
<tr>
<td>Weakness</td>
<td>12 (57)</td>
</tr>
<tr>
<td>Reduced Tolerance and Endurance</td>
<td>12 (57)</td>
</tr>
<tr>
<td>Communication Difficulties</td>
<td>12 (57)</td>
</tr>
<tr>
<td>Unsupportive Employer/Co-workers</td>
<td>12 (57)</td>
</tr>
<tr>
<td>Job is too Physically Demanding</td>
<td>8 (38)</td>
</tr>
<tr>
<td>Weight Gain</td>
<td>7 (33)</td>
</tr>
<tr>
<td>Transportation</td>
<td>6 (28)</td>
</tr>
<tr>
<td>Job has Changed/No Longer Exists</td>
<td>5 (23)</td>
</tr>
</tbody>
</table>

A few participants in the no RTW group also reported that taking medication and experiencing post-TBI depression were barriers to RTW.

5.2.5 Safety Climate Scale

The table below describes the responses to the 6-item Safety Climate Scale, completed by the entire sample (n=40). Qualitative analysis of these data suggests that, in general, the majority of participants seemed to agree that safety issues are taken seriously in their workplaces. However, a sizable minority seemed to have concerns that safety climate was not optimal in their workplaces. There was a significant difference in safety concerns between the RTW and no RTW groups on 4 out of the 6 items of the scale.
Table 6: Safety Climate Scale

<table>
<thead>
<tr>
<th>Safety Climate Scale Items</th>
<th>N= 40 [n (%)]</th>
<th>Agree</th>
<th>Disagree</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>New employees learn quickly to follow good health and safety practices</td>
<td></td>
<td>32 (80)</td>
<td>8 (20)</td>
<td>0.028*</td>
</tr>
<tr>
<td>Employees are told when they do not follow good health and safety practices</td>
<td></td>
<td>26 (67)†</td>
<td>13 (33)†</td>
<td>0.110</td>
</tr>
<tr>
<td>Workers and management work together to ensure safest working conditions</td>
<td></td>
<td>26 (67)†</td>
<td>13 (33)†</td>
<td>0.035*</td>
</tr>
<tr>
<td>No major shortcuts are taken when worker’s safety are at stake</td>
<td></td>
<td>27 (68)</td>
<td>13 (33)</td>
<td>0.095</td>
</tr>
<tr>
<td>Worker’s health and safety is management’s priority</td>
<td></td>
<td>24 (60)</td>
<td>16 (40)</td>
<td>0.019*</td>
</tr>
<tr>
<td>Feel free to report safety problems</td>
<td></td>
<td>31 (77)</td>
<td>9 (23)</td>
<td>0.014*</td>
</tr>
</tbody>
</table>

(*p≤0.05, Chi Square Test/Fishers exact); †N=39

For ease of reading this thesis, the results of the MOS SF-36 health survey analysis are listed in Table 9 under the Activity Limitation and Participation sub-heading.

5.3 Body Structure and Function

5.3.1 Pre-injury Characteristics at time of assessment

Prior mental health history was included as a variable and obtained from the psychiatric and neuropsychological reports. It was found that a prior history of depression was noted in 27% of the cases, while 20% had a reported history of anxiety/anxiety-related disorders. Seventeen percent disclosed a history of alcohol/substance abuse, and 28% were noted to have other mental health issues, such as antisocial personality disorder, bipolar disorder, ADHD, PTSD and/or social phobia. In terms of prior medical health, 15% of the participants had also reportedly sustained a previous TBI. Thirty percent had diabetes or a previous heart/cardiovascular condition, while 20% had a respiratory condition such as asthma or sleep apnea, and 10% suffered from arthritis. Overall, an overwhelming 77% of the participants sampled had one or more prior or concurrent physical or mental health issue in addition to their WrTBI. However, there was no significant relationship between a participant’s reported history of physical and mental health and RTW status at the time of follow-up.
5.3.2 Post-injury Characteristics at time of assessment

The mean age of participants at time of assessment was 46.7 years (SD=11.9, range 19-62 years). Participants were admitted to TRI for assessment at a mean time of 1.4 years post-injury (SD=6.4 years) with a range of 1-8 years post-injury. An independent t-test revealed no significant between group differences in time of post-injury assessment and RTW status. Thirty percent of participants were known to be admitted to TRI a second time for follow-up, completion of assessment or re-assessment. One participant had a third admission date. The injury event and mechanism of injury for the 40 participants was as follows: 80% of workers were injured as a result of being struck in the head by an animate or inanimate object or struck their head against an animate or inanimate object; and/or they sustained a WrTBI as a result of falling from the same level or from an elevation and hitting their head on the ground/floor. The remaining 20% of injuries were sustained in motor vehicle collisions. There was no significant relationship between mechanism of injury/injury event and RTW status.

Upon completion of assessment, the Neurology assessment team diagnosed 92.5% (n=37) of the sample with a mild TBI (24% of which were considered “complicated” mild TBI, i.e., with positive neuroimaging findings), and the remainder were diagnosed as having sustained a moderate TBI (7.5%, n=3). There was no significant relationship between TBI severity diagnosis and RTW status in the present sample: 49% (18/37) of those with a mild TBI returned to work, (11% of which returned to work after a complicated TBI), while 33% (1/3) of participants with a moderate TBI was able to RTW. Additional diagnosis included the following: post-traumatic and chronic headaches (50%), adjustment disorder with anxiety and/or depressed mood (42.5%), cervical strain (or cervical strain superimposed on degenerative disc disease) (42.5%), scalp and facial lacerations (30%), cognitive disorder not otherwise specified (30%), major depressive disorder (25%), benign positional vertigo (10%), anxiety disorder not otherwise specified (10%), post-traumatic stress disorder (7.5%), and malingering (10%).

Thirty-six percent of the participants had an injury that was head exclusive (including cranial nerve injuries) while the remaining participants had multiple traumas including musculoskeletal injuries that included the neck and spine along with a head injury. Patients who suffered head injury exclusively were no more likely to RTW than those who had head injuries plus other musculoskeletal injuries.
Forty percent of participants reported experiencing a LOC after sustaining a head injury, with LOC ranging from an unspecified duration of time to less than 1 hour. Similarly, PTA was reported by 27% and included an unspecified length of time or PTA ranging from less than 1 minute to less than 24 hours. In the present sample, there was not a significant relationship between PTA or LOC and RTW status.

Seventy-five percent of the participants had a CT scan performed at time of Neurology assessment or prior. The majority of the scans were normal, although 38% of those scans showed abnormal results such as acute subdural hematoma, and subarachnoid haemorrhage. Almost all participants (90%) had an MRI performed as part of their assessment and the majority had normal results; only 10% of these revealed any abnormalities. Also, in 50% of the patients with abnormal MRIs, the report stated that the observed abnormalities were both accident and non-accident related. There was no significant relationship between CT scan or MRI results and RTW status.

An otolaryngologist or ear-nose-throat (ENT) specialist assessed 77.5% of the injured workers and 53% of these had abnormal results, such as hearing loss, benign positional vertigo, anosmia, and/or inner ear trauma. Abnormalities were not necessarily accident-related. Forty-five percent were assessed by a neuro-opthamologist and the majority had normal results, while 39% of those assessed were described as having floaters in the eye, transient visual blurring and retinal dysfunction as a result of their WrTBI. Abnormal findings in ENT and neuro-opthamology assessment reports did not significantly predict RTW status.

Table 7 describes the head symptoms that were reported by the patients at time of assessment and were abstracted from their medical records. As can be seen, regardless of the RTW status, participants reported experiencing a large number of injury-related symptoms that persisted after their sustained TBI.
Table 7: Incident-related symptoms reported at time of assessment

<table>
<thead>
<tr>
<th>Incident-related Symptom Report</th>
<th>RTW</th>
<th>No-RTW</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=40 [n (%)]</td>
<td>N=19 [n (%)]</td>
<td>N=21 [n (%)]</td>
</tr>
<tr>
<td>Headaches</td>
<td>36 (90)</td>
<td>17 (89.47)</td>
<td>19 (90.53)</td>
</tr>
<tr>
<td>Sleep Disturbances (ex. Difficulty Sleeping)</td>
<td>33 (82)</td>
<td>15 (79.45)</td>
<td>18 (86.55)</td>
</tr>
<tr>
<td>Mood/Affect Personality Changes (ex. Anxiety)</td>
<td>32 (80)</td>
<td>14 (74.44)</td>
<td>18 (86.56)</td>
</tr>
<tr>
<td>Changes in Memory/Forgetfulness</td>
<td>30 (75)</td>
<td>15 (79.50)</td>
<td>15 (71.50)</td>
</tr>
<tr>
<td>Dizziness/Vertigo</td>
<td>27 (68)</td>
<td>13 (68.48)</td>
<td>14 (67.52)</td>
</tr>
<tr>
<td>Difficulty Concentrating/Decreased Attention</td>
<td>25 (63)</td>
<td>10 (53.40)</td>
<td>15 (71.60)</td>
</tr>
<tr>
<td>Fatigue/Tires Easily</td>
<td>23 (58)</td>
<td>12 (63.52)</td>
<td>11 (52.48)</td>
</tr>
<tr>
<td>Auditory Changes/Sensitivities</td>
<td>19 (48)</td>
<td>10 (53.53)</td>
<td>9 (43.47)</td>
</tr>
<tr>
<td>Anger/Irritability Personality Changes</td>
<td>15 (38)</td>
<td>7 (37.47)</td>
<td>8 (38.53)</td>
</tr>
<tr>
<td>Frustration Personality Changes</td>
<td>15 (38)</td>
<td>8 (42.53)</td>
<td>7 (33.47)</td>
</tr>
<tr>
<td>Changes in Thinking Speed</td>
<td>14 (35)</td>
<td>4 (21.28)</td>
<td>10 (48.72)</td>
</tr>
<tr>
<td>Vestibular Changes/Sensitivities</td>
<td>13 (33)</td>
<td>8 (42.62)</td>
<td>5 (23.38)</td>
</tr>
<tr>
<td>Chronic Nausea and/or Vomiting</td>
<td>10 (25)</td>
<td>5 (26.50)</td>
<td>5 (23.50)</td>
</tr>
<tr>
<td>Visual Sensitivity</td>
<td>9 (23)</td>
<td>6 (31.67)</td>
<td>3 (14.33)</td>
</tr>
<tr>
<td>Taste/Gustatory Changes or Sensitivities</td>
<td>8 (20)</td>
<td>4 (21.50)</td>
<td>4 (19.50)</td>
</tr>
<tr>
<td>Post-traumatic Seizures</td>
<td>6 (15)</td>
<td>2 (10.33)</td>
<td>4 (19.67)</td>
</tr>
<tr>
<td>Blurred Vision</td>
<td>5 (13)</td>
<td>4 (21.80)</td>
<td>1 (5.20)</td>
</tr>
<tr>
<td>Olfactory Changes /Sensitivities</td>
<td>4 (10)</td>
<td>1 (5.25)</td>
<td>3 (14.75)</td>
</tr>
<tr>
<td>Double Vision/Diplopia</td>
<td>2 (5)</td>
<td>1 (5.50)</td>
<td>1 (5.50)</td>
</tr>
</tbody>
</table>

(*p≤0.05, Chi Square Test), **bold**=column percent, *italics*=row percent

Table 8 summarizes the three domains of the neuropsychological assessment form performance on cognitive testing, emotional and psychological complaints, and evidence of symptom exaggeration. In addition, for each domain, summary scores were calculated to describe (a) any evidence of possible cognitive impairment on testing, (b) any evidence of psychiatric complaints on testing, and, (c) any evidence of symptom exaggeration on testing.

As can be seen, cognitive impairment on testing was seen in 60% of patients tested, but the presence of impairment did not significantly differentiate patients who returned to work versus those who did not. However, the presence of psychiatric complaints (i.e., mood disturbance, anxiety disorder, PTSD, psychosis) did differentiate the two groups, with those reporting psychiatric symptoms on testing being significantly less likely to RTW than those who did not. Furthermore, participants who, on neuropsychological testing, showed evidence of symptom exaggeration, were significantly less likely to RTW. This was true in cases of poor effort on cognitive testing (61% of the participants), as well as in cases of exaggerated psychological disturbance on self-report questionnaires (47% of the participants).
Table 8: Summary of neuropsychological factors by return to work status

<table>
<thead>
<tr>
<th>Neuropsychological Factors</th>
<th>RTW</th>
<th>No-RTW</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attention/Working Memory impairment</td>
<td>30</td>
<td>8/17 (47)</td>
<td>5/13 (38)</td>
</tr>
<tr>
<td>Verbal Memory impairment</td>
<td>29</td>
<td>8/17 (47)</td>
<td>6/12 (50)</td>
</tr>
<tr>
<td>Visual Memory impairment</td>
<td>30</td>
<td>5/17 (29)</td>
<td>5/13 (38)</td>
</tr>
<tr>
<td>Information Processing Speed impairment</td>
<td>29</td>
<td>6/16 (37)</td>
<td>4/13 (30)</td>
</tr>
<tr>
<td>Visuospatial Skills impairment</td>
<td>29</td>
<td>3/16 (19)</td>
<td>4/13 (30)</td>
</tr>
<tr>
<td>Executive Functioning impairment</td>
<td>30</td>
<td>7/17 (41)</td>
<td>6/13 (46)</td>
</tr>
<tr>
<td>Any Cognitive Impairment on Testing</td>
<td>30</td>
<td>14/17 (82)</td>
<td>10/13 (77)</td>
</tr>
<tr>
<td>Mood Disturbance</td>
<td>35</td>
<td>6/15 (40)</td>
<td>15/20 (75)</td>
</tr>
<tr>
<td>Anxiety Disorder</td>
<td>36</td>
<td>6/16 (37)</td>
<td>15/20 (75)</td>
</tr>
<tr>
<td>Other Psychiatric Problem (e.g., PTSD)</td>
<td>36</td>
<td>4/16 (25)</td>
<td>14/20 (70)</td>
</tr>
<tr>
<td>Any Psychiatric Problems on Testing</td>
<td>37</td>
<td>8/17 (47)</td>
<td>16/20 (80)</td>
</tr>
<tr>
<td>Engagement in Cognitive Testing</td>
<td>36</td>
<td>7/17 (41)</td>
<td>15/19 (79)</td>
</tr>
<tr>
<td>Evidence of Exaggerated Psychiatric Symptoms</td>
<td>32</td>
<td>3/14 (21)</td>
<td>12/18 (67)</td>
</tr>
<tr>
<td>Evidence of Exaggerated Pain Complaints</td>
<td>17</td>
<td>2/4 (50)</td>
<td>7/13 (53)</td>
</tr>
<tr>
<td>Any Symptom Exaggeration on Testing</td>
<td>37</td>
<td>8/17 (47)</td>
<td>17/20 (85)</td>
</tr>
</tbody>
</table>

(*p≤0.05, Fisher’s Exact Test)

At time of follow-up, 26% of the 19 participants who had returned to work reported sustaining a subsequent injury as a result of their Wr-TBI. Two of these participants reported that they had experienced a subsequent injury as a result of their brain injury-related persistent symptoms such as dizziness, while the remaining 3 reported experiencing recurrence of symptoms from injuries they sustained prior to their TBI (e.g., low-back injury or knee-injury).

5.4 Activity Limitation and Participation

Table 9 describes the results of the MOS SF-36 Health Survey items categorized under the ICF framework. The total study sample’s mean scores were very low (i.e., reported poor health) on all the domains of the MOS SF-36 Health Survey. These scores were lower than the normative mean of this health survey (normative mean=50, SD=10) (Ware et al., 2000). Figure 1 provides a graphical summary of the MOS SF-36 health survey domain scores for the US general population (age 45-54, n=338) (Ware et al., 2000), total study population and the RTW and No-
RWT groups. The US general population mean scores were higher on all domains compared to
the total study population scores (Table 9) as well as the RWT and no-RWT group’s mean
scores.

In addition, there was a significant relationship between the participant’s self-reported current
general health, vitality, social function, mental health, emotional and physical role limitation
status and current RWT status (p<0.001), with those who did not RWT reporting poorer
functioning in all of these domains. Additionally, there were differences between the RWT and
no-RWT group on scores of current bodily pain, physical function, as well as the physical
component summary scores (p<0.05), in the direction of greater impairment in those who did not
RWT.

Table 9: Participants’ ratings on the MOS SF-36 subscales and component scores at time of
follow-up.

<table>
<thead>
<tr>
<th>SF-36 Category</th>
<th>Total N=40</th>
<th>RTW N=19</th>
<th>No-RWT N=21</th>
<th>US † (age 45-54)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Personal and Environmental Factors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Health</td>
<td>49.5 ±21.4</td>
<td>60.8 ±19.2</td>
<td>39.3 ±18.1</td>
<td>0.0008*</td>
<td>71.7 ±19.3</td>
</tr>
<tr>
<td>Vitality</td>
<td>30.5 ±16.7</td>
<td>40.0 ±15.5</td>
<td>21.9 ±12.7</td>
<td>0.0003*</td>
<td>61.7 ±20.9</td>
</tr>
<tr>
<td>Social Function</td>
<td>49.6 ±28.5</td>
<td>67.7 ±25.4</td>
<td>33.3 ±20.2</td>
<td>&lt;.0001*</td>
<td>84.0 ±21.8</td>
</tr>
<tr>
<td>Mental Health</td>
<td>41.2 ±17.8</td>
<td>51.7 ±15.8</td>
<td>31.6 ±13.7</td>
<td>0.0001*</td>
<td>75.3 ±17.8</td>
</tr>
<tr>
<td><strong>Summary Score</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Component</td>
<td>39.7 ±10.9</td>
<td>43.9 ±11.6</td>
<td>35.9 ±8.6</td>
<td>0.017*</td>
<td></td>
</tr>
<tr>
<td>Mental Component</td>
<td>33.4 ±12.4</td>
<td>40.7 ±12.4</td>
<td>26.7 ±9.1</td>
<td>0.0002*</td>
<td></td>
</tr>
<tr>
<td><strong>Body Structure and Function</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bodily Pain</td>
<td>52.5 ±21.6</td>
<td>60.1 ±21.1</td>
<td>45.7 ±20.2</td>
<td>0.034*</td>
<td>73.1 ±24.0</td>
</tr>
<tr>
<td><strong>Activity Limitation and Participation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Function</td>
<td>53.9 ±28.9</td>
<td>66.6 ±28.9</td>
<td>42.3 ±24.1</td>
<td>0.006*</td>
<td>84.6 ±21.1</td>
</tr>
<tr>
<td>Role Limitations, Physical</td>
<td>69.3 ±41.4</td>
<td>47.3 ±44.0</td>
<td>89.2 ±26.8</td>
<td>0.0007*</td>
<td>82.6 ±33.0</td>
</tr>
<tr>
<td>Role Limitation, Emotional</td>
<td>65.0 ±41.9</td>
<td>36.8 ±39.8</td>
<td>90.4 ±23.9</td>
<td>&lt;.0001*</td>
<td>83.6 ±31.4</td>
</tr>
</tbody>
</table>

†US General Population (age 45-54, n=338), (*p≤0.05, T-Test)
Figure 1: Graphical representation of the study population in comparison to US general population normalized MOS SF-36 domain scores.

* US General Population age 45-54 Mean Score for MOS-SF 36 domains (Ware et al., 2000).
Chapter 6

6 Discussion

The main objectives of this study were to describe and compare the profile of injured workers who were successful in returning to work with those who were unsuccessful in doing so, months or years after sustaining a mild to moderate WrTBI. In addition, this study aimed to identify factors that may have influenced RTW in this sample from the injured worker’s perspective. From our sample of 40 respondents, 19 indicated that they succeeded in returning to work, either on a full-time or part-time basis. They identified factors such as receiving work accommodations from their employer and participating in therapies and services (such as physiotherapy) as important facilitators to their ability to return to work. Those who were unable to return to work identified personal and environmental factors such as suffering from psychological turmoil, and dealing with unsupportive employers and/or co-workers as barriers to their success. Results also indicated that both the RTW and no-RTW group self-reported limitations in many aspects of their health, including general health, vitality, mental health, social function and emotional role limitation. In our sample, regardless of RTW status, the majority of injured workers felt their pre-injury workplace to be safe.

The injury-related events, emotional and psychosocial well-being as well as the cognitive impairments of injured workers were also investigated in this study and will be discussed below.

6.1 Personal and Environmental Factors

6.1.1 Sociodemographics

Despite younger age being a risk factor for TBI in general, the present sample of individuals injured at work was characterized by relatively few young adults, with most participants aged 40 or older. Within this sample, those who were unsuccessful in returning to work were somewhat, but not significantly, older compared to participants who had returned to full-time or part-time employment. This finding is consistent with other findings in the literature that demonstrate that adults over 40 generally experienced poor vocational outcomes, and were less likely to be employed 2 years post-injury (Ponsford et al., 1995). The present sample had a high proportion of males and the majority of the males (63%) did not return to work. On the other hand, a high proportion of the females (67%) in this study successfully returned to work. However, the effect
of sex was also not a statistically significant predictor of RTW. Additionally, there was no significant relationship between RTW status and marital status, or between RTW status and BMI.

On the other hand, the relationship between pre-injury education and RTW was significant (p=0.03). Specifically, those with higher levels of education (post-secondary) were more likely to RTW compared to individuals with a high school degree or less. These findings are consistent with those of Ip and colleagues (1995) who demonstrated a trend in which those with higher education were more likely to return to work. This relationship may be accounted for by Shames and colleagues’ (2007) observation that highly motivated individuals with higher post-injury cognitive abilities are more likely to return to jobs that do not require physical labour. The physical injuries that often accompany TBI may preclude individuals with less education from returning to the physically demanding jobs they may hold. However, more research is necessary to understand the complex interaction of education status, types of occupation and employment outcomes in an injured worker population.

6.1.2 RTW Facilitators

The most noteworthy environmental factor that reportedly facilitated participants in returning to full-time or part-time employment was receiving workplace job modifications. For example, participants who successfully returned to work were offered modified duties, shorter hours and flexible shifts, which reportedly aided their transition back into the workplace environment. Participants also perceived the following factors as facilitators of RTW: communication between health care providers and employers (with consent), early contact from employer, and access to a RTW planner/coordinator. Furthermore, participating in counselling, guidance and job replacement services were also identified as facilitators of RTW. Interestingly, these types of facilitators have also been identified by the Institute for Work and Health (IWH) in their seven principles for successful return to work (IWH, 2007b). Specifically, the IWH developed these seven principles by reviewing both qualitative and quantitative studies in the existing RTW literature:

1. The workplace has a strong commitment to health and safety which is demonstrated by the behaviour of the workplace parties.
2. The employer makes an offer of modified work (also known as work accommodations) to injured/ill workers so they can return early and safely to work activities suitable to their abilities.

3. RTW planners ensure that the plan supports the returning worker without disadvantaging co-workers and supervisors.

4. Supervisors are trained in work disability prevention and included in RTW planning.

5. The employer makes an early and considerate contact with injured/ill workers.

6. Someone has the responsibility to coordinate RTW.

7. Employers and health care providers communicate with each other about the workplace demands as needed, and with the worker’s consent.

The IWH literature review showed evidence that these principles are consistent with findings from the RTW literature (Franche et al., 2005). For example, Franche and colleagues found that injured workers were more likely to successfully RTW if there was a collaborative effort between management and employers to create a RTW strategy (Principle 1). Secondly, injured workers were more likely to have favourable employment outcomes if they were offered work accommodations that did not disadvantage the employer or co-workers by creating a situation that led to resentment towards the returning worker (Principles 2 & 3). In addition, educating supervisors and managers in safety training also contributed to successful RTW (Principle 4). An Ontario study of RTW found that supervisors who were not included in the RTW plan felt ill-equipped to accommodate returning workers (Share & Reardon, 2004), compared to those who were included in the RTW plan and had received safety training. Therefore, it is crucial for supervisors and injured workers to establish early and regular contact (Principles 5 & 6) to ensure that the RTW plan and job modifications are implemented in the workplace. Lastly, when there was communication between RTW coordinators, employers and health care providers, injured workers were more likely to successfully return to work with shorter work disability duration (Principle 7) (Franche et al., 2005).

Participatory research conducted by Beardwood and colleagues between 1999 and 2001 on the perceptions and experiences of injured workers revealed that the workers in these studies believe that the RTW process victimizes them and renders them powerless and dependent on others (Beardwood, Kirsh, & Clark, 2005). Furthermore, the injured workers in this study believed that health care professionals and bureaucrats impeded their rehabilitation process. The authors
suggested that injured workers should be included in the decision-making process of their rehabilitation, RTW process and the rebuilding of their lives.

All in all, successful RTW is a multi-faceted and complex process that results from the interaction between the injured worker, his/her employer, health-care providers and the RTW coordinator (where one exists). The literature in this area suggests that in order for employees to successfully return to and sustain employment, it is important for managers to anticipate the worker’s RTW, and communicate with the employee and health-care providers to identify the employee’s abilities, restrictions and limitations. Based on this information, ideally, job duties would be modified in keeping with the worker’s difficulties, and a RTW plan should be developed and implemented. Lastly, managers and employees could monitor and evaluate the RTW plan to identify further barriers and implement accommodations where needed.

Furthermore, RTW policies and availability of work accommodation (i.e., adaptation to impairments) as well as contact between health care providers and the workplace influence successful RTW outcomes (Franche et al., 2005). Thus far, these factors have not been well investigated in WrTBI populations, despite their practical significance. Further research is necessary to investigate the relationship between these factors and vocational outcome.

Personal factors that were identified as facilitators by the successful RTW group were personal motivation, “will power”, and partial or good recovery from injury. Personal motivation and will power can strongly influence a person’s coping style and willingness to participate in rehabilitation programs (Ownsworth & McKenna, 2004). Though there is a paucity of literature on the effects of coping style and employment outcomes, Ben-Yishay, Silver, Piasetsky, and Rattok (1987), have shown that in the work environment, an individual’s coping style and ability to use self-regulatory strategies significantly impact their work performance and long-term employment success. However, it is unclear whether these personal factors preceded or were a consequence of employment status. Given that rehabilitation programs can target an individual’s coping style and self-regulatory strategies to improve RTW success, further research is necessary to elucidate the relationship between these factors and employment outcomes. Additionally, studies have shown that participating in rehabilitation programs and publicly disclosing problems indicates a willingness to change and accept guidance from rehabilitation professionals, and is significantly related to successful employment outcomes after rehabilitation (Ownsworth & McKenna, 2004). This suggests that injured workers can benefit from participating in
rehabilitation programs that target an individual’s coping style and teach self-regulatory strategies to improve their vocational outcome.

6.1.3 Therapies and Services that facilitated RTW

The participants who had returned to work identified several therapies and services as facilitators. For example, receiving physiotherapy treatment and participating in exercise therapy and weight management were perceived as helpful factors that aided in the RTW process. Additionally, those who were successful in returning to work were more likely to receive counselling for emotional adjustment and participate in assessment and treatment of sleep disorders. These therapies and services address the hallmarks of TBI, which are physical, cognitive and psychosocial impairments. During the different stages of the rehabilitation process, measures of physical disability, cognitive impairment, independence, psychosocial adjustment and adaptation to the community are used by rehabilitation professionals to assess the functional status of patients. The TBI literature demonstrates that functional status assessed at time of discharge is a strong predictor of RTW (McCrea, 2008). Furthermore, Greenspan et al., (1996) found that the addition of a motor limitation to any given level of cognitive functioning resulted in a reduced functional status, which in turn decreased the likelihood of returning to work. It seems that participating in therapies and services enhanced the functional status of injured workers and facilitated their RTW. To better understand the relationship between participating in different therapies and RTW outcomes, further research is necessary to understand what types of therapies might enhance injured workers’ chances of returning to full or part-time employment. Specific investigation of types and amounts of treatment undertaken will then be useful in determining the most empirically supported therapies for WrTBI patient groups.

6.1.4 RTW Barriers

In this study, 21 injured workers had not returned to work since their assessment at TRI. Perceived barriers of RTW included both personal and environmental factors. Personal barriers were mainly injury-related symptoms, such as headaches, pain, fatigue, sleep disturbances, weakness and weight gain. Unsupportive employers and co-workers as well as the job’s physical demands were perceived as environmental barriers. Interestingly, the main perceived barrier of RTW was difficulty thinking and concentrating, suggesting perceptions of cognitive impairments in this group. Communication difficulties and emotional and psychological issues were other
cognitive impairments identified by the participants as RTW barriers. The TBI literature has demonstrated that even a mild TBI can lead to cognitive changes that can hinder successful RTW by affecting a worker’s ability to complete job-related duties in a meaningful and effective way (Hofgren, Esbjornsson, & Sunnerhagen, 2010), at least at early stages. Even subtle cognitive changes can hinder RTW by deterring a worker’s ability to understand, plan and execute their duties and make it difficult for injured workers to effectively communicate with their employer and co-workers. Therefore, attention to cognitive changes at early stages of rehabilitation services is an important step in the RTW process.

6.2 Body Structure and Function

Unlike some prior studies of mixed severity, in this sample of mostly mild TBI survivors, there were no significant relationships between RTW status and injury characteristics such as LOC, PTA, GCS and the results of neuroimaging (e.g., CT, MRI). Additionally, injured workers successful in returning to work reported a similar number of injury-related head symptoms (Table 7) during their assessment as those who did not return to work (e.g., headaches, cognitive impairment). As another example of this, a similar number of patients in the RTW group reported cognitive impairments at time of assessment as in the no RTW group (Table 8). Although many of our participants reported such cognitive changes, perhaps due to the high rates of inadequate effort on the neuropsychological testing (61%), the presence of apparent impairments on the testing did not predict RTW status. Despite the fact that 60% of our participants who were tested at time of assessment did appear to have some type of cognitive impairment on testing, it is important to note that our data gathering approach does not allow for a determination of the etiology of these apparent impairments. In fact, in a meta-analytic review of cognitive impairments following mild TBI, Binder et al., (1997) concluded that 95% of mild head trauma patients display no significant cognitive impairment 3 months or more post-injury. Thus, it is statistically unlikely that the impairments seen in our sample are actually a result of TBI. Furthermore, given this restriction in variance, cognitive changes in mild TBI may be difficult to quantify and may not present as a significant predictor of RTW. However, as Binder et al. point out, the association between mild TBI and cognitive deficits, symptoms and disability may not be causal. In this regard, these writers refer to empirical data that suggests that patients with mild TBI have more psychosocial problems prior to injury than do non-injured persons. Other aspects of the injury may also lead to perceived cognitive changes that are difficult to
quantify, but are nevertheless real. For example, the depressive and anxiety symptoms and sleep disturbances that are sometimes associated with mild TBI can lead to difficulties with attention, concentration and short-term memory. All in all, the interaction between post-injury cognitive changes that persist beyond the natural course of injury recovery and employment outcomes is complex and warrants further research.

In keeping with the above, Meares et al. (2006) investigated the association between PCS and neuropsychological and psychological outcome in 122 general trauma patients and found that individuals with PCS reported significantly more psychological symptoms than neuropsychological symptoms, which was evident by large effect sizes found on psychological measures. The participants with mild TBI who presented with PCS reported more psychological rather than neuropsychological symptoms. The authors concluded that psychological factors were present much earlier than previously considered in the development of PCS. PCS can in turn lead to chronic symptomatology months or even years after TBI. In accordance with this, we found a relationship between the RTW status of injured workers at time of follow-up and their performance on measures of emotional and psychological functioning examined at time of assessment. Specifically, those who were unable to RTW were more likely to report difficulties on measures of mood disturbance, anxiety disorder, and other psychiatric problems (e.g., PTSD) compared to the RTW group.

This finding is consistent with the existing TBI literature showing that psychiatric and psychological deficits are among the most disabling consequences of TBI (Masel & DeWitt, 2010). In the acute stages of TBI, survivors often experience aggression, confusion and agitation, while in the chronic phase survivors are at high risk for developing psychiatric disease such as anxiety disorders and mood disorders such as major depression. At times, these difficulties can exacerbate over time, for example, when the patient plateaus in terms of neurological recovery and must learn to compensate for any permanent changes. A long-term follow-up study of TBI survivors found a higher incidence of emotional and behavioural changes at 5 years post-injury compared to 2 years (Olver, Ponsford, & Curran, 1996). Additionally, 32% of those working at 2 years were unemployed at 5 years. Another study that followed 60 TBI survivors for 30 years post-injury demonstrated that 50% developed a major mental disorder that began after their TBI (Koponen et al., 2002). Furthermore, in a literature review, Kim and colleagues (2007) found that in chronic TBI, the prevalence of depression was 18-61 percent, while the prevalence of
PTSD and psychosis were 3-59 percent and 20 percent, respectively. Taken together, these results suggest that injured workers who do not return to full or part-time employment and report experiencing emotional and psychological impairments may benefit from participating in psychological and emotional counselling (e.g., cognitive-behavioral therapy, mindfulness therapy) for a period of time, and in some cases, may require psychopharmacological treatment as well.

The WHO Collaborating Centre Task Force on mild TBI summarized the literature on post-injury symptom recovery by stating that there is evidence that symptom persistence beyond the normal recovery period of several days to weeks may be attributable to factors other than the mild TBI per se (Carroll et al., 2004). The authors found that the following four factors were also implicated as predictors of prolonged symptoms after mild TBI: demographics (e.g., female gender, older age), psychosocial factors (e.g., unstable relationships, lack of social support system, pre-existing psychiatric problems or personality disorder, chemical dependency), medical factors (e.g., severe associated injuries, comorbid medical or neurologic disorders, prior history of mild TBI), and situational factors (e.g., litigation/compensation). Though we did not examine all of these factors, some of these factors did appear to impact on RTW in our sample, although they were not statistically significant given our small sample size. A meta-analytic review revealed that mild TBI survivors who present with these additional factors may benefit from early interventions that focus on providing information about the symptoms experienced post injury, including that the symptoms tend to be a transient but common phenomenon (Masel & DeWitt, 2010). Further research is necessary to better understand the interaction of these factors and WrTBI symptom persistence in relation to RTW outcomes.

Further to the notion of situational factors associated with symptom reporting post-mild TBI, a large number of meta-analytic studies in the TBI literature have investigated the prevalence of symptom exaggeration on neuropsychological tests of cognitive and psychiatric dysfunction as well as the relationship between post-mild TBI symptom reporting and litigation/compensation-seeking. For example, Green et al. examined the neuropsychological data from charts of 904 patients seen for disability or compensation claims and found that 50% of the variance in the data, which was obtained from neuropsychological tests of cognitive and psychiatric impairment, was accounted for by effort (as measured by Word Memory Test); years of education and age at time of injury only accounted for 11% and 4% of the variance, respectively (Green, Rohling,
Lees-Haley, & Allen, 2001). In a meta-analysis of 20 years of data on head injury and
compensation, Binder and Rohling (1996) showed that the weighted effect size of financial
compensation was 0.47, whereas the weighted effect size of mild TBI on test performance was
only .12 (or approximately 2 IQ points).

Unfortunately, litigants also report more persisting symptoms and poorer functional outcome
(e.g., RTW) compared to non-litigating mild closed head injury patients (Paniak et al., 2002). In
this context, it is perhaps unsurprising that we found a significant relationship between the RTW
status of participants, performance on measures of cognitive engagement (poor effort) and the
presence of exaggerated psychiatric symptoms on questionnaires (Table 8). Specifically, we
found that injured workers in the no-RTW group were more likely to show evidence of poor
effort and exaggerated psychiatric symptoms on these measures compared to the no-RTW group.
Financial factors are a robust predictor of vocational outcome (Reynolds et al., 2003); the TBI
literature has demonstrated that mild TBI cases that involve financial incentives show more
abnormality and disability than even patients with more severe brain injuries. Of course, the
presence of inadequate effort on testing and symptom exaggeration on questionnaires does not
necessarily imply anything about a particular patient’s specific motives. As Reynolds and
colleagues (2003) pointed out, it is possible that the involvement of individuals in
litigation/compensation-seeking cases can lead to the internalization of disability mentality by
the injured patient and in turn, lead to a need to magnify reporting of symptoms on these
measures. On the other hand, those who did not return to work showed evidence of
psychological impairment that was significantly different from the RTW group. As such, effects
of mood impairment might also account for evidence of poor effort on neuropsychological
assessments. Regardless of the motives of particular patients, however, the performance of
injured workers on measures of engagement in cognitive testing, and measures of exaggerated
psychiatric symptoms, can be used as indicators of vocational outcome in this WrTBI
population, and may even be a point of intervention. For example, the assessment team can
potentially use these indices to recommend that such individuals be targeted for specific types of
counseling, vocational rehabilitation, or other interventions in order to improve RTW outcome.
Further research on the most helpful approaches in these cases is certainly needed.

Lastly, a small proportion of individuals who returned to work reported a subsequent injury
incurred as a result of their WrTBI. The TBI literature indicates that those with a history of TBI
are more at risk for future injuries and the results of this study may be in keeping with this finding. For example, in our sample, those who returned to work and experienced a subsequent injury said that they did so as a result of TBI-related symptoms such as dizziness and headaches. Additionally, physical impairment following TBI may have caused old injuries to flare up. Further research in a larger sample of injured workers with mild to moderate WrTBI is necessary to investigate rates of re-injury post-TBI with a view towards intervention.

6.3 Activity Limitation and Participation

The literature has demonstrated that an individual’s perceived severity of post-injury problems obtained from self-report measures is associated with employment outcomes (Drake et al., 2000; Ruffolo et al., 1999; Wenden et al., 1998). For example, in a univariate analysis, Malec, Buffington, Moessner, and Degiorgio (2000) found that individuals’ self-reported level of physical, cognitive, social and emotional difficulties were associated with the duration of time it took the individual to attain a vocational placement. That is to say, TBI survivors who reported higher levels of impairment on self-report measures of perceived health and functional status were more likely to take a longer time to attain post-injury employment compared to individuals reporting lower levels of impairment. Similarly, in the present study, the results of the MOS SF-36 health survey (Table 9) obtained at time of follow-up revealed that the entire sample reported experiencing a poor quality of life compared to the US general population (age 45-54) (Ware et al., 2000). In our sample, despite RTW status, WrTBI survivors self-reported feeling extreme and frequent nervousness and depression. They also reported feeling tired and worn-out and reported experiencing physical and emotional limitations in their daily lives when compared with the same age group in the US general population (45-54) (Table 9) (Ware et al., 2000; Ware & Kosinski, 2001). Furthermore, there was a significant difference between the self-reported deficits of injured workers in the RTW and no-RTW group. Specifically, the mean scores of injured workers who were unable to return to work were significantly lower on the general health, vitality, social function and mental health subscales of this health survey compared to those who had returned to work.

These self-reported impairments, collected at time of follow-up, were similarly reported at initial assessment. For example, injured workers who did not return to work reported experiencing an array of physical, cognitive and psychological impairments during their initial assessment at TRI.
At approximately 1 year post-assessment, these same individuals rated their personal health as poor, and reported believing that they would get worse (as measured by the general health subscale of the MOS SF-36 Health Survey) (Ware & Kosinski, 2001). These individuals also reported feeling tired and worn out, and not participating in social activities due to emotional and physical problems. Compared to the RTW group, these individuals also reported more feelings of nervousness and depression, as well as problems with work and other activities as a result of emotional problems. Furthermore, this group told us that they experienced more severe and limiting pain, which contributed to limitations in physical and social activities and hindered self-care compared to those who were successful in returning to work. Taken together, these results indicate that injured workers in our sample who were unable to return to work reported experiencing a poor quality of life. This finding is consistent with the results of health surveys in the TBI literature showing that TBI survivors self-reported experiencing a reduced quality of life post-injury as measured by MOS SF-36 health survey (Ocampo, Colantonio, & Dawson, 1997).

To investigate the effects of psychosocial well-being on RTW, Li-Tsang, Chan, Lam, Lo-Hui, & Chan (2007) and colleagues administered the SF-36 to a group of injured workers in Hong Kong who were on long term sick leave. The results of this study revealed that there was a strong relationship between successful RTW and an injured worker’s perceived readiness to return to work as measured by their self-reported physical function, bodily pain and perception of general health. That is, injured workers were more likely to return to work if they perceived themselves to be physically and mentally healthy and prepared for RTW. These findings are consistent with the results of the present study, in which those with a better perception of their general health and functioning were more likely to return to work. As such, self-reported health surveys are a valuable indicator of RTW and can be incorporated in vocational rehabilitation settings to assess a person’s perceived readiness to return to employment. This suggests that a worker’s post-TBI awareness of their own mental and physical function could be targeted in rehabilitation interventions to teach injured workers how to monitor their readiness for employment. However, it should be noted that individuals may often underestimate or overestimate their post-injury difficulties due to various factors such as their level of insight and emotional distress (Ownsworth & McKenna, 2004). Overall, there is a need for additional research to elucidate the relationship between employment outcomes and the level of self-reported symptoms and quality of life.
6.4 Strengths and Limitations

This pilot study was the first of its kind to investigate the RTW outcomes, and factors associated with these outcomes, in a sample of Ontario workers who sustained a mild to moderate WrTBI. These workers were referred by the WSIB to TRI for a neurology assessment as a result of reporting symptom persistence following a TBI. The data collected during the assessment provided a wealth of information about the functional outcomes of workers who report symptom persistence after sustaining a WrTBI. In this study, we investigated an array of health-related factors and functional indices of RTW. History of physical and mental health, injury severity and mechanism, physical and neuropsychological functional status of injured workers, and many more factors were investigated both at time of assessment at TRI and at follow-up. These factors were used to build a profile of injured workers who report symptom persistence, with a view towards intervention. In summary, those who returned to work post-TBI had higher education and perceived their general health, social and mental well-being to be better than their no-RTW counterparts. Those who did not RTW differed significantly from the RTW group in their general mood, which indicates a causal arrow for this factor. Based on the findings of this pilot, it is imperative to investigate the effects of enhanced mood and RTW. Specifically, it is unclear whether mood facilitated RTW or whether RTW had a therapeutic impact on the mood of injured workers who successfully returned to full or part-time employment. If the latter case is true, the WSIB would benefit from a better understanding of the mood enhancing effects of RTW to promote early RTW programs for their injured workers.

Environmental factors pertaining to workplace safety and more complex factors such as the relationship between modified hours, employer-employee relationships, communication, litigation, and RTW outcomes were also explored. Those who were successful in returning to work were offered modified hours and gradual RTW plans. Furthermore, environmental factors collected also provide a wealth of information to the stakeholders involved and can serve as a guideline to help inform and ease the RTW process.

As per our stated objectives, this study also served as a successful feasibility study for a larger scale study of the same population of WSIB referrals to TRI Neurology Services. We showed that the Return to Work Survey ascertained relevant information with regard to injured workers’ perceived barriers and facilitators of RTW, and the abstraction tools were successfully utilized to
obtain the necessary information to build a profile of injured workers. Thus, the study methodology and instruments were validated for use in a similar WrTBI population.

That said, the study was not without its limitations. First, the survey mail out method was less than ideal for obtaining a high response rate, evident by the small sample size of the study. However, this small sample size may be reflective of the vulnerability of the study population. Many injured workers in our population were likely claimants in worker’s compensation cases, which may have influenced their decision to participate in a study such as this. For example, one of the deciding factors that contributes to success or failure of the worker’s compensation claim (through WSIB) is the TRI Neurology Services assessment results and recommendations. As such, individuals might be deterred from participating in our study by a desire to avoid re-experiencing the process of having to convince clinicians, WSIB staff, and other professionals about the severity and legitimacy of their impairments. The compensation process can be a difficult and cumbersome process, especially for symptomatic survivors of TBI. On top of having to cope with the sequelae of TBI, injured workers have to adjust their lifestyle to deal with possible work-related issues that may arise as a result of their injury. For example, an injured worker might not be offered any compensation or time off post-injury and might be expected to return to work immediately following their TBI, or risk losing their job. Given our low response rate, follow-up studies of this vulnerable population should consider other methods such as a telephone interview. In fact, during a phone contact, the research staff can explain the purpose of the study and provide reasons for the necessity of RTW follow-up research in this population, perhaps making the respondents more amenable to participating. Using a telephone interview, however, as an alternative means for data collection may be coercive and/ or elicit demand characteristics. That is, subjects may be more willing to acknowledge limitations on rating scale in a survey rather than admit limitations in direct conversations, depending on how secure they feel about the potential ramifications of their status and/ or opinions. As such, other methods of enhancing patient recruitment through surveys might be multiple mail-outs and reminders, which were not feasible in this study, given the short time-frame for data collection.

Given the low response rate, we cannot be certain about the extent of generalizability of our findings to the population of WSIB Neurology patients. Another limitation of this study is that since TRI Neurology Services changed the format and content of documentation of assessment in 1999, we cannot directly compare our findings with previous findings obtained from the same
pool of injured workers. The findings of this study are also not generalizable to other WrTBI populations such as military personnel that sustain a WrTBI, because the demand characteristics of the different military occupations that lead to head injuries is different than those in the civilian sector. In addition, our findings may not be generalizable to professional athletes who also have very different circumstances and personal characteristics than workers at large.

The small sample size of this study caused two (related) problems: 1) The study had low power; therefore, 2) not all statistical tests could be used due to low counts. We also did not conduct i.e., Bonferroni analyses to control for multiple comparisons in this pilot study.

Another limitation of this study was the order of questions on the return to work questionnaire. Specifically, the first part of the questionnaire targeted post-assessment RTW status, modified work-accommodations, employee information and factors that facilitated RTW, from the RTW group only. In order to do in-depth analysis and compare the RTW and no-RTW groups following WrTBI, the questionnaire must be reorganized to ascertain barriers and facilitators of RTW from both these groups. The RTW portion of the questionnaire should also include questions about the quality of RTW. Also, the RTW barriers on the return to work questionnaire should be revised to contain the same items that probe the injury-related persisting symptoms on the medical record abstraction tool. This will enable the investigators to collect consistent data on both instruments, which will simplify the data analysis phase (between-group comparisons) and reporting of results.

Additionally, the Return to Work Survey only collected information about perceived facilitators and barriers of RTW. Even though this information was helpful, the survey did not collect any additional information about the different interventions in which the injured workers actually participated. For example, participants perceived that physiotherapy facilitated their RTW. However, detailed information about duration of participation in this therapy was not collected. As such, the larger scale study should collect more complete data about interventions that were used by the injured workers and compare this with the perceived facilitators and services of RTW.
Also, the household income of the injured worker was not ascertained. This variable could be utilized to assess whether income plays a role in RTW outcome. This would allow a comparison of the socioeconomic status of injured workers who return to work with those who did not.

Furthermore, the MOS SF-36 question that targets the perceived vitality and mental health of participants has nine sub-questions and six response choices for each question in the generic form. The six response choices are: a) All the time, b) Most of the time, c) A good bit of the time, d) Some of the time, e) A little bit of the time and f) None of the time. However, in this study, option c) A good bit of the time was accidentally excluded as a response choice. We attempted to correct for this oversight by collapsing category c) and d) in the data analysis phase.

Furthermore, the medical record abstraction tool was validated to obtain health and injury-related data on this population, based on the medical charts of the WSIB referrals in 1999-2001. As such, this tool was outdated and contained information that was no longer available in the more recent patient charts. Thus, we had difficulty in the information extraction phase because numerous reports had to be reviewed in order to ascertain the necessary data. For future studies, this abstraction tool should be revised to be more in keeping with current charting practices, and also to obtain more detailed injury-related factors, such as GCS. In the present study, we were unable to compare injury predictors of RTW data such as GCS at time of injury to RTW status, because a small proportion of the patient files did not have exact or accurate representations of these indices.

Additionally, another limitation of this study was the creation of composite scores from the neuropsychological assessment results. These composite scores were created because the TRI Neurology Services assessment team caters each assessment to the needs of each injured worker. For example, each patient undergoes a different set of neuropsychological tests as part of their assessment at the discretion of the team’s neuropsychologists (Appendix J). As such, the data collected from the neuropsychological assessment files contained different information about the cognitive and psychological well-being as well as engagement scores (symptom exaggeration) of each patient and some files had missing information about these subcategories (e.g., executive function, mood, information processing speed). These subcategories were created by Dr. Carter, one of the co-investigators, for ease of data analysis and interpretation of results. For data analysis purposes the neuropsychology assessment variables were categorized into 3 general
groups: Cognitive Impairment, Mood Impairment and Exaggeration on cognitive and psychological testing (Table 8). Composite scores were calculated based on standardization of the impaired/non-impaired categories and chi-square tests of significance were conducted to ascertain whether between-group differences existed. However, each category had a different number of subjects and included different neuropsychological tests for each subject. Therefore, the cognitive impairment and mood differences, as well as the findings about the group differences on measures of cognitive and mood exaggeration are based on these composite scores. One of the disadvantages of using composite scores in the data analysis is that subtle differences in the clinical profiles of injured workers may be lost.

Lastly, this study’s sample was not representative of non-English speaking injured workers in Ontario with persistent symptoms, because, for a number of reasons, those who required an interpreter at the time of assessment (as indicated by their medical record) were excluded from the study. In order to include non-English speakers in our sample, we would have had to translate the Return to Work Survey into all the different languages spoken by injured workers who completed assessments between the years of 2007 and 2009; and, we would have had to pilot test each translated version to validate the survey before mailing it out to potential participants. Alternatively, we could have included non-English speakers by conducting the survey over the phone, using interpreters. However, these approaches were not within the scope of this pilot, for time, budgetary, and practical reasons. Ideally, the investigators of the large scale study can correct for this sampling bias by keeping track of the number of eligible participants who require interpreters and estimating the cost of hiring interpreters to conduct a phone interview with these individuals.
Chapter 7

7 Conclusion

7.1 Implication of Results and Relevance to Rehabilitation

RTW following TBI plays an integral role in the social, psychological and economic well-being of an injured worker. We have identified a number of injury-related, personal and environmental factors that might facilitate or hinder an individual’s vocational outcomes following mild to moderate WrTBI in our sample of injured workers who reported persisting injury-related symptoms. The results of this study suggest that the profile of individuals with mild to moderate WrTBI are similar to non-WrTBI populations on RTW indices such as injury severity (GCS, PTA, LOC), personal and environmental factors. Similar to patients with non-work-related TBIs, those WrTBI patients in our sample who were unable to return to full or part time employment were more likely to report psychiatric impairments such as mood disturbances, anxiety disorders and PTSD. Furthermore, these individuals perceived their general health and quality of life to be poor. These factors also appeared to act as barriers of RTW. As such, the most successful vocational rehabilitation programs for WrTBI might be those that specifically target emotional dysfunction, as well as awareness and acceptance of post-injury changes to enhance RTW outcomes. Furthermore, identification of injured workers at risk of failure to return to work should be a priority for assessing clinicians as well as insurance bodies, in order to ensure that injured workers can access the necessary resources (e.g., work accommodations) that will enhance RTW outcomes. For example, these individuals might benefit from participating in vocational rehabilitation programs, psychological counseling and supported-employment programs.

We also identified many factors that appeared to be facilitators of RTW. For example, those who had returned to full or part time employment were more likely to report having been assisted by rehabilitation services and therapies (e.g., physiotherapy, exercise therapy) and more likely to report that they were offered work accommodations at their workplace. Furthermore, although they still reported difficulties, those individuals who RTW reported less impairment on measures of psychological well-being and reported experiencing good general health, social function, mental health and physical function. As such, more attention should be paid to RTW as part of vocational rehabilitation programs, in order to increase the number of people who return to work,
and increase the sustainability of RTW. Future research is necessary to elucidate the relationship between these factors and RTW in a similar population to validate the present study’s findings. Once this study has been replicated in a large WrTBI population, the results can then be used to compare this population to the general TBI population, as well as military-related TBI populations.

7.2 Future Directions

The end goal of this program of research is to generate predictive models of RTW following a WrTBI. This predictive model will in turn enable injured workers and other affected stakeholders, such as health care providers and rehabilitation clinicians, employers, and insurance agencies to choose the most optimal return to work plan that will be customized to each individual’s needs.

This intervention plan may include communication between the patient, health care providers and insurance agents about the most cost effective and efficient rehabilitation strategies, as well as modified duties offered by the employer to the injured worker to gradually return them to work. One strategy that may prove useful is patient education. Comper, Bisschop, Carnide, and Tricco (2005) showed that supportive patient-centered care and reassurance along with provision of symptom-related information is conducive to recovery from mild TBI, across most symptom domains. Additionally, the WHO Collaborating Task Force on mild TBI examined the totality of evidence for economic cost for mild TBI patients by conducting a systematic review of the literature and a best evidence synthesis (Carroll et al., 2004). The task force declared that early educational information can reduce long-term complaints and that this early intervention need not be intensive. Furthermore, McCrea summarized the findings of multiple studies about interventional models for PCS by stating that supportive psychological and educational interventions can effectively reduce the incidence of PCS, which in turn enhances functional outcome and alleviates the burden of disability associated with mild TBI (McCrea, 2008). Moreover, evidence has suggested that these interventions are most effective when introduced early during the acute or subacute recovery phase after mild TBI and they need not be intensive or costly to be effective. Thus, it is conceivable that client-centered interventions focused on patient reassurance and psychological education may have some value in promoting recovery from TBI and successful RTW.
Participatory research studies about the needs and experiences of injured workers in Ontario have also proved valuable in developing strategies for change. Kirsh and McKee (2003) worked in partnership with injured worker peer researchers to develop and administer a survey to injured workers about their perceived experiences in the RTW process. Their findings suggest that injured workers experience hardships due to perceived lack of respect, insufficient information concerning rights and the RTW process, and limited opportunities for input into the medical or rehabilitation process. Based on their findings, these researchers recommended that injured workers should be included in their RTW process and rehabilitation plans, and workers’ knowledge about their rights and access to information must be improved. Furthermore, the legitimacy of injured workers’ claims and issues must be fully recognized and there should be increased sensitivity and accountability on the part of the compensation system. Lastly, physical injuries and diseases affect one’s state of mind, which in turn affect one’s susceptibility and recovery from physiological disorders. As such, these researchers recommend that a more holistic approach to treatment and rehabilitation must be taken.

This study provides preliminary data suggesting targets for intervention for workers experiencing a WrTBI in order to facilitate improved outcomes, including return to work. Targets include improved rehabilitation and management of post-TBI symptoms, psychoeducation regarding TBI, work accommodations, as well as interventions aimed at improving communication with employers and third-party payers. Further research is necessary to elucidate the factors that facilitate and hinder RTW in a large national sample of WrTBI survivors who report symptom persistence.


*Archives of Physical Medicine & Rehabilitation, 81*(8), 1007-1015.


Appendices

Appendix A: Contact Sheet

Eligible □ Not Eligible □ MRN___

Date of Abstraction: ______/ ______/________
Day Month Year

Name of Abstractor: _______________________________________________________

**Contact Information:**

Name of individual with Brain Injury:

<table>
<thead>
<tr>
<th>Last Name</th>
<th>First Name</th>
<th>Middle Initial</th>
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</table>

Address: ________________________________________________________________

City: ________________________________ Province: __________________________

Postal Code: _________________________________

**Injury Information:**

Date of Injury: ______/ ______/________
Day Month Year

Date of Discharge: ______/ ______/________
Day Month Year

Was the injury a Traumatic Brain Injury (TBI)? □ Yes □ No

What type of TBI? □ Mild TBI □ Moderate TBI □ Severe TBI
Appendix B: Contact Letter

Date
Dear First Last,
I am the medical director of the Neuro Rehab Program at Toronto Rehabilitation Institute, where you had received care in the past. I am writing to tell you about a research study called, “Mild to Moderate Work-related Traumatic Brain Injury: A Pilot Study” being conducted at the Toronto Rehabilitation Institute led by Dr. Angela Colantonio.

The purpose of the research study, which is a Master’s Thesis project for a student at the University of Toronto, is to learn about the consequences of having a brain injury at work. To our knowledge, this is the first study to provide information about the consequences of having a brain injury at the workplace and the factors that affect return to work. We want to see which workers are able to return to work and which workers are not. We also want to learn about the factors which affect return to work and to see if there is an incidence of re-injury. The study will consist of a review of your medical chart and completing a few questionnaires (Return to Work Questionnaire and Short-Form 36 Health Survey and Safety Climate Scale), which ask a series of questions concerning your brain injury and how your rehabilitation and recovery led to your return to work or not.

Should you decide to participate in this study, you will have to complete and sign the attached consent form and fill out the Return to Work Questionnaire included in the package. Once you have completed the consent form and Questionnaire, please return the documents in the envelope provided.

If you are interested in participating or would like more information about the study, you can contact: Dr. Angela Colantonio (the principal investigator) at 416-597-3422 x 7607.

At Toronto Rehab, we strive to maintain your privacy while conducting research. If you have any concern about being contacted for this research project, or would prefer not to be contacted again about research projects, please call Tara Anderson at 416-597-3422 x 7840.

Your involvement in this project is completely voluntary. We will mail out a $10 Tim Horton’s gift certificate to you, if you do decide to participate; however, it is up to you to decide if you would like to participate. Your decision will not affect your current or future care at Toronto Rehab. If you have received this letter in error, please accept our apologies and let us know.

Sincerely,

Dr. Mark Bayley
Medical Director of Neurology Services
Appendix C: Information Sheet/Consent Form

**Investigators:** Dr. Angela Colantonio, Dr. Bonnie Kirsh, Dr. John Lewko, Dr. Mark Bayley, Ms. Deborah Hebert, Dr. David Cassidy, Dr. Vicki Kristman, Dr. Angela Carter, Ms. Kitty Wong, Dr. Oshin Vartanian, and Sara Salehi (M.Sc. Candidate)

You are invited to take part in a research study. Before you agree to be in this study, you should read all the information describing the study on this form. It tells you the purpose of the study and that your participation is voluntary. It also describes the risks and benefits to you and your right to end your participation at any time. Also, it explains that your medical services will not be affected in any way if you choose not to take part in this research study. You may or may not choose to participate. Make sure that all of your questions have been answered before you agree to take part.

**Title of Research Project:** Mild to Moderate Work-Related Traumatic Brain Injury: A Pilot Study

**Background:** There is currently no long-term follow-up data on the outcome of workers who have had a brain injury at work. This study will provide new information in this area. We want to determine which workers who had a brain injury at work are able to return to work, and what factors affected their success, or their inability to return to work. Despite the fact that many people have brain injuries at work, these workers have never been studied.

**Study purpose:** This study is the Master’s thesis of a student at the University of Toronto (Sara Salehi), who is working under the supervision of Dr. Angela Colantonio, the primary investigator. The purpose of this study is to learn about how many workers with work-related brain injury are able to return to work, how many are not and how their injuries and experiences affected this outcome. We also want to learn about the long-term consequences of having a brain injury at work. We want to use this information to help brain injured workers get the necessary assessments, treatment and support from both their rehabilitation professionals and their employers so they can return to work. This could help us to develop better rehabilitation and job re-entry programs, and to help prevent further brain injuries at the workplace.

**Procedures:** The study will look at whether or not workers have returned to some form of employment, what type and in what capacity. We will look at any changes in employment status post-injury, and all the factors that may affect this. If you give consent, the research staff (Dr. Angela Colantonio and Sara Salehi) along with a clinician from the Neurology Services at Toronto Rehab will review your medical charts to abstract your medical history (i.e. Physical Health and Mental Health), diagnosis (i.e. whether you had any physical injuries and/or brain injury) and post-injury information such as your neuropsychology and occupational therapy reports. In the package that was mailed to you, we have also included a Return To Work Questionnaire, Short Form Health Survey (SF-36) and a Safety Climate Scale, where you will be asked some questions to help us learn more about your recovery and what has happened to you since your discharge from Toronto Rehab. All of the information will be confidential and you will not be identified in any way. If you decide to participate, please use the provided return
envelope to mail us the signed consent form, along with the completed Return to Work Questionnaire, Short Form Health Survey (SF-36), and the Safety Climate Scale.

Possible risks and benefits: There are no risks associated with participating in this study. We anticipate that those who choose to participate may learn more about their recovery and the factors that either help or impede their return to work. Please note that this information package contains a list of resources and support groups, should you need to contact someone. Also, if you choose to give consent, your medical chart will be reviewed and information will be collected about history of substance abuse and mental health/illness.

Costs and payments: There is no cost for you to take part in this study. Participants who choose to return their signed consent form and the completed Return to Work Questionnaire, Short Form Health Survey (SF-36), and the Safety Climate Scale in the return envelope provided, will also receive a $10 Tim Horton’s gift certificate as a token of appreciation for participating.

Confidentiality: Any personal information connecting you to this study will be kept private. Your name, address and phone number will be kept in the research office in locked files. No personal information will be on the data collection forms. Be advised that all research staff will sign a privacy agreement. None of your personal information will be used or shared with any organizations, including the WSIB, when we discuss or publish this research. By agreeing to take part in this study, you are also agreeing to let us, the researchers and two clinicians, read your hospital charts at Toronto Rehabilitation Institute in order to learn more about your injury. The researchers are Dr. Angela Colantonio, the primary investigator, who is also an Occupational Therapist; Sara Salehi, a second-year Master’s student; and Dr. Angela Carter, a clinician from the assessment team of Neurology Services at Toronto Rehab. By signing this form, you also agree to the publication of this research for scientific uses.

Right to withdraw: Your participation in this study is voluntary and you may choose not to participate. Your medical services will not be affected in any way if you do not participate in this research study. You have the right to remove your consent at any time; simply call Tara Anderson at 416-597-3422 x 7840. There will be no negative outcomes if you choose to withdraw from this study. Should you choose to withdraw from the study at any point, all of the data collected (i.e. medical history, Return to Work Survey) will be discarded in a secure manner and the information will not be used for data analysis or publication.

For more information: If you have any questions about this study, or if you want a copy of the final report, please call: Dr. Angela Colantonio at 416-597-3422 x7607.

If you have any questions about your rights as a research participant, please call: Dr. Paul Oh, Chair of the Toronto Rehab Research Ethics Board: 416-597-3422 ext 3081.

Voluntary consent:
I agree that I have read the information in this form or it has been read to me and that I understand it completely. All of my questions about this study have been answered. I will be given a copy of this signed form. My signature below means that I have agreed to take part in
this study. I also give permission to the researchers to access my hospital charts to gather information for this study. I consent to take part in this study.

Date: _______________________________________________________

Participant Name (in print): ______________________________________

Participant’s Signature:  ________________________________________

INVESTIGATOR’S GUARANTEE:
I have explained to the person above why we are carrying out this research and all consequences that could result from taking part in this study. I have answered all questions asked by the person above about the study.

_________________________
Date

_________________________  ______________________
Investigator/Research Staff’s Name  Investigator/Research Staff’s Signature
Appendix D: Return to Work Survey

RETURN TO WORK QUESTIONNAIRE

Today’s Date: _____/ _____/ _____
   Day       Month       Year

Name: ______________________
      Please Print Clearly
Are you currently working? (Check one option

☐ 0 No If No, please skip to Section 3: “No Return to Work” (pg. 8).

☐ 1 Yes If Yes, please answer the questions below.

Section 1: RETURN TO WORK

1: Have you returned to work in any capacity since your discharge from the Toronto Rehabilitation Institute (TRI) Neurology Service? (Check one option

☐ 1 Yes

☐ 0 No If Yes: Number of hours per week

1a: What is the total amount of time you have been working since your discharge from the Toronto Rehabilitation Institute (TRI)? Please express in days, months, or years.

#: _______________ Circle (days/months/years)

2: Currently, are you working full-time or part-time? (Check one option

☐ 1 Full-time

☐ 2 Part-time

Number of hours per week

2a: Currently, are you working with the same employer as before your brain injury?

☐ 1 Yes

☐ 0 No

2b: Currently, are you working the same job as before your brain injury?

☐ 1 Yes

☐ 0 No

3: What was your pre-injury job title/description?

___________________________________________________________________________

___________________________________________________________________________

4: What is your current job title/description?

___________________________________________________________________________

5: When you first returned to work after your brain injury, was it full-time or part-time? (Check one option

☐ 1 Full-time

☐ 2 Part-time

5a: When you first returned to work, did you return to the same employer?

☐ 1 Yes

☐ 0 No If Yes: Same Employer

If No: Different Employer

6: Did you return to the same job title/description?

☐ 1 Yes

☐ 0 No

6a: Were your job duties modified to accommodate your return to work?

☐ 1 Yes

☐ 0 No

7: When you first returned to work with a different employer, was it full-time or part-time?

☐ 1 Full-time

☐ 2 Part-time

7a: Did you return to the same job title/description?

☐ 1 Yes

☐ 0 No

7b: Were your job duties modified to accommodate your return to work?

☐ 1 Yes

☐ 0 No
8: What are the factors that helped you return to work? (Check ALL that apply)

<table>
<thead>
<tr>
<th>Return to Work Factors</th>
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<tbody>
<tr>
<td>1 Good recovery from injury</td>
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<tr>
<td>2 Partial recovery from injury</td>
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</tr>
<tr>
<td>3 Job modifications</td>
<td></td>
</tr>
<tr>
<td>If Yes, specify_________________________</td>
<td></td>
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<tr>
<td>________________________________</td>
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<tr>
<td>4 Early/considerate contact from employer</td>
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<tr>
<td>5 Workplace commitment to health and safety</td>
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<tr>
<td>6 Support of co-workers</td>
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<tr>
<td>7 Support of TRI Neurology team</td>
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<tr>
<td>8 Access to return to work planners/ or return to work Coordination</td>
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<tr>
<td>9 Communication between health care providers and your employer with consent</td>
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<tr>
<td>10 Supervisor who is trained in return to work planning</td>
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<tr>
<td>11 On-the-job training</td>
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<tr>
<td>12 Counselling and guidance</td>
<td></td>
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<tr>
<td>13 Job placement services</td>
<td></td>
</tr>
<tr>
<td>14 Other factors</td>
<td></td>
</tr>
<tr>
<td>Specify :_________________________</td>
<td></td>
</tr>
<tr>
<td>________________________________</td>
<td></td>
</tr>
<tr>
<td>________________________________</td>
<td></td>
</tr>
</tbody>
</table>

9: Which of the following therapies or services have you participated in, or are currently participating in to help you recover? (Check ALL that apply)

<table>
<thead>
<tr>
<th>Therapies or Services</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Physiotherapy</td>
<td></td>
</tr>
<tr>
<td>2 Occupational therapy</td>
<td></td>
</tr>
<tr>
<td>3 Speech language therapy</td>
<td></td>
</tr>
<tr>
<td>4 Counselling for emotional adjustment</td>
<td></td>
</tr>
<tr>
<td>5 Vocational counsellor</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Weight management</td>
</tr>
<tr>
<td>---</td>
<td>------------------</td>
</tr>
<tr>
<td>7</td>
<td>Pain management</td>
</tr>
<tr>
<td>8</td>
<td>Assessment and treatment of sleep</td>
</tr>
<tr>
<td>9</td>
<td>Work hardening</td>
</tr>
<tr>
<td>10</td>
<td>Exercise therapy</td>
</tr>
<tr>
<td>11</td>
<td>Chiropractics</td>
</tr>
<tr>
<td>12</td>
<td>Cognitive skills training</td>
</tr>
<tr>
<td>13</td>
<td>Assistive technology and training in its use</td>
</tr>
<tr>
<td>14</td>
<td>Other factors</td>
</tr>
</tbody>
</table>

**Specify:** ____________________________________________________________

____________________________

____________________________

10: Please tell us about any other factors which you feel helped you to return to work:
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________

11: Please tell us about any barriers you experienced in returning to work:
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________

12: Are you more aware or conscious of safety issues in the workplace since your injury? (Check one option)

☐ Yes  ☐ No

*If Yes, Please explain:*
___________________________________________________________________________
___________________________________________________________________________

13: Is there anything that could have been added to or improved in your return to work program from either your employer or the Neurology team that would have helped make your return to work easier? (Check one option)

☐ Yes  ☐ No

*If Yes, Please explain:*
___________________________________________________________________________
___________________________________________________________________________
Please complete sections 4, 5 & 6.

Section 2: SUBSEQUENT INJURIES

(Check one option □)

☐ Yes  ☐ No

If Yes, how many? __________
If No, please complete Section 4, 5 & 6 (pg. 10)

14a: Please describe the subsequent injury or injuries?

___________________________________________________________________________
___________________________________________________________________________

14b: For all subsequent injuries, please explain what happened to cause the injury or injuries?

___________________________________________________________________________
___________________________________________________________________________

14c: Please describe any barriers that affected your ability to return to work after sustaining a subsequent injury.

___________________________________________________________________________
___________________________________________________________________________

14d: What factor(s) do you think caused or contributed to the first subsequent injury?

___________________________________________________________________________
___________________________________________________________________________

14e: What factor(s) do you think caused or contributed to all other subsequent injuries?

___________________________________________________________________________
___________________________________________________________________________

Section 3: NO RETURN TO WORK

For individuals who are currently not working, please answer the following questions:

15: If you are not working, please indicate the reason? (Check one option □)

☐ 1. Retired
☐ 2. Returned to school
3 Volunteering
4 Homemaker
5 Other - specify ________________________________
6 Sick leave/long-term disability

16: If you have **not been able to return to work due to sick leave/long term disability**, please tell us why? (Check ALL that apply)

<table>
<thead>
<tr>
<th>Reasons For No Return to Work</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Physical impairment</td>
<td></td>
</tr>
<tr>
<td>2 Difficulty thinking and concentrating</td>
<td></td>
</tr>
<tr>
<td>3 Pain</td>
<td></td>
</tr>
<tr>
<td>4 Weakness</td>
<td></td>
</tr>
<tr>
<td>5 Sleep disturbance</td>
<td></td>
</tr>
<tr>
<td>6 Fatigue</td>
<td></td>
</tr>
<tr>
<td>7 Headaches</td>
<td></td>
</tr>
<tr>
<td>8 Weight gain</td>
<td></td>
</tr>
<tr>
<td>9 Emotional/psychological issues</td>
<td></td>
</tr>
<tr>
<td>10 Reduced tolerance and endurance</td>
<td></td>
</tr>
<tr>
<td>11 Communication difficulties</td>
<td></td>
</tr>
<tr>
<td>12 Unsupportive employer</td>
<td></td>
</tr>
<tr>
<td>13 Unsupportive co-workers</td>
<td></td>
</tr>
<tr>
<td>14 Transportation</td>
<td></td>
</tr>
<tr>
<td>15 Job has changed or no longer exists</td>
<td></td>
</tr>
<tr>
<td>16 Job is too physically demanding</td>
<td></td>
</tr>
<tr>
<td>17 Other factors</td>
<td></td>
</tr>
<tr>
<td>Specify: __________________________</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

17: Please provide **details** and comments for all those that you checked:

___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________

18: What could have been done or done differently by you, your employer at the time of the injury, and the Neurology team that might have **helped** you return to work?

___________________________________________________________________________
___________________________________________________________________________
This survey asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities.

1. In general, would you say your health is: (Check one option)
   - [ ] Excellent
   - [ ] Very Good
   - [ ] Good
   - [ ] Fair
   - [ ] Poor

2. Compared to the past four weeks, how would you rate your health in general now?
   - [ ] Much better now than one year ago
   - [ ] Somewhat better now than one year ago
   - [ ] About the same
   - [ ] Somewhat worse now than one year ago
   - [ ] Much worse than one year ago

3. The following items are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much? (Check one option)
   a) Vigorous activities, such as running, lifting heavy objects, participating in strenuous sports.
      - [ ] Yes, Limited a lot
      - [ ] Yes, Limited a Little
      - [ ] No, Not Limited at all
   b) Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf
      - [ ] Yes, Limited a lot
      - [ ] Yes, Limited a Little
      - [ ] No, Not Limited at all
   c) Lifting or carrying groceries
      - [ ] Yes, Limited a lot
      - [ ] Yes, Limited a Little
      - [ ] No, Not Limited at all
   d) Climbing several flights of stairs
      - [ ] Yes, Limited a lot
      - [ ] Yes, Limited a Little

Please complete sections 4, 5 & 6.

Section 4: Short Form-36 Health Survey

For All Respondents



☐ 3 No, Not Limited at all

e) Climbing one flight of stairs
☐ 1 Yes, Limited a lot
☐ 2 Yes, Limited a Little
☐ 3 No, Not Limited at all

f) Bending, kneeling, or stooping
☐ 1 Yes, Limited a lot
☐ 2 Yes, Limited a Little
☐ 3 No, Not Limited at all

g) Walking more than a mile
☐ 1 Yes, Limited a lot
☐ 2 Yes, Limited a Little
☐ 3 No, Not Limited at all

h) Walking several blocks
☐ 1 Yes, Limited a lot
☐ 2 Yes, Limited a Little
☐ 3 No, Not Limited at all

i) Walking one block
☐ 1 Yes, Limited a lot
☐ 2 Yes, Limited a Little
☐ 3 No, Not Limited at all

j) Bathing or dressing yourself
☐ 1 Yes, Limited a lot
☐ 2 Yes, Limited a Little
☐ 3 No, Not Limited at all

4. During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of your physical health? (Check one option)

a) Cut down the amount of time you spent on work or other activities
☐ 1 Yes ☐ 0 No

b) Accomplished less than you would like
☐ 1 Yes ☐ 0 No

c) Were limited in the kind of work or other activities
☐ 1 Yes ☐ 0 No

d) Had difficulty performing the work or other activities (for example, it took extra effort)
☐ 1 Yes ☐ 0 No

5. During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)? (Check one option)
a) Cut down the amount of time you spent on work or other activities
   □ 1 Yes  □ 0 No

b) Accomplished less than you would like
   □ 1 Yes  □ 0 No

c) Didn't do work or other activities as carefully as usual
   □ 1 Yes  □ 0 No

6. During the past 4 weeks, to what extent has your emotional problems interfered with your normal social activities with family, friends, neighbors, or groups? (Check one option □)
   □ 1 Not at all  □ 2 Slightly  □ 3 Moderately  □ 4 Severe  □ 5 Very Severe

7. How much bodily pain have you had during the past 4 weeks? (Check one option □)
   □ 1 Not at all  □ 2 Slightly  □ 3 Moderately  □ 4 Severe  □ 5 Very Severe

8. During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?
   □ 1 Not at all  □ 2 Slightly  □ 3 Moderately  □ 4 Severe  □ 5 Very Severe

9. These questions are about how you feel and how things have been with you during the last 4 weeks. For each question, please give the answer that comes closest to the way you have been feeling. (Check one option □)
   a) Did you feel full of life?
      □ 1 All of the time
      □ 2 Most of the time
      □ 3 Some of the time
      □ 4 A little bit of the time
      □ 5 None of the Time

   b) Have you been a very nervous person?
      □ 1 All of the time
      □ 2 Most of the time
      □ 3 Some of the time
      □ 4 A little bit of the time
      □ 5 None of the Time

   c) Have you felt so down in the dumps that nothing could cheer you up?
      □ 1 All of the time
      □ 2 Most of the time
      □ 3 Some of the time
      □ 4 A little bit of the time
      □ 5 None of the Time

   d) Have you felt calm and peaceful?
☐ 1 All of the time
☐ 2 Most of the time
☐ 3 Some of the time
☐ 4 A little bit of the time
☐ 5 None of the Time

e) Did you have a lot of energy?
☐ 1 All of the time
☐ 2 Most of the time
☐ 3 Some of the time
☐ 4 A little bit of the time
☐ 5 None of the Time

f) Have you felt downhearted and blue?
☐ 1 All of the time
☐ 2 Most of the time
☐ 3 Some of the time
☐ 4 A little bit of the time
☐ 5 None of the Time

g) Did you feel worn out?
☐ 1 All of the time
☐ 2 Most of the time
☐ 3 Some of the time
☐ 4 A little bit of the time
☐ 5 None of the Time

h) Have you been a happy person?
☐ 1 All of the time
☐ 2 Most of the time
☐ 3 Some of the time
☐ 4 A little bit of the time
☐ 5 None of the Time

i) Did you feel tired?
☐ 1 All of the time
☐ 2 Most of the time
☐ 3 Some of the time
☐ 4 A little bit of the time
☐ 5 None of the Time

10. During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting with friends, relatives, etc.)? (Check one option)

☐ 1 All of the time
11. How TRUE or FALSE is each of the following statements for you? (Check one option)

a) I seem to get sick a little easier than other people
   - 1 Definitely true
   - 2 Mostly true
   - 3 Don't know
   - 4 Mostly false
   - 5 Definitely false

b) I am as healthy as anybody I know
   - 1 Definitely true
   - 2 Mostly true
   - 3 Don't know
   - 4 Mostly false
   - 5 Definitely false

c) I expect my health to get worse
   - 1 Definitely true
   - 2 Mostly true
   - 3 Don't know
   - 4 Mostly false
   - 5 Definitely false

d) My health is excellent
   - 1 Definitely true
   - 2 Mostly true
   - 3 Don't know
   - 4 Mostly false
   - 5 Definitely false

Please complete sections 5 & 6.
Section 5: Safety Climate Scale

Please answer the following questions, to the best of your ability, about the workplace where you were injured:

1. New employees learn quickly that they are expected to follow good health and safety practices. (Check one option )
   - [ ] 1Strongly agree   [ ] 2Agree  [ ] 3Disagree   [ ] 0Strongly disagree

2. Employees are told when they do not follow good safety practices. (Check one option )
   - [ ] 1Strongly agree   [ ] 2Agree  [ ] 3Disagree   [ ] 0Strongly disagree

3. Workers and management work together to ensure the safest possible conditions. (Check one option )
   - [ ] 1Strongly agree   [ ] 2Agree  [ ] 3Disagree   [ ] 0Strongly disagree

4. There are no major shortcuts taken when worker health and safety are at stake. (Check one option )
   - [ ] 1Strongly agree   [ ] 2Agree  [ ] 3Disagree   [ ] 0Strongly disagree

5. The health and safety of workers is a high priority with management where I work. (Check one option )
   - [ ] 1Strongly agree   [ ] 2Agree  [ ] 3Disagree   [ ] 0Strongly disagree

6. I feel free to report safety problems where I work. (Check one option )
   - [ ] 1Strongly agree   [ ] 2Agree  [ ] 3Disagree   [ ] 0Strongly disagree

Section 6: General Health Information

1: What is your current Age: ___________ Years
For the following questions, please check one option:

2: Sex: [ ] 1 Male [ ] 2 Female

3: Approximately, what is your current height? [ ] Metres  [ ] Feet/inches

4: Approximately, what is your current weight? [ ] Kilograms  [ ] pounds

5: What is your current marital status?
[ ] 1 Single  [ ] 2 Married/Living with partner  
[ ] 3 Divorced  [ ] 4 Widowed

6: What is your current highest level of education?
[ ] 1 Less than high school  
[ ] 2 Completed high school  
[ ] 3 Some University, college, vocational or technical education  
[ ] 4 Complete college, vocational or technical education  
[ ] 5 Completed university degree

You're Finished!

Thank you for taking the time to answer these questions.
Appendix E: Brain Injury Associations & Injured Worker’s Support Groups located in Ontario

Ontario Brain Injury Association (OBIA)
Toll Free Crisis Hotline: 1-800-263-5404
P.O. Box 2338
St.Catharines, Ontario
L2R 7R9
Phone (work): (905) 641-8877
Fax (work): (905) 641-0323
Email: obia@obia.on.ca
Website: www.obia.ca

Brain Injury Association of Canada
155 Queen St, Suite 808
Ottawa, Ontario K1P 6L1
Phone: 613-762-1222
Toll Free: 1-866-977-2492
Fax: 613-236-5208
E-mail: info@biac-aclc.ca
Website: www.biac-aclc.ca

Ontario Network of Injured Workers Groups
Peter Page, President
905 Main Street East
Hamilton, Ontario
L8M 1M6
Phone (work): (905) 543-9090
Fax (work): (905) 543-1775
Email: oniwg@sympatico.ca
Appendix F: Thank you Letter

Date

Dear Mr/Ms. Name,

Thank you for participating in the research study called, “Mild to Moderate Work-related Traumatic Brain Injury: A Pilot Study”.

We have received your completed Return to Work Survey and as a token of our appreciation, we would like to present you with a $10 Tim Horton’s card. There is also a copy of your signed consent form included in this letter.

If you have any questions or would like more information about the study, you can contact: Dr. Angela Colantonio (the principal investigator) at 416-597-3422 ext. 7607.

At Toronto Rehab, we strive to maintain your privacy while conducting research. If you have any concern about participating in this research project, or would prefer not to be contacted again about research projects in the future, please call Tara Anderson at 416-597-3422 ext. 7840.

Sincerely,

Dr. Angela Colantonio, Ph.D., OT Reg. (Ont).
Saunderson Family Chair in Acquired Brain Injury Research
Toronto Rehabilitation Institute
Professor, Occupational Science and Occupational Therapy,
Rehabilitation and Public Health Sciences
University of Toronto
Appendix G: Letter Requesting Participants’ Consent

Date

Dear Mr/Ms. Name,

Thank you for returning your completed Return to Work survey. It has come to our attention that we did not receive a copy of the signed consent form. Without your signed consent, we do not have permission to access your health records at the Toronto Rehabilitation Institute for this research study. We request access to these files to look at the factors that may have affected your recovery following your injury. Please be assured that your information will be kept strictly confidential.

If you wish to give us permission to access your medical records, please read the enclosed consent form and return the signed form to us using the return envelope included in this letter. However, if you do not wish to grant us permission to access your medical records, please disregard this letter. Your decision to allow us to access your medical record or not is voluntary. Your decision will have no effect on the health services you receive at the Toronto Rehabilitation Institute, now or in the future.

We apologize for any inconvenience and thank you for your time.

Sincerely,

Angela Colantonio, Ph.D., OT Reg. (Ont).
Saunderson Family Chair in Acquired Brain Injury Research
Toronto Rehabilitation Institute
Professor, Occupational Science and Occupational Therapy,
Rehabilitation and Public Health Sciences
University of Toronto
Rehabilitation Sciences Building
Centre for Function and Well-being
160-500 University Avenue,
Toronto Ontario  M5G 1V7
Office Tel: 416/978-1098
Assistant and lab tel: 416/946-8575
Fax: 416/946-8570
Email: angela.colantonio@utoronto.ca
Appendix H: Second mail out Invitation Letter

Date

Dear Mr/Ms. First Last,

This is Angela Colantonio, professor of occupational therapy and rehabilitation science at the University of Toronto and affiliated with the Toronto Rehab Institute.

A few months ago you received a survey from me in the mail inviting you to participate in a study titled: “Mild to Moderate Work-related Traumatic Brain Injury: A Pilot Study”. I asked you to return a completed survey and consent form, for which you would have received a $10 Tim Hortons gift card.

I am writing to ask you to kindly reconsider your participation in this study. If you do decide to participate, all you have to do is to sign and date the consent form, complete the attached survey and send them back to me in the stamped envelope provided. If you require assistance in filling out the survey, you may call me at 416/978-1098.

I would like to thank you for taking the time to read this letter.

Sincerely,

Angela Colantonio, Ph.D., OT Reg. (Ont).
Saunderson Family Chair in Acquired Brain Injury Research
Toronto Rehabilitation Institute
Professor, Occupational Science and Occupational Therapy,
Rehabilitation and Public Health Sciences
University of Toronto
Rehabilitation Sciences Building
Centre for Function and Well-being
160-500 University Avenue,
Toronto Ontario M5G 1V7
Office Tel: 416/978-1098
Assistant and lab tel: 416/946-8575
Fax: 416/946-8570
Email: angela.colantonio@utoronto.ca
Appendix I: Medical Record Review Abstraction Tool

TRI Neurology Service Chart Review:
A Retrospective Analysis of WSIB Referral Clinical Data

MEDICAL RECORD REVIEW
ABSTRACTION TOOL

Medical Record #: ______________
Project ID: ______________
WSIB Claim #: ______________
Date of Abstraction: ____/(dd)/____/(mm)/____/(yyyy)
[This page to be removed from tool before data entry and placed in marked box in chart storage room (TRI)]
TRI Neurology Service Chart Review:
A Retrospective Analysis of WSIB Referral Clinical Data

Abstraction Tool

This tool is organized according to where in the chart information should be abstracted. Other sections of the chart may contain similar or different information, however, for data abstraction the information should only be compiled from the specific location identified.

<table>
<thead>
<tr>
<th>ABID:</th>
<th>Abstractor ID: ____________</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABDATE:</td>
<td>Date of Abstraction:</td>
</tr>
<tr>
<td></td>
<td>_____ (dd)/ _____(mm)/ _____(yyyy)</td>
</tr>
<tr>
<td>ABST:</td>
<td>Abstraction start time (24 hour clock; use leading zeros for single digit numbers):</td>
</tr>
<tr>
<td></td>
<td>________ (hr): ________(min)</td>
</tr>
<tr>
<td>ABSP:</td>
<td>Abstraction stop time (24 hour clock; use leading zeros for single digit numbers):</td>
</tr>
<tr>
<td></td>
<td>________ (hr): ________(min)</td>
</tr>
</tbody>
</table>
**For all date variables: either qualitatively indicate information in left hand column (dd, mm, yyyy), using leading 0’s for single digit numbers, or write 99 (for dd or mm) or 9999 (for yyyy) if specific date information is not noted/available.**

**DOB:** Date of Birth: ___ ___ (dd) / ___ ___ (mm) / ___ ___ ___ ___ (yyyy)

**INDATE:** Injury Date: ___ ___ (dd) / ___ ___ (mm) / ___ ___ ___ ___ (yyyy)

**ADDAT:** Admission Date #1 (first admission):

___ ___ (dd) / ___ ___ (mm) / ___ ___ ___ ___ (yyyy)

For following 2 variables: ***Check one (0) or (1) to identify if chart notes subsequent admission dates; if there are subsequent admission dates fill in date information or check 999 if date information is not noted in chart. If there are no subsequent admission dates noted, then check option (0) for following 2 questions and proceed to next page***

**ADDAT2:** Admission Date #2:

( ) 0 No, second admission date not noted in chart
( ) 1 Yes, second admission date noted in chart
→ (ADDAT2.1) If there is a second admission date fill in or check:

___ ___ (dd) / ___ ___ (mm) / ___ ___ ___ ___ (yyyy)

**ADDAT3:** Admission Date #3:

( ) 0 No, third admission date not noted in chart
( ) 1 Yes, third admission date noted in chart
→(ADDAT3.1) If there is a second admission date fill in or check:

___ ___ (dd) / ___ ___ (mm) / ___ ___ ___ ___ (yyyy)
**DISCHARGE/ CASE CONFERENCE SUMMARY REPORT**

**DDATE:** Discharge date (first discharge):

___ ___ (dd) / ___ ___ (mm) / ___ ___ ___ (yyyy)

**MPHX:** History of medical and/or psychiatric conditions:
(Circle one option for each condition; if “other conditions” are noted please circle (1) and write qualitatively spaces 20.1-20.3; if no “other” conditions noted, circle (0) or (2) as appropriate):

<table>
<thead>
<tr>
<th>Condition</th>
<th>Stated Positive</th>
<th>Stated Negative</th>
<th>Inferred Negative</th>
<th>Missing/not noted</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Depression</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>2. Anxiety/Anxiety related disorders</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>3. Schizophrenia</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>4. Substance/alcohol abuse, addiction or dependence</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>5. Other Mental Health Issue (not 1, 2, 3 or 4): Specify:</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>(5.1) ________________________</td>
<td></td>
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<td></td>
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<tr>
<td>(5.2) ________________________</td>
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<td></td>
</tr>
<tr>
<td>(5.3) ________________________</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Epilepsy/seizures</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>7. Traumatic Head/Brain injury</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>8. Stroke/ transient ischemic attack(s)</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>9. Other neurological disorder (not 6, 7 or 8): Specify ( \rightarrow )</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>(9.1) ________________________</td>
<td></td>
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<td></td>
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<tr>
<td>(9.2) ________________________</td>
<td></td>
<td></td>
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<tr>
<td>(9.3) ________________________</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Ear/nose/throat conditions</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>11. Heart/cardiovascular conditions (include myocardial infarction, hypertension, high cholesterol, angina, congestive heart failure (CHF), coronary artery disease)</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>12. Diabetes (includes Type I and Type II)</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>13. Endocrine disorders other than diabetes (i.e. thyroid, adrenal, etc.): Specify ( \rightarrow )</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>(13.1) ________________________</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(13.2) ________________________</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(13.3) ________________________</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Cancer</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Condition</td>
<td>Stated Positive</td>
<td>Stated Negative</td>
<td>Inferred Negative</td>
<td>Missing/not noted</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>-----------------</td>
<td>-----------------</td>
<td>-------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Sleep Apnea</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Respiratory conditions</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Eye or sight conditions</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Headaches/migraines</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Arthritis (osteoarthritis, rheumatoid arthritis)</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Other (Condition does not fit into aforementioned categories)</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Specify →</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(20.1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(20.2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(20.3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Diagnoses:**

**TBID: Incident related brain injury diagnosis**

(all diagnosis in this section should relate be brain injuries that are incident related (i.e. stated as accident related) and should be able to correspond to list of ICD-9 codes in abstraction protocol)

(if 0 or only 1 TBI Dx given then insert (9) into ICD-9 code and qualitative description areas and circle (9) for code)

**TBI Dx1:**

<table>
<thead>
<tr>
<th>Qualitative Description (TBID1A):</th>
<th>ICD-9 code (TBID1B):</th>
<th>Code (TBID1C): (check one)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>( ) 1 Abstracted from chart</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( ) 2 Inferred by data abstractor based on qualitative description</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( ) 9 Does not apply (Dx1 not given)</td>
</tr>
</tbody>
</table>

**TBI Dx2:**

<table>
<thead>
<tr>
<th>Qualitative Description (TBID2A):</th>
<th>ICD-9 code (TBID2B):</th>
<th>Code (TBID2C): (circle one)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>( ) 1 Abstracted from chart</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( ) 2 Inferred by data abstractor based on qualitative description</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( ) 9 Does not apply (Dx2 not given)</td>
</tr>
</tbody>
</table>
**TBI Dx3:**

<table>
<thead>
<tr>
<th>Qualitative Description (TBID3A):</th>
<th>ICD-9 code (TBID3B):</th>
<th>Code (TBID2C) (circle one)</th>
</tr>
</thead>
</table>

( ) 1 Abstracted from chart
( ) 2 Inferred by data abstractor based on qualitative description
( ) 9 Does not apply (Dx3 not given)

---

**OINJ:** Incident related other injuries
Either qualitatively indicate diagnosis or circle (9) if no diagnosis given for each number/option.
Transcribe codes → Only transcribe the codes that are recorded in the chart.
(Includes incident related or possible incident related mental health and non-brain physical health diagnosis/injuries; → If Dx not noted (9) is chosen, (9) applies to qualitative description (OTHINJ#))

<table>
<thead>
<tr>
<th>Diagnosis (Qualitative) (OTHINJ#)</th>
<th>Dx not noted</th>
<th>ICD 9 code (if given) (#.1)</th>
<th>ICD 10 code (if given) (#.2)</th>
<th>DSM-IV code (if given) (#.3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**BRADIAG:** Brain/cerebral injury diagnosis:
Does the diagnoses list in report contain a diagnosis related to brain injury (Check one):
( ) 0 Diagnoses list does NOT include a diagnosis of brain/cerebral injury
( ) 1 Diagnoses list includes a diagnosis of brain/cerebral injury (i.e. concussion, cerebral laceration, contusion…)
( ) 9 Not noted/diagnosis list is not within document

**PHINJ:** Physical medical main injury classification
(Excludes any diagnosis of accident related mental health issues)(Check one; qualitatively specify if option (4) is chosen):
( ) 1 Injuries involving the head exclusive (includes cranial nerve injuries; excludes neck or spine injuries)
( ) 2 Multiple trauma including head trauma/brain injury (includes neck or spine injuries with head injury)
( ) 3 Multiple trauma with no noted head trauma/brain injury (includes neck or spine injuries with no head injury documented)
( ) 4 Other → Specify (PHINJ4.1): ____________________________
( ) 9 Not noted/missing

CON: Was the brain injury classified as a concussion (i.e. diagnosis of concussion; injury stated as concussion; check one option for injury classification and if yes, check one option for concussion classification) (Check one)
( ) 0 No (Stated negative)
( ) 1 Yes (Stated positive) → Specify classification of concussion (CONCLASS):
   ( ) 1 Mild
   ( ) 2 Moderate/Medium
   ( ) 3 Severe
   ( ) 9 Not noted

( ) 9 Not noted/ Inferred negative (the diagnosis of concussion is not noted within the report)

LOC: Reported Loss of consciousness (LOC) at time of injury: (Circle one option in left column and if circle 2,3,4 or 5 specify length of time; only report one of seconds, minutes, hours or days; if seconds are specified round to the nearest minute (eg. 5 minutes, 6 seconds is 5 minutes; for hours → round to the nearest hour (i.e. 7 hours 30 minutes is 8 hours); if days and hours are specified than specify only the days and round up if hours are given – 3 days and 5 hours is considered 4 days)

<table>
<thead>
<tr>
<th></th>
<th>LOC</th>
<th>LOCSPEC:</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No LOC noted (stated as negative)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>LOC noted but length of time of LOC not specified</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>LOC of less than or equal to 59 seconds (includes LOC classified as “brief”)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>LOC of greater than or equal to 1 minute but less then 60 minutes (less then one hour)</td>
<td>Specify number of minutes only:</td>
</tr>
<tr>
<td>4</td>
<td>LOC greater or equal to 60 minutes (1 hour) but less than 24 hours (less than one day)</td>
<td>Specify number of hours only:</td>
</tr>
<tr>
<td>5</td>
<td>LOC of greater or equal to 24 hours (1 day) but less than 1 week (less than 7 days)</td>
<td>Specify number of days only:</td>
</tr>
<tr>
<td>6</td>
<td>LOC of greater than or equal to 1 week</td>
<td>Specify number of weeks only:</td>
</tr>
<tr>
<td>9</td>
<td>LOC not noted/missing</td>
<td></td>
</tr>
</tbody>
</table>
**PTA:** Reported **Post-traumatic amnesia (PTA)** at time of injury:
(Circle one option in left column and if circle 2,3,4 or 5 specify length of time; only report one of seconds, minutes, hours or days; if seconds are specified round to the nearest minute (eg. 5 minutes, 6 seconds is 5 minutes; for hours round to the nearest hour (i.e. 7 hours 30 minutes is 8 hours); if days and hours are specified than specify only the days and round up if hours are given – 3 days and 5 hours is considered 4 days)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No PTA noted (stated as negative)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>PTA noted but length of time of PTA not specified</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>PTA of less than or equal to 59 seconds (includes PTA classified as “brief”)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>PTA of greater than or equal to 1 minute but less than 60 minutes (less than one hour)</td>
<td>Specify number of minutes only:</td>
</tr>
<tr>
<td>4</td>
<td>PTA greater or equal to 60 minutes (1 hour) but less than 24 hours (less than one day)</td>
<td>Specify number of hours only:</td>
</tr>
<tr>
<td>5</td>
<td>PTA of greater or equal to 24 hours (1 day) but less than 1 week (less than 7 days)</td>
<td>Specify number of days only:</td>
</tr>
<tr>
<td>6</td>
<td>PTA of greater than or equal to 1 week (7 days)</td>
<td>Specify number of days only (if given in weeks then times # if weeks by 7 to get number of days)</td>
</tr>
<tr>
<td>9</td>
<td>PTA not noted/missing</td>
<td></td>
</tr>
</tbody>
</table>
For this section refer to the standardized neuropsychology interview protocol forms if available; otherwise utilize the qualitative neuropsychology report.

**EINC:** What was/were the **event(s) of the incident** involving the person? (Circle one of either yes (applies) or no (does not apply)/not noted for each option; circle yes/no and qualitatively specify if “other” (17))

<table>
<thead>
<tr>
<th>Event</th>
<th>YES</th>
<th>NO/ not noted</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Contact with temperature extremes</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2 Contact with electrical current</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>3 Diving, boating, or water accident involving traumatic events</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>4 Flying or air accident (i.e. plane crash, parachuting accident)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>5 Caught, crushed, jammed or pinched in, under or between objects</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>6 Struck by an inanimate object (object thrown, projected or fallen)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>7 Struck by (hit, punched, kicked) by another person</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>8 Struck against inanimate object (boxes, materials, furniture, fixtures)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>9 Struck against building structures (ie. floors, walls, doors…)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>10 Struck against or bumping into another person or by another person</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>11 Exposure to Explosion</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>12 Fall from same level (includes slips, trips, and stumbles; tripping up stairs, falling off furniture or toilet; if MVA/explosion includes person being thrown (i.e. from windshield))</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>13 Fall from elevation or one level to another (includes fall down stairs/steps; fall on and from ladder; fall from scaffold; fall from or out of building or structure; plane crash if plane in air)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>14 Motor Vehicle accident (driver or passenger of vehicle) (motor vehicle includes bulldozer, car, motorcycle, pick-up truck, bus, street car, train, tram, subway, truck, recreational vehicle (RV), snow-mobile, all-terrain vehicle (ATV), tractor) (excludes plane/flying or boating accidents)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>15 Motor-pedestrian accident (person was pedestrian or cyclist and was crushed, dragged, hit, injured, knocked down, run over by a motor vehicle)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Event</td>
<td>YES</td>
<td>NO/ not noted</td>
</tr>
<tr>
<td>-------</td>
<td>-----</td>
<td>---------------</td>
</tr>
<tr>
<td>16 Events involving animals (i.e. accident involving animal being ridden)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>17 Other Specify → (17.1): ___________________________________________ (17.2): ___________________________________________</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

**Pre-injury**

**FLA:** First language (Check one option; specify if other (4))

( ) 1 English (stated positive)
( ) 2 English (inferred positive – person’s language is not noted and there is no indication a translator was utilized)
( ) 3 French
( ) 4 Other → Specify first language (FLASPEC): ____________________________

**MARSTAT:** Marital status at time of admission (Check one option)

( ) 1 Never married
( ) 2 Married/living with someone
( ) 3 Divorced (excludes those divorced but noted as remarried or living with someone at time of injury)
( ) 4 Separated (excludes those separated but noted as currently living with someone at time of injury)
( ) 5 Widowed and not remarried/living with someone
( ) 9 Not noted/missing

**EDUC:** Highest Level of Education (Check one option)

( ) 1 Did not complete secondary/high school diploma
    Educ1.1 Specify → last grade in school completed: ________________
( ) 2 Secondary (high) school graduation certificate/diploma or equivalent (i.e. GED)
( ) 3 High school diploma and some post-secondary education (college, trades school, university) BUT no certificate, diploma or degree completed
( ) 4 Trades certificate or diploma
( ) 5 Other non-university certificate or diploma
( ) 6 University certificate or diploma below bachelor’s level
( ) 7 Bachelor’s degree
( ) 8 University certificate or diploma above Bachelor’s level
( ) 9 Advanced degree (i.e. Masters, PhD/doctorate, medicine, dentistry)
( ) 99 Not noted/missing
**Post-injury:**

**INSYMP: Incident related head symptoms:**
(Symptoms based on Rivermead Post-concussion questionnaire (King et al., 1995))

*(Circle one option for each symptom; Instructions to answering same as with pre-injury medical history, please refer to manual)*

<table>
<thead>
<tr>
<th>Does the individual report:</th>
<th>Stated Positive</th>
<th>Stated Negative</th>
<th>Inferred Negative</th>
<th>Missing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Headaches</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>2 Sleep disturbances (ex. difficulty sleeping)</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>3 Fatigue/tires easily</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>4 Dizziness/vertigo</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>5 Chronic nausea and/or vomiting</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>6 Post-traumatic seizures</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>7 Difficulty concentrating/decreased attention</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>8 Changes in memory/forgetfulness (retrograde/anterograde amnesia; short/long term, working memory issues)</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>9 Changes in thinking speed (ex. increased information processing time; takes longer to think)</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>10 Auditory changes or sensitivities (ex. bothered by noise; ringing in the ears)</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>11 Vestibular changes or sensitivities (ex. balance issues; sense of ear pressure)</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>12 Visual sensitivity (photophobia, bothered by light)</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>13 Blurred vision</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>14 Double vision/diplopia</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>15 Taste/gustatory changes or sensitivities</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>16 Olfactory/sense of smell changes or sensitivities</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>17 Anger/Irritability personality changes (ex. loses temper more easily; irritability; easily angered)</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>18 Frustration personality changes (ex. increased frustration, impatience or restlessness)</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>19 Mood/affect personality changes (ex. increased tearfulness, anxiety or depressed feelings—does not have to have a clinical diagnosis)</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
</tbody>
</table>
IMMGN: Immigration status
(Was the person described as having immigrated to Canada (i.e. was not born in Canada)
(Check one option; if yes (1) qualitatively specify country/year to specify):

( ) 0  No (stated negative (i.e. “person was born in Canada”)
( ) 1  Yes (stated positive (i.e. person immigrated to Canada) →
   Specify country of birth (IMMGN1.1): ____________________
   Specify year of immigration to Canada (IMMGN1.2): _________(yyyy)
( ) 9  Immigration status not noted/missing.

DEMP: Duration of employment with employer where injury occurred:
(At time of injury, how long was the person employed with the employer where injury occurred)
(Circle one option and specify data required for option chosen):

<table>
<thead>
<tr>
<th></th>
<th>Duration of 1 day or less (includes injuries during first day of work)</th>
<th>DEMPSPEC:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Duration of 1 day or less (includes injuries during first day of work)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Days: Greater than 1 day (i.e. not first day of job) to greater than or equal to 6 days (i.e. within first week)</td>
<td>Only specify number of days:</td>
</tr>
<tr>
<td>3</td>
<td>Weeks: Greater than or equal to 1 week (7 days) but less than 4 weeks (28 days/1 month).</td>
<td>Only specify number of weeks:</td>
</tr>
<tr>
<td>4</td>
<td>Months: Greater than or equal to 1 month (4 weeks) but less than 1 year.</td>
<td>Only specify number of months:</td>
</tr>
<tr>
<td>5</td>
<td>Years: Greater than or equal to one year</td>
<td>Only specify number of years:</td>
</tr>
<tr>
<td>9</td>
<td>Duration of employment not noted/missing</td>
<td></td>
</tr>
</tbody>
</table>
SEX:  Stated sex/gender of injured worker:
(Check one option):
( ) 0  Male
( ) 1  Female
( ) 9  Not noted missing

Occupation Information:

OCCUP:  Qualitative description of occupation at time of injury:
_________________________________________________________________________
_________________________________________________________________________

INDUST:  Industry sector at time of injury
Based on rate group number. Match rate group number to the WSIB Industry Sector by rate group number located in the manual (Appendix)
Check one

( ) 1  Forest Products
( ) 2  Mining & Related Industries
( ) 3  Other Primary Industries
( ) 4  Manufacturing
( ) 5  Transportation & Storage
( ) 6  Retail & Wholesale Trades
( ) 7  Construction
( ) 8  Government & Related Services
( ) 9  Other services (e.g. financial, hospitality, real estate)

OCCCLASS: Classification of occupation at time of injury
(Based on the qualitative description of the occupation at the time of injury, use the NOC codes (Appendix) to classify the person’s occupation; numbers in brackets at end of option indicate corresponding NOC digit 1 & 2 codes)
(Check one of the following options)

( ) 1  Senior Management Occupations (00)
( ) 2  Middle and Other Management Occupations (01-09)
( ) 3  Professional Occupations in Business and Finance (11)
( ) 4  Skilled Administrative and Business Occupations (12)
( ) 5  Clerical Occupations (14)
( ) 6  Professional Occupations in Natural and Applied Sciences (21)
( ) 7  Technical Occupations Related to Natural and Applied Sciences (22)
( ) 8  Professional Occupations in Health (31)
( ) 9  Technical and Skilled Occupations in Health (32)
( ) 10  Assisting Occupations in Support of Health Services (34)
(11) Professional Occupations in Social Science, Education, Government Services, & Religion (41)
(12) Paraprofessional Occupations in Law, Social Services, Education and Religion (42)
(13) Professional Occupations in Art and Culture (51)
(14) Technical and Skilled Occupations in Art, Culture, Recreation and Sport (52)
(15) Skilled Sales and Service Occupations (62)
(16) Intermediate Sales and Service Occupations (64)
(17) Elemental Sales and Service Occupations (66)
(18) Trades and Skilled Transport and Equipment Operators (72-73)
(19) Intermediate Occupations in Transport, Equipment Operation, Installation & Maintenance (74)
(20) Trades Helpers, Construction Labourers and Related Occupations (76)
(21) Skilled Occupations in Primary Industry (82)
(22) Intermediate Occupations in Primary Industry (84)
(23) Labourers in Primary Industry (86)
(24) Processing Manufacturing and Utilities Supervisors and Skilled Operators (92)
(25) Processing and Manufacturing Machine Operators and Assemblers (94-95)
(26) Labourers in Processing, Manufacturing and Utilities (96)
(27) Occupation description is not applicable to any of the above described codes
(99) Occupation description not noted in chart

END OF CHART REVIEW
(Please complete abstractor comments on quality of chart form on next page)

ABSTRACTOR COMMENTS ON QUALITY OF CHART

<table>
<thead>
<tr>
<th>FORMS: Forms/reports available/present in chart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form/report</td>
</tr>
<tr>
<td>-------------</td>
</tr>
<tr>
<td>1 Client Program Status Form</td>
</tr>
<tr>
<td>2 Discharge/Case Conference Summary Report</td>
</tr>
<tr>
<td>3 Neuropsychological Assessment Form</td>
</tr>
<tr>
<td>4 Neuropsychological Report</td>
</tr>
<tr>
<td>5 Occupational / Physical Therapy Report(s)</td>
</tr>
<tr>
<td>6 WSIB Employer’s Report of Injury/Disease (Form 7)</td>
</tr>
</tbody>
</table>
MISSDATA: In your opinion, is this chart missing data needed to complete the abstraction form?

( ) 0 NO
( ) 1 YES
If YES, please specify what is missing:

CONFLICT: In your opinion, does this chart contain conflicting data?

( ) 0 NO
( ) 1 YES
If YES please specify areas of conflicting data and provide example (i.e. dates, outcomes, names; sections noted to have conflicting reports…)

Appendix J: Neuropsychological Assessment Abstraction Tool

1. PREMORB ________ (1=low average or below, 2=average, 3=high or above average)

2. 
   a) TOMM1 ________ (0-50)
   b) TOMM2 ________ (0-50)
   c) TOMMRET ________ (0-50)
   d) WMTIR ________ (0-100)
   e) WMTRDR ________ (0-100)
   f) WMTCN ________ (0-100)
   g) NVMSVT ________ (0=failed, 1=not failed)
   h) VSVTEASY ________ (0-24)
   i) VSVTHARD ________ (0-24)
   j) CTIP ________ (0=failed, 1=not failed)
   k) ENGAGED ________ (0=not engaged, 1=marginal, 2=well engaged)

3. ATTNWM ________ (1=“impaired” or <2SD below expectation, 2=possibly reduced 1-2 SD below expectation, 3=within expectations or above)

4. VERBMEM ________ (1=“impaired” or <2SD below expectation, 2=possibly reduced 1-2 SD below expectation, 3=within expectations or above)

5. VISMEM ________ (1=“impaired” or <2SD below expectation, 2=possibly reduced 1-2 SD below expectation, 3=within expectations or above)

6. INFOPS ________ (1=“impaired” or <2SD below expectation, 2=possibly reduced 1-2 SD below expectation, 3=within expectations or above)

7. VISSPAT ________ (1=“impaired” or <2SD below expectation, 2=possibly reduced 1-2 SD below expectation, 3=within expectations or above)

8. EXECFXN ________ (1=“impaired” or <2SD below expectation, 2=possibly reduced 1-2 SD below expectation, 3=within expectations or above)

9. MOTOR ________ (1=any “impaired” or <2SD below expectation, 2=none impaired but one or more possibly reduced 1-2 SD below expectation, 3= all scores within expectations or above)

10. MOOD ________ (0= no evidence of mood disturbance, 1= possibility of mild-moderate mood disturbance, 2= possibility of significant mood disturbance)

11. ANX ________ (0= no evidence of anxiety disturbance, 1= possibility of mild-moderate anxiety disturbance, 2= possibility of significant anxiety disturbance)

12. OTHERPSY ________ (0= no evidence of another psychiatric disturbance, 1= possibility of mild-moderate psychiatric disturbance, 2= possibility of significant psychiatric disturbance)

13. PAIN ________ (0= no evidence of pain disorder, 1= possibility of mild to moderate pain problem, 2= possibility of significant pain problem)

14. SOMATOF ________ (0= no evidence of somatoform disorder, 1= possible somatoform disorder, 2= significant/probable somatoform disorder)
15. EXAGPSYC________ (0= no evidence of exaggerated psychiatric disturbance, 1= possible exaggerated psychiatric disturbance/some evidence, 2= probable exaggerated psychiatric disturbance/significant evidence)

16. EXAGPAIN________ (0= no evidence of exaggerated pain, 1= possible exaggerated pain/some evidence, 2= probable exaggerated pain/significant evidence)

17. FAKEBAD_______

1. Estimated premorbid intellectual functioning

-one variable
-based on any combination of: National Adult Reading Test, Wechsler Test of Adult Reading, Wechsler Abbreviated Scale of Intelligence, Wechsler Adult Intelligence Scale-3, Peabody Picture Vocabulary Test, Test of Nonverbal Intelligence - 3
-Coding:
  1 = low average or below
  2 = average
  3 = high average or above

2. Engagement in cognitive testing

-11 variables:
  i. Test of Memory Malingering (TOMM¹) Trial 1 score (0 to 50)
  ii. TOMM Trial 2 score (0 to 50)
  iii. TOMM Retention score (0 to 50)
  iv. Word Memory Test (WMT²) IR score (0 to 100)
  v. WMT DR score (0 to 100)
  vi. WMT Consistency score (0 to 100)
  vii. Non-verbal Medical Symptom Validity Test, Failed or not (0=failed, 1=not failed)
  viii. Victoria Symptom Validity Checklist (VSVT) Easy items score (0 to 24)
  ix. VSVT Difficult items score (0 to 24)
  x. Computerized Tests of Information Processing, Failed or not (0=failed, 1=not failed)
  xi. Overall judgment of engagement by neuropsychologist (0=not engaged; 1=marginal; 2=well engaged)

3. Attention / Working Memory

-one variable

1 Cut-offs for engagement: TOMM Trial 2 of <45 OR TOMM Retention Trial Score of <45

2 Cut-offs for engagement: WMT Immediate Recall, or Delayed Recall, or Consistency of <82.5 is a fail; Immediate Recall, or Delayed Recall, or Consistency between 82.5% and 90% is a caution
-based on any combination of: Conners' Continuous Performance Test – II, Consonant Trigrams, Ruff 2 & 7 Selective Attention Test, Trail Making Test, Visual Search Attention Test, Wechsler Adult Intelligence Scale-3 subtests
Coding:
1 = “impaired” or less than 2 SD below expectation
2 = possibly reduced (1-2 SD below expectation)
3 = within expectations or above

4. Verbal memory

-one variable
Coding:
1 = “impaired” or less than 2 SD below expectation
2 = possibly reduced (1-2 SD below expectation)
3 = within expectations or above

5. Visual memory

-one variable
-based on any combination of: Rey Complex Figure Test, Wechsler Memory Scale – 3 subtests, Brief Visuospatial Memory Test – Revised, Taylor Complex Figure Test
Coding:
1 = “impaired” or less than 2 SD below expectation
2 = possibly reduced (1-2 SD below expectation)
3 = within expectations or above

6. Information processing speed

-one variable
-based on any combination of: Symbol-Digits Modalities Test, Ruff 2 & 7 Selective Attention Test, Trail Making Test, Wechsler Adult Intelligence Scale-3 subtests
Coding:
1 = “impaired” or less than 2 SD below expectation
2 = possibly reduced (1-2 SD below expectation)
3 = within expectations or above

7. Visuospatial functioning

-one variable
-based on any combination of: Wechsler Adult Intelligence Scale-3 subtests, Test of Nonverbal Intelligence – 3, Rey Complex Figure Test, Taylor Complex Figure Test, Judgment of Line Orientation, Visual Form Discrimination
Coding:
1 = “impaired” or less than 2 SD below expectation
2 = possibly reduced (1-2 SD below expectation)
3 = within expectations or above

8. Executive functioning

-one variable
-based on any combination of: Category Test, Controlled Oral Word Association, Delis Kaplan Executive Function System, Wisconsin Card Sorting Test, Ruff Figural Fluency, Stroop Coding:
1 = “impaired” or less than 2 SD below expectation
2 = possibly reduced (1-2 SD below expectation)
3 = within expectations or above

9. Motor functioning
-one variable
-based on any combination of: Grooved Pegboard, Finger Tapping, Grip Strength
Coding:
1 = any “impaired” or less than 2 SD below expectation
2 = none impaired but one or more possibly reduced (1-2 SD below expectation)
3 = all scores within expectations or above

10. Mood disturbance*
-one variable
-based on any combination of: Beck Depression Inventory – 2, Depression Anxiety Stress Scale, Minnesota Multiphasic Personality Inventory-2, Personality Assessment Inventory
Coding:
0 = no evidence of mood disturbance
1 = test scores reveal possibility of mild to moderate mood disturbance
2 = test scores reveal possibility of significant mood disturbance

11. Anxiety disorder (other than PTSD)*
-one variable
-as determined by (any combination of): Beck Anxiety Inventory, Depression Anxiety Stress Scale, Minnesota Multiphasic Personality Inventory-2, Personality Assessment Inventory
Coding:
0 = no evidence of anxiety problems
1 = test scores reveal possibility of mild to moderate anxiety problems
2 = test scores reveal possibility of significant anxiety problems

12. Other psychiatric problem (e.g., PTSD, psychosis)*
-one variable
-based on any combination of: Minnesota Multiphasic Personality Inventory-2, Personality Assessment Inventory, Trauma Symptom Inventory / Trauma Symptom Inventory- A
Coding:
0 = no evidence of another psychiatric disturbance
1 = test scores reveal possibility of mild to moderate other psychiatric disturbance
2 = test scores reveal possibility of significant other psychiatric disturbance

13. Pain*
-one variable
-based on Pain Symptom Rating - I
Coding:
0 = no evidence of pain disorder
1 = test scores reveal possibility of mild to moderate pain problem
2 = test scores reveal possibility of significant pain problem

14. Somatoform disorder other than pain*
   - one variable
   - based on Minnesota Multiphasic Personality Inventory-2, Personality Assessment Inventory
   Coding:
   0 = no evidence of somatoform disorder
   1 = possible somatoform disorder
   2 = significant/probable somatoform disorder

15. Evidence of exaggerated psychiatric disturbance
   - one variable
   - based on Structured Inventory of Malingered Symptomatology, Malingering Probability Scale,
     Minnesota Multiphasic Personality Inventory-2, Personality Assessment Inventory, Trauma Symptom
     Inventory / Trauma Symptom Inventory - A
   Coding:
   0 = no evidence of exaggerated psychiatric disturbance
   1 = possible exaggerated psychiatric disturbance (some evidence)
   2 = probable exaggerated psychiatric disturbance (significant evidence)

16. Evidence of exaggerated pain
   - one variable
   - based on Pain Symptom Rating - I
   Coding:
   0 = no evidence of exaggerated pain
   1 = possible exaggerated pain (some evidence)
   2 = probable exaggerated pain (significant evidence)

Complete list of 16 domains and tests:

1. Estimated premorbid intellectual functioning
2. Engagement in cognitive testing (not engaged, marginal, engaged)
3. Attention
4. Verbal memory
5. Visual memory
6. Information processing speed
7. Visuospatial functioning
8. Executive functioning
9. Motor functioning
10. Mood disturbance*
11. Anxiety disorder*
12. Other psychiatric problem (e.g., PTSD, psychosis)*
13. Pain*
14. Somatoform disorder other than pain
15. Evidence of exaggerated psychiatric disturbance
16. Evidence of exaggerated pain

*As with all of the other domains, 10 through 14 would be coded from testing, if available, and not necessarily confirmed by our team final diagnoses.

<table>
<thead>
<tr>
<th>AuditoryVerbal Learning Test - X</th>
<th>Rey 15</th>
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<tbody>
<tr>
<td>Beck Anxiety Inventory</td>
<td>Rivermead Post Concussion Symptoms Questionnaire</td>
</tr>
<tr>
<td>Beck Depression Inventory -II</td>
<td>Ruff Figural Fluency</td>
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<tr>
<td>Brief Visuospatial Memory Test (BVMT)</td>
<td>Ruff 2 &amp; 7 Selective Attention Test</td>
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<tr>
<td>California Verbal Learning Test-II Category Test</td>
<td>Stroop</td>
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<tr>
<td>Colour Trails Test</td>
<td>Structured Inventory of Malingered Symptomatology</td>
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<td>Computerized Tests of Information Processing</td>
<td>Symbol-Digits Modalities Test</td>
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<td>Conners’ Continuous Performance Test – II</td>
<td>Taylor Complex Figure Test</td>
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<td>The Test of Memory Malingering</td>
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<td>Controlled Oral Word Association</td>
<td>Test of Nonverbal Intelligence – 3</td>
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<tr>
<td>Delis Kaplan Executive Function System</td>
<td>Trail Making Test</td>
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<tr>
<td>Finger Tapping</td>
<td>Trauma Symptom Inventory / Trauma</td>
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<td>Grooved Pegboard</td>
<td>Symptom Inventory- A</td>
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<td>Grip Strength</td>
<td>Victoria Symptom Validity Checklist</td>
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<td>Visual Discrimination (Benton)</td>
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<td>Visual Search Attention Test</td>
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<tr>
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<td>Wechsler Adult Intelligence Scale–3</td>
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<tr>
<td>Non-verbal Medical Symptom Validity Test</td>
<td>Wechsler Abbreviated Scale of Intelligence Wisconsin Card Sorting Test</td>
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<tr>
<td>Personality Assessment Inventory</td>
<td>Wechsler Memory Scale – 3</td>
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<tr>
<td>Peabody Picture Vocabulary Test</td>
<td>Word Memory Test</td>
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<tr>
<td>Pain Symptom Rating – I</td>
<td>Wide Range Achievement Test</td>
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<td>Rey Complex Figure Test</td>
<td>Wechsler Test of Adult Reading</td>
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Appendix K: TRI and U of T REB Approval Letters

June 02, 2010

Dr. Angela Colantonio
Toronto Rehabilitation Institute
TRI - University Centre
550 University Avenue
Toronto, Ontario
M5G 2A2

Dear Dr. Colantonio:

RE: TRI REB # 10-011
    Mild to Moderate Work-related Traumatic Brain Injury: A Pilot Study

The Toronto Rehabilitation Institute Research Ethics Board has reviewed the above-named submission. Any concerns and requested revisions have been addressed to the satisfaction of the REB. The protocol (dated May 25, 2010) and the consent form (Appendix 1, dated May 25, 2010) are approved for use for the next 12 months. Included in this approval is the Return to Work Questionnaire, version June 01, 2010). If the study is expected to continue beyond the expiry date, you are responsible for ensuring the study receives re-approval. The REB must also be notified of the completion or termination of this study and a final report provided.

If, during the course of the research, there are any serious adverse events, changes in the approved protocol or consent form or any new information that must be considered with respect to the study, these should be brought to the immediate attention of the Board.

Best wishes for the successful completion of your project.

Yours sincerely,

[Signature]

[ ] Paul Oh MD, MSc, FRCP, FACP
Chair, Research Ethics Board
Toronto Rehabilitation Institute

[ ] Ann Haestens BEd, BA, MA, PhD(ABD)
Vice Chair, Research Ethics Board
Toronto Rehabilitation Institute

June 02, 2010
Date of Initial REB Approval

June 02, 2011
Expiry Date of REB Approval

TRI REB conforms with the Tri-Council Policy Statement Ethical Conduct for Research Involving Humans and Ontario Privacy Legislation PHIPA
Dear Dr. Colantonio and Ms. Salehi:

Re: Your research protocol entitled “Mild to Moderate Work-related Traumatic Brain Injury: A Pilot Study”

ETHICS APPROVAL Original Approval Date: July 28, 2010

Expiry Date: July 27, 2011

Continuing Review Level: 1

We are writing to advise you that a member of the Health Sciences Research Ethics Board has granted approval to the above-named research study, for a period of one year. Ongoing projects must be renewed prior to the expiry date. All your most recently submitted documents have been approved for use in this study.

Any changes to the approved protocol or consent materials must be reviewed and approved through the amendment process prior to its implementation. Any adverse or unanticipated events should be reported to the Office of Research Ethics as soon as possible.

Please ensure that you submit an Annual Renewal Form or a Study Completion Report 15 to 30 days prior to the expiry date of your study. Note that annual renewals for studies cannot be accepted more than 30 days prior to the date of expiry, as per federal and international policies.

If your research has funding attached, please contact the relevant Research Funding Officer in Research Services to ensure that your funds are released.

Best wishes for the successful completion of your project.

Yours sincerely,

S. Lanthier,
Research Ethics Coordinator