University of Alberta

The Utility of the *MMPI-2* Work Interference Scale With Severe Traumatic Brain Injury and Stroke Patients

by

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Abstract

The *Minnesota Multiphasic Personality Inventory* (*MMPI-2*) Work Interference Scale (WRK) is purported to measure the behaviours and attitudes associated with work performance, but little research has examined the clinical utility of the *MMPI-2* WRK scale with individuals who have sustained severe traumatic brain injuries (STBI) or strokes. The relationship between the *MMPI-2* WRK scale and vocational outcome in individuals who sustained STBI ($N = 173$) or stroke ($N = 82$) and were seen in a rehabilitation hospital in Western Canada for neuropsychological assessment from 1990 to 2001 was investigated. The research is exploratory and archival in nature. Records were searched to obtain information about demographic (gender, age, marital status, education, employment status), neurologic (posttraumatic amnesia [PTA], chronicity, injury), and neuropsychological variables (Wechsler Adult Intelligence Scale–Revised [WAIS-R] Digit Symbol Subtest, Wechsler Memory Scale–Revised [WMS-R] Immediate Memory Subtest, Trailmaking Test [TMT], Booklet Category Test, *MMPI-2* WRK scale) for two separate studies (i.e., STBI and stroke). The *MMPI-2* WRK scale was tested in a variety of statistical analyses, and the findings reveal that it was not concurrently or predictively related to employment status. In contrast, some neuropsychological and injury related variables used were related to work status (i.e., WAIS-R Digit Symbol Subtest & Injury Severity). Concerns were raised about the *MMPI-2* WRK scale's post hoc development and the ability of the scale to correlate with work status either concurrently or predictively. The findings do not support the use of the *MMPI-2* WRK scale with participants who have suffered STBI or stroke.

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List of Definitions

AIS: Abbreviated Injury Scale: Provides a numeric by which injury severity can be ranked; takes into account the impact of injury factors other than head injury (Dikmen et al., 1994).

Aneurysm: "Circumscribed dilation of an artery or a cardiac chamber, usually due to an acquired or congenital weakness of the wall of the artery or chamber" (Stedman, 1998, p. 45)

Aphasia: "Impaired or absent comprehension or production of, or communication by, speech, writing, or signs, due to an acquired lesion of the dominant cerebral hemisphere" (Stedman, 1998, p. 60)

Apraxia: "1. A disorder of voluntary movement, consisting of impairment in the performance of skilled or purposeful movements, notwithstanding the preservation of comprehension, muscular power, sensibility, and coordination in general; due to acquired cerebral disease. 2. A psychomotor defect in which the proper use of an object can not be carried out although the object can be named and its uses described" (Stedman, 1998, p. 63)

Arteriovenous malformation: A disorder of the blood vessels in the brain "relating to both an artery and a vein or to both arteries and veins in general; both arterial and venous" (Stedman, 1998, p. 69).

CHI: Closed head injury: Those injuries in which the "skull remains intact and the brain is not exposed" (Lezak, 1995, p. 172)

Chronicity: The time from the initial injury to the neuropsychological assessment

Coma: "1. A state of profound unconsciousness from which one cannot be roused" (Stedman, 1998, p. 178)

CT: Computed tomography: "Imaging anatomical information from a cross-sectional plane of the body, each image generated by a computer synthesis of x-ray transmission data obtained in many different directions in a given plane" (Stedman, 1998, p. 888)

F: Scale that measures items that are rarely endorsed by test takers

FB: Scale that measures items that are rarely endorsed by test takers on the latter portion of the test

GCS: Glasgow Coma Scale: Based on separate assessment of motor responses, verbal responses, and eye-opening criteria. Currently, the revised version of the GCS (15-point breakdown) is commonly used in predicting outcome in the early stages after injury (Richardson, 1990)

GOS: Glasgow Outcome Scale: Breaks outcome down into a 5-point scale based on death, persistent vegetative state, severe disability, moderate disability, and good recovery (Richardson, 1990)

Hemorrhagic stroke: Those disorders in which direct bleeding into or around the brain occurs

Herniation: Displacement or movement of part of the brain tissue of the brainstem through the *foramen* (defined by Stedman [1998] as "an aperture or perforation through a bone or a membranous structure")

Infarct: "An area of necrosis resulting from a sudden insufficiency of arterial or venous blood supply" (Stedman, 1998, p. 439)

Ischemic stroke: Those disorders in which the symptoms are due to an inadequate blood supply to the brain (Kolb & Whishaw, 1996)

ISS: Injury Severity Score: "The ISS is the sum of the squares of the highest AIS code in each of the three most severely injured ISS body regions" (Association for the Advancement of Automotive Medicine, 1990, p. 10). It is based on rules outlined in the Abbreviated Injury Scale

K: Scale that provides a measure of sophisticated attempts to present oneself in a very favourable manner and to deny faults (Newmark, 1996)

LOC: Loss of unconsciousness

MMPI-2: *Minnesota Multiphasic Personality Inventory-2* (2^{nd} ed.; Hathaway & McKinley, 1989)

MVA: Motor vehicle accident

Open head injuries: Those injuries in which the skull is penetrated

Premorbid work status: Being employed in full-time paid work or part-time paid work "preceding the occurrence of disease" (Stedman, 1998, p. 709)

PTA: Posttraumatic amnesia: "Occurring after trauma, and, by implication, caused by it" (Stedman, 1998, p. 705)

SAH: Subarachnoid hemorrhage: "A disorder involving bleeding between the middle membrane covering of the brain and the brain itself, within the CSF (cerebrospinal fluid) filled spaces surrounding the brain (also known as the subarachnoid space)" (1UpHealth, 2003, n.p.)

STBI: Severe traumatic brain injury: Defined by the duration of coma being greater than six hours or by a score of 8 or less on the first GCS taken or by posttraumatic amnesia extending past 24 hours

Stroke: Rapidly developed signs of focal (or global) disturbance of cerebral function lasting >24 hours (unless interrupted by surgery or death), with no apparent nonvascular cause" (Thorvaldsen, Asplund, Kuulasmaa, Rajakangas, & Schroll, 1995, p. 362)

TBI: Traumatic brain injury: An injury that is a direct result of an "external mechanical force causing damage to brain tissue as evidenced by posttraumatic amnesia, or objective neurological findings that can be reasonably attributed to TBI on physical or mental status examination, with or without skull fracture" (Dahmer et al., 1993, p. 13)

TRIN: True Response Inconsistency Scale: Examines the internal consistency of a participant's responses and provides the examiner with an understanding of whether the participant responds in an acquiescent or nonacquiescent manner

VRIN: Variable Response Inconsistency Scale: Determines how the participant has responded to pairs of items that are similar or opposite and provides the examiner with an understanding of response consistency

WRK: *MMPI-2* Work Interference Scale: Measures the behaviours and attitudes associated with work performance (Hathaway & McKinley, 1989)

CHAPTER ONE

INTRODUCTION

Due to advancements in medical practice (Fraser, Dikmen, McLean, Miller, & Temkin, 1988; Gordon, 1993), survival rates have increased for persons suffering severe traumatic brain injury (STBI; Colantonio, Kasl, Ostfeld, & Berkman, 1993) and stroke (Camerlingo et al., 2000; Gordon, 1993). With increased survival rates comes greater demand for return to productivity, especially return to employment (Gollaher et al., 1998). Unfortunately, persons who have sustained STBI or stroke often experience difficulty returning to work due to cognitive, physical, and/or emotional/psychosocial sequelae (Crépeau & Scherzer, 1993; Wehman et al., 1991). Nonetheless, the value that society places on work and the satisfaction that individuals derive from productivity continue to make vocational outcome a topic of critical importance (Ashley, Persel, Clark, & Krych, 1997; Chandler, 1993; Gollaher et al., 1998; Kim & Colantonio, 1997; Lam, Priddy, & Johnson, 1991; Saeki, Ogata, Okubo, Takahashi, & Hoshuyama, 1993).

Being able to better predict which individuals with STBI and stroke will likely benefit from rehabilitation services and return to work is an issue of paramount importance to diverse stakeholders (Arokiasamy & Millington, 1994; Ashley et al., 1997; Gollaher et al., 1998). To help guide decision making about employment, professionals rely upon numerous assessment instruments. One instrument commonly used in neuropsychological batteries administered to individuals who have suffered STBI or stroke is the *Minnesota Multiphasic Personality Inventory: Second Edition* (*MMPI-2*; Hathaway & McKinley, 1989), a measure of personality and psychopathology. In fact, "probably more is known about the *MMPI/MMPI-2* in the evaluation of brain damage

than about most other tests and procedures that might be used to assess emotional aspects of adjustment" (Reitan & Wolfson, 1997, p. 16).

The *MMPI-2* contains a series of clinical, supplementary, and content scales. The content scales are a series of scales that were designed to increase the clinical utility of the *MMPI-2* by incorporating "new ways of viewing personality characteristics and clinical problems—through the themes or content dimensions reported by the client" (Butcher, Graham, Williams, & Ben-Porath, 1990, preface). In particular, a new content scale on the *MMPI-2*, the Work Interference Scale (WRK), shows promise in assisting professionals in their decision making regarding employment after STBI or stroke. This scale is purported to measure the behaviours and attitudes associated with work performance. Inclusion of the scale in neuropsychological examinations may, in conjunction with other information, help identify those individuals who encounter difficulty or may in the future encounter difficulty vocationally and serve to aid professionals in determining who may benefit from vocational intervention programs. However, limited research has been conducted with the *MMPI-2* content scales in general, and none has addressed the utility of the *MMPI-2* WRK scale with STBI and stroke samples. This is unfortunate because it has yet to be determined whether the *MMPI-2* WRK scale actually provides useful information about work-related attitudes after STBI and stroke that can be used to assist clinicians in return-to-work rehabilitation endeavours.

The original study conducted by Butcher et al. (1990) in the development of the *MMPI-2* content scales is one of the few *MMPI-2* WRK-scale related studies published. They examined whether the *MMPI-2* WRK scale was able to discriminate between

samples with differing levels of work adjustment (i.e., airline pilots, active-duty military personnel, hospitalised alcoholics, and psychiatric patients; Butcher et al., 1990). The results demonstrated that the normative sample mean differences on the *MMPI-2* WRK scale were in the directions anticipated. Airline pilots scored two standard deviations (i.e., raw score mean [*M*] = .79, standard deviation [*SD*] = 1.43) below the normative sample mean (i.e., raw score mean $M = 7.30$, $SD = 4.98$), indicating highly developed work-adjustment skills and positive attitudes pertaining to work). Active-duty military personnel achieved poorer scores, but scores still indicative of good work adjustment (i.e., $M = 7.49$, $SD = 5.77$). The results achieved by hospitalised alcoholics (i.e., $M = 11.39$, $SD = 6.86$) and psychiatric patients (i.e., $M = 15.26$, $SD = 7.93$) were indicative of individuals who presented with negative work-related attitudes, because their *MMPI-2* WRK scores were elevated. Thus, if results similar to those just outlined were found, the *MMPI-2* WRK scale might assist professionals in their decision making regarding employment after STBI or stroke. (Refer to Table 1 for information about the *t* scores for some of the aforementioned samples.)

Criticisms have been raised about the content scales by Jackson, Fraboni, and Helmes (1997), who examined the role of social desirability in responding and concluded that the "convergent and discriminant validity of the *MMPI-2* content scales are seriously compromised by the presence of substantial, confounding, general variance" (p. 111). However, they also acknowledged that the impact of social desirability on the MMPI/*MMPI-2* has been an ongoing argument and that the results cannot provide definitive evidence that confounding results due to social desirability can extend towards the content scales.

Ben-Porath, McCully, and Almagor (1993) investigated whether the information provided by the *MMPI-2* content scales could help facilitate communication between users. They examined the incremental contribution of the *MMPI-2* content scales to predicting scores on several self-report measures (i.e., *MMPI-2*, Beck Depression Inventory [BDI], Symptom Checklist-90–Revised [SCL-90-R]). Based on their findings, they concluded that the content scales added incrementally "to the prediction of variance in self-report measures of personality and psychopathology above and beyond what is predicted by the clinical scales alone" (p. 569). They reported that the criterion measures were correlated with *MMPI-2* clinical and content scales that measured similar constructs such as the following: (a) The BDI was correlated with the Depression Content Scale; (b) the Health Concerns Content Scale was correlated with the SCL-90-R SSOM Scale (Somatization); (c) the Anxiety Content Scale was correlated with the SCL-90-R SPHO (Phobic Anxiety) and the SOBS Scale (Obsessive-Compulsive), and (d) the WRK Scale was correlated with the SCL-90-R SOBS Scale (Obsessive-Compulsive). Overall, the highest correlations were between the Depression Content Scale and the SCL-90-R SPAR (Paranoid Ideation) and the SPSY (Psychoticism) scales.

Examining the clinical utility of the *MMPI-2* WRK scale and knowing which combinations of predictors and measures could be used to predict employment after STBI or stroke is of clinical interest (e.g., Dikmen et al., 1994; Rao & Kilgore, 1992; Rao et al., 1990) because determining which patients have a greater likelihood of returning to work may enable clinicians to triage patients to more appropriate rehabilitation services. Moreover, obtaining more information about an individual's work-related attitudes might serve to guide rehabilitation professionals in evaluating these individuals in regard to

employment. Therefore, the current study examined the clinical utility of the Work Interference Scale of the Minnesota Multiphasic Personality Inventory: Second Edition (*MMPI-2*) and issues related to vocational functioning after STBI and stroke. Because the *MMPI-2* WRK scale has not been validated with these populations and the measure is used extensively in evaluation of individuals who have sustained an STBI or stroke, it is critical that this measure be investigated, in part because clinicians might be using it in an uncritical way, based simply on what the test developers stated that the scale was intended to measure.

The literature review that follows is divided into two main sections, the first focusing on severe traumatic brain injury (STBI) and the second on stroke. Within these main sections a series of subsections will address the following: (a) the characteristics of the target populations, (b) the pathophysiology associated with injury, (c) the variables commonly addressed in vocational outcome research, (d) the *MMPI-2*, (e) the Work Interference Scale, and (f) a synthesis of the two main sections of the literature review.

CHAPTER TWO

TRAUMATIC BRAIN INJURY LITERATURE

One of the most common forms of brain damage is the result of traumatic brain injury (TBI). *TBI* refers to an injury that is a direct result of an "external mechanical force causing damage to brain tissue as evidenced by posttraumatic amnesia, or objective neurological findings that can be reasonably attributed to TBI on physical or mental status examination, with or without skull fracture" (Dahmer et al., 1993, p. 13). Traumatic brain injuries can be classified as either closed or open head injuries. *Closed head injury* refers to those injuries in which the "skull remains intact and the brain is not exposed" (Lezak, 1995, p. 172). *Open head injury* refers to those injuries in which the skull is penetrated. For the purposes of this dissertation, the primary focus is on severe closed head injury (CHI).

Characteristics Associated With TBI

Epidemiological studies of TBI in American and Canadian populations provided information about a wide range of characteristics. Comparisons between studies are difficult due to the differences in TBI definitions, the inclusion of patients with injuries of different injury severity, the occurrence of individuals having more than one TBI, and the varying methods of assessment used in the studies (Kraus & Sorenson, 1994; Willer, Abosch, & Dahmer, 1990; Wong, Dornan, Schentag, Ip, & Keating, 1993). However, a review was conducted with the intention of synthesizing common findings and identifying discrepancies that required further clarification. Incidence and mortality, causes of injury, gender, and age are addressed.

Incidence and Mortality

Incidence refers to the number of new occurrences of a given disease or impairment over a specific period of time" (Willet et al., 1990, p. 18). In the United States the average yearly incidence for fatal and nonfatal TBI is estimated to be around 237 per 100,000 persons (Kraus & McArthur, 1996). The incidence of TBI cases requiring hospitalization in Canada is estimated to be approximately 200 cases per 100,000 (Parkinson, Stephenson, & Phillips, 1985). Nonetheless, it is important to keep in mind that in the incidence rates reported, approximately 80% of the injuries sustained will be mild, 10% moderate, and 10% severe (Kraus & Sorenson, 1994).

Mortality refers to the frequency of death or the death rate due to a particular disease or disorder. Mortality due to TBI has been estimated to be between approximately 22 and 24 deaths per 100,000 cases per year in the United States (Centers for Disease Control and Prevention [CDC], 1997; Kraus & McArthur, 1996). Canadian figures for mortality reveal that 14% of the deaths recorded from death certificates in 1995 were due to intracranial injuries without skull fractures (Statistics Canada, 1995). In the province of Alberta in 1997, head injuries were the main cause of death "in over 200 injury-related deaths accounting for approximately 14% of all injury related deaths" (Alberta Centre for Injury Control & Research, 1998, p. 4). Mortality from head injury is greater in males than in females. Approximately four males perish compared to one female (Frankowski, Annegers, & Whitman, 1985).

Causes of Injury

Until recently, fatal and nonfatal brain injuries were more often due to transport-related accidents then any other single cause (Kraus & Sorenson, 1994). Motor vehicle accidents (MVAs) were the primary cause of severe traumatic brain injury (Rosenthal, Griffith, Bond, & Miller, 1990). When 1990 to 1993 discharge data from American hospitals in four states were examined, 47% of all TBI injuries sustained were associated with MVAs (CDC, 1997).

Falls were the next most common cause of TBI (Snow, McCartney-Filgate, Schwartz, Klonoff, & Ridgley, 1988) and accounted for around 23% of the TBI injuries sustained in hospital discharge data from 1990 to 1993 (CDC, 1997). Nevertheless, more recent research has shown that falls have now exceeded MVAs as the leading cause of injury in the 1990s (Diamond, 1996; Sosin, Sniezek, & Waxweiler, 1995). A reduction in alcohol-related fatalities was believed to be the main reason that MVA fatalities had decreased in the Diamond study. However, the reduction in fatalities may also have been due to the use of air bags and seat belts (Mikhail, Huelke, Donald, Arbor, & Arbor, 1997; Sosin et al., 1995).

The results from Canadian studies of TBI from the 1980s are similar in that the greatest numbers of injuries were due to MVAs. Across studies, injuries due to MVAs ranged from approximately 33% to 43% (Parkinson et al., 1985; Snow et al., 1988; Wong et al., 1993). In contrast, injuries sustained as a result of a fall ranged from 19.3% to 32.7% (Parkinson et al., 1985; Snow et al., 1988; Wong et al., 1993). However, as in the United States, changes in causality may be occurring, because 1997 data from the province of Alberta revealed that "falls accounted for the majority of these

hospitalisations [serious head injuries] with 38.7% of the cases; motor vehicle related injury was second with 31.8% of the cases" (Alberta Centre for Injury Control & Research, 1998).

Although MVAs and falls account for the greatest number of TBIs, they may also be due to assaults, sports-related injuries, recreation-related injuries, industrial accidents, and suicide attempts (Wong et al., 1993). In the United States, TBIs due to assaults account for between approximately 9% and 10% of the injuries (CDC, 1997), and in other countries assaults are among the leading causes of TBI (Kraus & McArthur, 1996). In Canada there are fewer injuries due to assault and industrial accidents than in other countries. These differences are believed to be due to a lower violent crime rate and less heavy industry (Wong et al., 1993). The rate of sports- and recreation-related injuries is difficult to determine because often these sorts of injuries are included in other categories.

Gender

More males than females suffer traumatic brain injuries, and, in general, their injuries are likely to be more severe than those of females (Dikmen, Machamer, Winn, & Temkin, 1995; Parkinson et al., 1985). The incidence ratio is approximately twice as high for males as for females (Anderson, 1994). About 65% of the hospital admissions from motor vehicle collisions were males (Canadian Institute for Health Information, 1998). However, relatively more females than males are injured in MVAs as passengers or as pedestrians (Parkinson et al., 1985; Wong et al., 1993). Likewise, more females than males sustain injuries due to falls in their home (Kraus & Sorenson, 1994). Females are more likely to sustain an injury in a fall due to conditions associated with advanced age,

and males are more likely to sustain an injury in a fall associated with alcohol consumption (Wong et al., 1993).

Age

Traumatic brain injury is considered to be a problem of the young, in that 80% of all the injuries reported in the Virginia Brain Injury Central Registry were in persons 40 years of age or younger (Diamond, 1996). The ages at which incidence peaks are from 15 to 25 years (Kraus & Sorenson, 1994). The high rate of injuries associated with this age range is thought to be linked to MVAs, which account for approximately 50% of the injuries to teens and individuals in their early 20s (Kraus & Sorenson, 1994; Lezak, 1995; CDC, 1997). Individuals most at risk are males and females who have higher demerit points and spend greater time driving (Smiley, 1999). On the other hand, injuries from falls are more prevalent in infants, children under 5, and adults in their 70s or older (Kraus & Sorenson, 1994).

Summary

MVAs and falls account for the majority of the TBIs in the United States and Canada. TBI is common in individuals 40 years and younger. The peak age for a TBI due to an MVA is from 15 to 25. TBI as a result of a fall is more prevalent in children under 5 years of age and adults older than 70. About 10% of the TBIs sustained will be severe, with more males than females suffering severe TBIs. More males than females are injured as drivers in MVAs, whereas more females than males are injured as passengers or pedestrians. Females are more likely to suffer injuries in falls due to advancing age, whereas males are more likely to suffer injuries in falls associated with intoxication.

Pathophysiology of Severe Traumatic Brain Injury

The pathophysiology of STBI is complex because a single CHI can involve several different types of lesions (Little, 1985). However, two main factors contribute to injury pathophysiology: the trauma pertaining to the initial injury (primary damage) and the secondary complications that contribute to further injury (secondary damage; Cassidy, 1994). The location and severity of the mechanical distortion also contribute to understanding injury pathophysiology (Gennarelli, 1993). Therefore, the initial injury or the primary damage, the specific mechanisms of injury, and the accompanying secondary complications are the focus of this section.

The Initial Injury

Initial injuries can be divided into three main categories: skull fractures, focal injuries, and diffuse injuries (Gennarelli & Meaney, 1996). Because skull fractures are not considered to be the most significant factor in neurologic disability (Gennarelli, 1983; Gennarelli & Meaney, 1996), only focal and diffuse injuries are discussed. In the literature focal injuries have been referred to as *macroscopic lesions*, and diffuse injuries as *microscopic injuries*.

Injuries deemed focal are macroscopically visible with a mass in a clearly defined area. Contusions and epidural, subdural, and intercerebral hemorrhages and hematomas are types of focal injuries. Of the focal injuries, subdural hematomas are associated most frequently with a high morbidity risk (Gennarelli, 1983) and occur largely because of falls (Gennarelli, 1993). Contusions and intracranial hematomas are the primary kind of focal lesions that occur as a result of CHI (Levin, Benton, & Grossman, 1982). Approximately 50% of all head-injury patients admitted to the hospital have sustained

focal injuries, and two thirds of the deaths from head injury are a result of a focal injury (Gennarelli, 1983).

With focal injuries, concentric circles or zones form around the point of contact. In these zones cellular pathophysiology is similar. Gennarelli (1993) proposed three zones. The first zone, closest to the point of impact, contains cellular material that is associated with a mass or localized structural damage. The next zone contains "primary traumatic damage to the brain, but not destruction of the brain tissue itself" (p. 8). The third zone is an area where delayed insults such as edema or ischemia may occur (Gennarelli, 1993). However, the critical point is that, because of these mass effects, brain shifts, herniation, and brainstem compression may take place and be followed by coma. In this case, the coma occurs secondarily to brainstem compression (Gennarelli, 1993).

Diffuse damage is believed to occur in almost all significant head injuries in which the head has suffered a blow (Reitan & Wolfson, 1988). Specifically, diffuse injuries "account for approximately 40% of hospitalised head injured patients, for one-third of the deaths and are the most serious cause of persisting neurological disability in survivors" (Gennarelli, 1985, p. 3). Diffuse axonal injuries (DAIs) are most often the consequence of MVAs and are associated with severe neurologic disability (Gennarelli, 1993; Gennarelli & Meaney, 1996). However, there have been cases in which diffuse axonal injury has occurred as a result of falls greater than the individual's height (Blumberg, Jones, & North, 1989).

In diffuse axonal injury, disruption in brain function occurs as a result of damage to neurons or nerve cells (Gennarelli, 1983; Gennarelli & Meaney, 1996). Neuron axons

are not usually sheared at the time of initial injury, but rather incur stretching at the nodes of Ranvier (Faden, 1993). As a result of the stretching, a defect in the axonal membrane occurs at the node of Ranvier, and depolarisation of the axon follows because proteins are free to enter the axonal membrane at unspecified rates (Gennarelli, 1993). Specifically, "cytoxic factors released into the cellular milieu at the time of impact may initiate a cascade of metabolic events that lead to neuronal death" (Cassidy, 1994, p. 63). Widespread neural dysfunction may occur and be followed by primary coma (Gennarelli, 1993).

Mechanisms of Injury

A CHI can occur as a result of a focal or a diffuse injury. Becoming more familiar with the role that mechanical factors play in injury is critical in understanding brain trauma. Injury mechanisms can essentially be divided into two categories: static loading and dynamic loading. *Static loading* refers to injuries sustained by a slow, compressing type of force. *Dynamic loading* is more common and refers to contact injuries in which the head stops moving very abruptly or motion injuries in which the head is set in motion very quickly. The focus here is on dynamic loading and contact injuries because there is generally a greater incidence due to these factors.

In contact injuries, or focal injuries, the injury is a result of the actual contact with the head. Here, "skull bending, volume changes and propagation of shock waves" (Gennarelli, 1993, p. 7) occur. Skull fractures often result, as do *coup* or *contrecoup* injuries. A coup injury occurs when the head is stopped abruptly, and the brain strikes the skull. In a coup injury the brain is injured directly underneath the skull contact site. As a result, primary damage may be sustained when the skull is pressed inward and is then

abruptly snapped back into place or when the brain rubs against the inner ridges of the skull (Gennarelli & Meaney, 1996). On the other hand, a contrecoup injury occurs away from the site of skull impact. A contrecoup injury might occur opposite the side of the initial coup injury. However, it is more important to recognise that, because of the complex motion factors and the inner ridges of the brain, the injury sustained in a contrecoup injury may not necessarily be directly opposite a coup injury. With both coup and contrecoup injuries, the key factor is "how much of the energy is converted into head motion and how much energy is attenuated in local skull bending" (p. 2619).

The actual volume of the cranial compartment may be subject to change, and the shock waves that radiate from the injury may cause further damage with coup or contrecoup injuries (Gennarelli, 1993). For instance, smaller intracerebral hemorrhages occur at the point of impact and distant from the point of impact as a result of the peaking and ebbing of the shock waves (Gennarelli & Meaney, 1996). Because areas of the skull such as the orbital plate and the sphenoid ridges have an irregular contour, the frontal and temporal lobes are areas where injury frequently occurs (Little, 1985).

In contrast, motion injuries or diffuse injuries to the head occur as a result of rapid acceleration or deceleration. Although acceleration and deceleration are considered to be the same phenomena, whether the movement is translocational, rotational, or angular is a crucial factor (Gennarelli & Meaney, 1996). *Translocational acceleration* occurs when the brain's centre of gravity moves in a straight line. *Rotational acceleration* "occurs when there is a rotation about the center of gravity of the brain without the center of gravity itself moving" (p. 2616). *Angular acceleration* refers to the combined movement involved in translocational and rotational acceleration. In terms of injury severity, angular

acceleration produces the most severe injuries. In fact, angular acceleration can produce every type of head injury except skull fracture and epidural hematoma (Gennarelli, 1985).

Secondary Sequelae

After the primary injury, secondary sequelae can also develop in both focal and diffuse injuries. Secondary damage can occur as a result of bleeding, ischemia, edema, and raised intracranial pressure. Because of the restricted space available inside the brain, bleeding contributes to increased intracranial pressure. The bleeding can be localized and form masslike focal injuries or can occur in diffuse injuries as a series of widespread petechial hemorrhages (Rietan & Wolfson, 1988).

Ischemia is also associated with poorer neuropsychological outcome (Levin et al., 1982; Reitan & Wolfson, 1988). Ischemic damage may occur when cerebral blood flow falls below a critical level. On the other hand, *edema* refers to an increase in the water content of the brain. Here the excess fluid contributes to increased swelling and elevated intracranial pressure. When there is a large pressure difference between areas of brain tissue, herniation of the brain may occur. *Herniation* refers to the displacement or movement of part of the brain tissue of the brainstem through the foramen. (The *foramen* is defined in *Stedman's Electronic Medical Dictionary 4.0* [Stedman, 1998] as "an aperture or perforation through a bone or a membranous structure.") When herniation occurs, the results can be disastrous because areas of the brainstem that control functions such as respiration and circulation may be catastrophically damaged (Little, 1985).

Summary

A single STBI can involve both focal and diffuse injuries. Focal lesions include contusions and intracranial hematomas, whereas diffuse injuries involve widespread damage to nerve fibres. Dynamic force is the most common mechanical mechanism and comprises two kinds of force: contact, as in focal injuries; and motion, as in diffuse injuries. As a result of contact force, the skull bends and shock waves radiate throughout the brain tissue. Subsequently, volume changes occur within the brain, and coma may follow brainstem compression. On the other hand, acceleration and deceleration are the critical factors in motion injury. Angular movement produces the most severe brain injuries—particularly those associated with diffuse axonal injury. Coma can also occur with rotational injury, leading to axonal injury in the brainstem, without compression. As identified earlier, secondary complications that arise from bleeding, ischemia, edema, and elevated intracranial pressure can also cause further injury to the brain.

Variables of Interest in Vocational Outcome Studies

Given the low incidence of return to competitive work, the financial demands on family members, and the limited monies available for long-term rehabilitation programs, improving vocational outcome after STBI is of interest to diverse stakeholders. By studying predictors and combinations of predictors, researchers hope to better understand the problems experienced by individuals with STBI and, subsequently, become more adept at triaging patients to appropriate rehabilitation services. Research pertaining to neurologic, demographic, and psychosocial variables is next examined in relation to vocational outcome.

Neurologic Variables and Vocational Outcome

In individuals with STBI, measures of altered consciousness have been used in conjunction with other neurologic variables to determine the level of injury severity and to predict outcome (see Adams, Parsons, Guilbertson, & Nixon, 1996). For STBI, changes in an individual's mental efficiency in the short term and long term have been associated with duration of altered consciousness. Changes in consciousness have been primarily examined via the Glasgow Coma Scale (GCS) and through evaluation of posttraumatic amnesia (PTA). A discussion of length of coma (LOC), GCS, and PTA in relation to vocational outcome follows.

Length of Coma

Length of unconsciousness and depth of coma have been commonly investigated in vocational outcome research. Consciousness can be evaluated on a continuum ranging from full alertness to drowsiness to stupor and, finally, to coma. *Coma* refers to the period when the individual is in a prolonged state of unconsciousness, and strong stimulation of any sort cannot arouse them (Chandler, 1993). When the duration of the coma is greater than six hours, the injury is rated as being in the severe range (Bishara, Partridge, Godfrey, & Knight, 1992; Lezak, 1995)

The inclusion of length of coma (LOC) as a prediction variable in vocational outcome research has revealed that a correlation exists between LOC and the likelihood of returning to work or school. Individuals in a coma for longer periods of time have a greater likelihood of being unemployed (Cifu et al., 1997). For example, in one study, individuals who were in a coma for greater than 24 hours were more likely to be

unemployed than were individuals who were in a coma less than one hour (Fraser et al., 1988).

Recent research has helped to illuminate the relationship between age, length of coma, and vocational outcome more clearly. According to Rao et al. (1990), "Patients who returned to work or school were younger, more likely to have a normal CT scan or one indicative of unilateral damage, had shorter duration of coma and were in inpatient rehabilitation for a shorter length of time" (p. 51). Similarly, Asikainen, Kaste, and Sarna (1998) found that when coma lasted for one week or less, individuals ranging from 8 to 40 years at the time of injury were able to return to independent work in adulthood. In comparison, individuals 7 years and younger at the time of injury were more likely to be involved in independent work when the coma lasted one day or less. Individuals older than 40 years were likely to be involved in independent work only when duration was half an hour or less. Moreover, Asikainen et al. concluded that "LOC is probably the best index for predicting vocational outcome, except for the difficulty in defining the end of coma in patients with multiple injuries who are relaxed and sedated when connected to the respirator" (p. 103).

In contrast, Stover and Zeiger (1976) pointed out that the use of LOC is problematic because coma has many gradations, which can make classification extremely difficult. Moreover, when duration of coma was examined as an outcome predictor, the results demonstrated that the duration of PTA was a significant outcome predictor, whereas duration of coma was not. The duration of PTA accounted for 24% of the variance in verbal learning and 19% of the variance in nonverbal problem solving (Shores, 1989). Similarly, LOC did not reliably predict vocational and educational

outcome in research by Ip, Dornan, and Schentag (1995). However, they indicated that barbiturate-induced coma was a common method for dealing with elevated intracranial pressure, and this may have confounded the results pertaining to LOC.

Glasgow Coma Scale

The Glasgow Coma Scale (GCS) is based on separate assessment of motor responses, verbal responses, and eye-opening criteria. Currently, the revised version of the GCS (15-point breakdown) is commonly used in predicting outcome in the early stages after injury. A score of 8 or less on the GCS is internationally accepted as the criterion for severe injury (Richardson, 1990). The exact descriptors for the GCS can be found in Appendix A, along with the criteria for severity level.

Several researchers have examined the usefulness of the GCS score as a predictor of later vocational outcome. Stambrook, Moore, Peters, Deviaene, and Hawryluk (1990) reported that "increasing severity of injury as measured by the admission GCS score has been found to be related to lower post-injury vocational status" (p. 188). On a similar note, Dikmen et al. (1994) reported that approximately 25% of individuals with an admission GCS score of 8 or less successfully returned to employment within one year of their injuries, compared with 80% of the individuals with a GCS in the 13 to 15 range.

Ip et al. (1995), in contrast, found that "GCS and length of coma respectively did not reliably predict vocational/educational outcome" and concluded that GCS "might be more useful in the initial stages in the evaluation of early treatment and in determining mortality" (pp. 522-523). The time after injury that the GCS score is obtained appears to be critical, because the best score taken in the first 24 hours was found to be more highly

correlated with outcome than were scores taken at admission (Alexandre, Colombo, Nertempi, & Benedetti, 1983; Levin et al., 1990).

Another issue under consideration is the utility of the GCS with older populations. In one study (Rothweiler, Temkin, Dikmen, & Sureyya, 1998), there was not a significant difference between different age groups admitted to the emergency room when GCS was examined in relation to depth of coma. However, individuals 60 years or older took longer than younger individuals did to emerge from coma and had a poorer outcome at one year postinjury. Therefore, injury severity may be underestimated in older individuals when based on the GCS score taken upon admission to the hospital.

Although injury severity as identified via the GCS on hospital admission is commonly used in assessment of neurologic patients, concerns pertaining to its use have been raised for consideration. For example, the initial GCS may not offer reliable estimates of outcome when patients are intoxicated during injury, are intubated due to respiratory difficulties, are aphasic (Lezak, 1995), or suffer from a delayed traumatic intracerebral hematoma (Young, Gleave, Schmidek, & Gregory, 1984). Moreover, the admission GCS may underestimate injury severity with elderly patients (Rothweiler et al., 1998). Therefore, despite its widespread use and simplicity in administration, careful consideration of the GCS with individual patients is necessary.

Posttraumatic Amnesia

Posttraumatic amnesia (PTA) is considered to be the period after traumatic brain injury when an individual is in a confused state and is unable to form continuous memories of daily occurrences (Forrester, Encel, & Geffen, 1994). The estimate of coma duration is taken into consideration in PTA evaluation. It is commonly accepted that

posttraumatic amnesia extending past 24 hours is deemed to be a severe brain injury. Russell and Smith's (1961) criteria for the different severity levels in relation to PTA can be found in Appendix B.

The length of PTA is often considered an important variable in outcome prediction with TBI because it is related to functional and employment outcome (Asikainen et al., 1998). For example, PTA was found to be more effective in predicting cognitive outcome two years after injury than was duration of coma (Brooks, Aughton, Bond, Jones, & Rizvi, 1980). Six months to a year postinjury, both GCS and PTA were found to be associated with outcome as defined by the Glasgow Outcome Scale (GOS). However, only PTA emerged as a significant predictor when other variables were considered in multivariate analysis (Bishara et al., 1992). Outcome according to the GOS is broken down into a 5-point scale based on death, persistent vegetative state, severe disability, moderate disability, and good recovery. For a more comprehensive description of the scale, refer to Richardson (1990).

When PTA was examined in relation to employment as an outcome, the results demonstrated that the mean length of PTA was longer for individuals who were unemployed at one year postinjury (Cifu et al., 1997). In another study, individuals whose PTA duration was 33 days or longer were unsuccessful in returning to their premorbid employment status (Paniak, Shore, Rourke, Finlayson, & Moustacalis, 1992).

Similarly, in a large-scale study that examined individuals who had suffered traumatic injuries at different ages and later vocational outcome, it was found that employability decreased in individuals of any age group who had a longer period of PTA (Asikainen et al., 1998). For those individuals in the study over 40 years old, employment

similar to postinjury employment or independent work status was correlated with PTA about one week or less in length. In contrast, for those patients with PTA about four weeks in length, who were injured at 8 to 40 years of age, most had the capacity to work in the subsequent job market.

Concerns have been raised about the ability of PTA measures to differentiate between moderate and severe injuries in research (Brooks, McKinlay, Symington, Beattie, & Campsie, 1987) and about the different methods of assessment used for PTA evaluation when comparing results across studies. In retrospective evaluation of PTA, confabulation, alcohol or drug intoxication at injury, isolated islands of memory, and the fact that a patient may simply be recalling what family members have told him/her about the accident rather than presenting his/her own account of what actually happened may confound the accuracy of the results (Forrester et al., 1994). In contrast, McMillan, Jongen, and Greenwood (1996) concluded that retrospective measures can provide reliable assessment of PTA in severe TBI.

To help obtain greater accuracy in PTA assessment and avoid some of the problems associated with retrospective measurement, prospective measures were developed. In particular, the Galveston Orientation and Amnesia Test (GOAT) and the Westmead PTA Scale are two of the most widely used measures. Although the GOAT is associated with scores achieved on the GCS and correlates with retrospective measures (see McMillan et al., 1996), concern has been raised that it measures disorientation, not amnesia (Forrester et al., 1994). In particular, the recent work of Stuss et al. (1999) revealed that when the ability of TBI patients to recall three words within 24 hours was examined, successful free recall occurred at a later date when their GOAT scores were

low than when they obtained normal scores. Thus, the GOAT primarily provides a measure of orientation and recognition. In comparison, the Westmead PTA scale has strong interrater reliability (Geffen, Bishop, Connell, & Hopkins, 1994). However, there are still concerns about the reliability of particular items that pertain to facial recognition and monthly recall (Forrester et al., 1994).

Summary

Examination of neurologic variables in relation to work outcome revealed that three measures are used to assess early neurologic status: LOC, GCS, and PTA. An LOC equivalent of greater than 24 hours has been found to correlate with poorer vocational outcome. The best GCS score taken in the first 24 hours after injury also serves as a good predictor for later outcome. However, in most research, PTA was found more highly correlated with vocational status at six months than was coma duration or GCS.

There are still some unanswered questions pertaining to the correlation of PTA, age of injury, and vocational outcome. For individuals over 40 years, being able to return to independent work or work similar to that of postinjury status was dependent upon the PTA being one week or less. However, a PTA of approximately a month or less was associated with capacity to work in the job market for those individuals who were injured when they were from 8 to 40 years old. Another study reported that adults whose PTA was 33 days or greater were unable to return to their premorbid work status. In general, it appears that a PTA longer than a month is associated with poorer vocational status, but that the age at which the injury occurred may have some bearing, as might the way that work is defined in outcome studies.

Unfortunately, all methods of neurologic assessment are imperfect. With LOC one must be vigilant in defining when coma has ended in individuals with respiratory difficulties or for those who are sedated. Likewise, the time that the GCS score is taken and the use of the GCS with older populations or patients who are intubated, medicated, and intoxicated warrant caution.

With PTA assessment, retrospective assessment may be limited due to confabulation, alcohol or drug intoxication, islands of memory, and recall based on family members' accounts of the event. Prospective measurement also has its limitations. Concerns have been raised that PTA measures assess disorientation rather than amnesia and that items pertaining to facial recognition and monthly recall may not be reliable. Ideally, it would be advantageous to rely upon more than one neurologic measure to help evaluate neurologic status. However, day-to-day practice reveals that it may be unrealistic given that often only information about PTA is consistently provided.

Non Brain Injury Severity and Vocational Outcome

Traumatic brain injuries are clearly recognised as being a threat to life and as having an impact upon vocational outcome (i.e., Asikainen et al., 1998; Stambrook et al., 1990). However, the impact of other body injuries in return to work is also of interest given that individuals involved in MVAs often sustain other injuries in addition to a traumatic brain injury. Moreover, the severity of the other bodily injuries in conjunction with STBI may further serve as a detriment in returning to work. To help determine injury severity, some researchers have calculated an injury severity score (ISS) based on the rules outlined in the Abbreviated Injury Scale (AIS; Association for the Advancement of Automotive Medicine, 1990) to help in this matter. Examining the severity of other

body injuries in individuals who have sustained STBI will help to provide a better understanding of the impact upon vocational outcome.

Mackenzie, Shapiro, Smith, Siegel, and Moody (1987) examined factors that impact upon return to work one year postinjury from traumatic brain injury. They relied on the ISS score to provide information about the specific body regions and reported that individuals with severe brain injuries or those individuals who had sustained a spinal cord injury had a low rate of returning to work. As well, they revealed that individuals who sustained injuries to their extremities also had a low rate of return to work. Mackenzie et al. reported that individuals with severe brain injury had a return-to-work rate of 43%, individuals with spinal cord injuries had a rate of 21%, and individuals with a severe injury to one or more of their extremities had a rate of 58%. It can be anticipated that if an individual with traumatic brain injury also sustained other bodily injuries, then his/her return-to-work rate might be significantly reduced. When Mackenzie et al. examined the limitations that the specific injuries had with respect to work, they discovered that those individuals with higher AIS scores had more limitations.

Dacey et al. (1991) examined the impact of non brain injuries and brain injuries on neuropsychological and psychosocial outcome at one month postinjury. Individuals with brain injuries had any period of LOC, PTA of one hour or greater, or cerebral trauma identified by positive neurological signs, skull fracture, or hematoma. The non-neural group was comprised of individuals with acute injuries to body parts other than their heads. Dacey et al. relied on the ISS score to provide information about the specific body regions in their comparisons between the two groups. Their findings reveal that the ISS score was associated with mortality. In regard to neuropsychological outcome, they

found that the severity of the brain injury was critical in regard to cognitive outcome. However, the psychosocial outcome was influenced by the severity of the head injury and other body injuries. In particular, even when Dacey et al. controlled for other body injuries, the severity of the brain injury impacted upon cognitive function, everyday functioning, independence, and return to work. As well, they suggested that poor outcome in individuals with mild or moderate brain injuries might be related to injuries sustained in other body areas.

Dikmen et al. (1994) examined employment rates and predictive factors after traumatic brain injury within one or two years postinjury. The study participants were divided into two groups (i.e., a group who sustained brain injuries and a group with other bodily injuries) based upon the same criteria used by Dacey et al. (1991). Head injury severity was assessed with the GCS scale, and body injury other than the head/brain was assessed with the AIS and calculation of an ISS score. Dikmen et al. developed a model to assist in predicting the probability of returning to employment. Their research showed that the severity of injuries to other body systems also had an impact upon return-to-work rates two years postinjury. As well, they found that individuals with the most severe brain injuries were more likely to have more severe injuries to other body systems.

Summary

Examination of the contribution of injuries to other bodily areas and their level of severity as measured by the AIS scale through calculation of an ISS score indicated that the impact of non brain injuries must also be considered in research pertaining to individuals with STBI and vocational outcome. In particular, individuals who obtained higher injury severity scores had more limitations in returning to employment, and

individuals with STBI were more likely to have the most severe injuries to other bodily areas. However, the severity of the brain injury remained the most significant detriment to vocational and day-to-day function even when the severity of non brain injuries was controlled.

Demographic Variables and Vocational Outcome

Noninjury characteristics of patients with TBI have been studied as a means to help predict vocational outcome. Age, educational achievement, premorbid intelligence, family/social support, substance abuse, prior psychiatric illness, and prior brain injury have all been found to correlate to some degree with outcome. Therefore, a discussion of these variables as they pertain to traumatic brain injury is presented.

Age

Age has been studied as a variable in several vocational outcome studies with individuals with TBI (Asikainen, Kaste, & Sarna, 1996; Crépeau & Scherzer, 1993; McMordie, Barker, & Paolo, 1990; Rothweiler et al., 1998; Ruff et al., 1993; Stambrook et al., 1990). Teens or young adults who suffer STBI fare better vocationally than individuals who sustain a severe injury at seven years of age or younger (Asikainen et al., 1996). Likewise, speed of recovery was found to be affected by age, with younger adults encountering greater success than older individuals at six months (Ruff et al., 1993) and at one year postinjury (Rothweiler et al., 1998).

Although some researchers have found that persons over the age of 40 are less successful in returning to competitive work (e.g., McMordie et al., 1990; Ponsford, Olver, Curran, & Ng, 1995; Rothweiler et al., 1998), others have suggested that 60 years or older is the critical age when there is less probability of returning to work (e.g.,

Crépeau & Scherzer, 1993; Rothweiler et al., 1998). For example, in a meta-analysis of TBI studies, age was found to be related to work status only in those studies that included individuals over 60 years of age (Crépeau & Scherzer, 1993).

Educational Achievement and Vocation

Higher premorbid educational achievement has been linked with greater vocational success in return to work after STBI (Dikmen et al., 1994; Girard, Brown, Burnett-Stolnack, Hashimoto, et al., 1996; Gollaher et al., 1998; Stambrook et al., 1990). Young individuals with STBI who obtained at least junior high school or vocational education before their injury had a greater likelihood of finding employment than did those individuals who were injured when they were in preschool or elementary school (Asikainen et al., 1996). However, in a meta-analysis of TBI studies, the results demonstrate that individuals with greater qualifications for employment were only slightly more apt to return to the competitive job market (Crépeau & Scherzer, 1993) when work status was categorically defined (i.e., executive, skilled, unskilled). Further research may reveal different results, because the criteria used in the meta-analysis were quite restrictive. Studies that contained measures of return to school and domestic work were excluded, as were studies that did not report a predictor or indicator of employment. In addition, the strict guidelines used in the study were seen as limiting, because data entry on other factors such as employment satisfaction, job stability, work requirements, and volunteerism were not considered.

Examination of different vocations revealed that persons in trades and service employment (e.g., building trades) seemed to be the least affected by their injuries (Fraser et al., 1988). It was suggested that these individuals were least affected because they were

able to perform their jobs at their own pace and had minimal contact with others in day-to-day assignments. In addition, these individuals were not in positions that were cognitively demanding and, subsequently, did not require retraining for lower-level positions. However, one wonders whether this finding would be obtained in a larger sample given that individuals in such occupations do indeed have deadlines to meet and often work with other persons.

In one study individuals with the highest level of education were more likely to be unemployed after severe injury (Asikainen et al., 1996). Specifically, 58% of those individuals with premorbid technical or university education were unable to return to their former jobs after their injury. The following were proposed as to why these results were obtained: (a) The subjects were older, and retraining was not a good possibility; and (b) the subjects were in management positions, and their positions were very cognitively demanding. On the other hand, individuals with severe brain injury who had a preinjury vocational or junior high school level of education had the highest frequency or capacity for a successful return to employment in Asikainen et al.'s study because they returned to their preinjury employment role or pursued vocational counselling, retraining, or academic upgrading for a new employment role.

Although many researchers have found that educational status does have some bearing on work outcome, it appears that the relationship between educational achievement and employment is interrelated with many factors. Thus, determining the importance of each factor in regard to outcome prediction is difficult because successful return to work varies from individual to individual, as do the specific characteristics of their employment and employers.

Premorbid Employment Status and Later Vocational Outcome

The relationship between premorbid employment and later vocational outcome has also been explored (e.g., Fabiano & Crewe, 1995; Kim & Colantonio, 1997; Stambrook et al., 1990; Thomsen, 1992). Fabiano and Crewe examined the contribution of severity of injury, premorbid occupation, and psychometric status variables in predicting vocational outcome in a sample of STBI individuals. Premorbid variables such as age, number of years of education, gender, and prior occupation were not related to employment after STBI. The strongest predictor of employment after STBI was psychometric status as measured by subtests on the WAIS-R. Individuals who were in college or were working full time were discernible from those who were unemployed or employed part time. However, the psychometric scores of the unemployed participants and the participants who were employed on a part-time basis were indistinguishable. Fabiano and Crewe concluded that some of the unemployed individuals might likely have been candidates for part-time employment.

Kim and Colantonio (1997) conducted an investigation of change in vocational status in a sample of individuals who had sustained mild, moderate, and severe injuries and who were 10 years postinjury. They determined the work status of individuals who were employed before and after injury by using three socioeconomic indexes: the Blishen Socioeconomic Index for Occupations, the Pineo Socioeconomic Classification of Occupations, and the Hollingshead Index. They concluded that the Blishen Socioeconomic Index for Occupations score was the most sensitive in detecting changes in status. However, "no significant correlations were found between severity of injury as measured by the Glasgow Coma Scale and the Injury Severity scores, education, at the

time of injury or the measures whether participants had received compensation and change in vocational status" (p. 192). They concluded that there were no significant changes in vocational status after injury. Nonetheless, they also acknowledged that the premorbid vocational status of the individuals may have had some bearing on their findings in that the individuals may have had lower status jobs to begin with or had established careers and did not want to seek greater career advances. In addition, their sample size was small, and this may also have had some bearing on their findings.

Stambrook et al. (1990) conducted a study of employment outcome in individuals who had sustained mild, moderate, and severe injuries. Like Kim and Colantonio (1997), they relied on the Blishen Socioeconomic Index for Occupations to provide a measure of socioeconomic status. However, their findings indicated that there was a significant difference between the preinjury vocational status and the postinjury vocational status of individuals with severe injuries as opposed to mild injuries. Individuals with severe injuries were not able to return to employment levels equivalent to their former employment level as measured by the Blishen Socioeconomic Index for Occupations.

Substance Abuse

A relationship exists between premorbid alcohol abuse and traumatic brain injury (Dikmen & Machamer, 1995; MacMillan, Martelli, Hart, & Zasler, 1999). A greater number of individuals with brain injury have premorbid alcohol problems compared to the Canadian national rate (Wong et al., 1993). Poor vocational outcome has been associated with premorbid alcohol abuse in individuals with traumatic brain injury. For example, Ip et al. (1995) reported that 46.2% of the individuals who did not return to employment or school had a preinjury history of alcohol abuse. Ben-Yishay, Silver,

Piasetsky, and Rattock (1987) also found that those individuals with premorbid and postinjury alcohol problems were less successful in returning to work. Similar findings were reported by MacMillan et al. in an examination of premorbid psychiatric status and substance abuse. They found a correlation between lower employment status and premorbid psychiatric and substance abuse history in individuals with moderate and STBI who were at least two years postinjury.

Family Support and Marital Status

Understanding the nature of the STBI and the functional limitations that may arise is critical in terms of facilitating vocational outcome for the survivor. Families who are more supportive and have better adjustment levels tend to promote employability for individuals with TBI and other disabilities (Wehman, West, Kregel, Sherron, & Kreutzer, 1995). It appears that a relationship exists between employment and family cohesion in that individuals with TBI who come from more cohesive families find it easier to return to work or school (Kaplan, 1991). Families with wider social groups, closer relationships, and greater support for the caregiver were seen as functioning more successfully. Likewise, poorer family functioning was associated with greater behavioural difficulties in the individual with STBI (Douglas & Spellacy, 1996). Behavioural difficulties were measured by the total score achieved on the Neurobehavioral Rating Scale. This measure takes into account behaviours such as inattention, disorientation, anxiety, mood, memory, agitation, self-appraisal, hostility, uncooperativeness, motivation, and tension.

Unfortunately, families can engage in denial, which is counterproductive to vocational outcome, when they unrealistically predict that an individual will automatically make a full recovery and simply return to his/her preinjury employment

status (Arokiasamy & Millington, 1994). Families may also be overwhelmed by the financial burdens associated with income loss and try to encourage the individual to return to work when he/she is not sufficiently recovered. The converse may occur when the family and the patient see employment as an undesirable goal because large cash settlements may be obtained through litigation (Ben-Yishay et al., 1987; Binder & Rohling, 1996).

Marital status, as with family issues, shows a variable relationship with employment. When Greenspan, Wrigley, Kresnow, Branche-Dorsey, and Fine (1996) divided study participants into married and nonmarried groups, they found that married individuals were more likely to return to employment after one year than were individuals who were not married. On the other hand, Ip et al. (1995) reported that individuals who were married or in common-law relationships had lower employment and return-to-school rates than did individuals who were single, divorced, separated, or widowed. However, when they examined marital status as a variable in a later regression analysis, the results were unclear, and they concluded that more research was required with larger samples. Thus, perhaps it is not merely whether the individual is married or not, but rather the qualities of the relationship that may influence vocational outcome.

Summary

In regard to employment after STBI, teens and young adults fare better vocationally than do children injured at a young age. Speed of recovery is faster for younger adults than for older adults. Individuals who are 40 years old or younger are more likely to return to competitive work than are older individuals. However, some

research has indicated that unsuccessful employment may pertain more to individuals who are 60 years and older.

The research on educational achievement tends to vary. Some studies reported that having a junior high or higher level of education before injury has been linked with a greater chance of finding employment after STBI, and others revealed that individuals with the highest educational level were unable to return to employment. On a similar note, the relationship between premorbid work status and postinjury outcome remains an area of controversy. Some studies reported that there was a significant relationship between preinjury socioeconomic status and postinjury status, whereas others reported no significant differences. Thus, it appears that other factors are at play here; namely, the kind of job, the motivation for employment, and, perhaps most important, how the demands of the particular job interact with the patient's abilities and disabilities. Regardless, premorbid and postinjury substance abuse and psychiatric problems have been found to be related to poorer vocational functioning.

Cognitive Variables and Vocational Outcome

After STBI, cognitive deficits of various degrees are common. Disorders in learning, memory, attention, speed of information processing, planning, initiation, perception, awareness, judgement, problem solving, and communication are often reported (Girard et al., 1996; Mazaux et al., 1997; Rosenthal et al., 1990). In fact, long-term cognitive difficulties are more problematic than physical sequelae when considering vocational rehabilitation after STBI (Ben-Yishay & Diller, 1983). Cognitive correlates associated with vocational outcome are discussed in a thematic manner. However, it is

important to keep in mind that these divisions or themes are simply for discussion purposes because cognitive functions are interrelated.

Memory and Verbal Learning

Memory deficits are commonly associated with STBI and can range from mild forgetfulness to permanent amnestic disorders. Approximately 36% of individuals with STBI will have memory impairment (Baddeley, Wilson, & Watts, 1995). However, it is difficult to determine whether specific processes such as encoding, storage, and retrieval are impaired after STBI or whether a combination of all three processes is impaired (Rosenthal et al., 1990). Nonetheless, individuals with STBI experience greater difficulty when the information to be learned and remembered is more complex (Rosenthal et al., 1990).

In the literature, memory function and verbal learning were often discussed together, primarily because measures of memory function presented auditorily also may examine an individual's verbal learning ability. However, it must be acknowledged that studies examining memory function vary greatly depending upon the methods used, the type of memory explored, or the follow-up interval used (Crépeau & Scherzer, 1993). For the purposes of the current discussion, only the literature pertaining to learning/memory function and vocational outcome was considered.

In relation to vocational outcome, Brooks et al. (1987) found that the most significant items that distinguished workers and nonworkers were those items related to verbal learning. Those individuals with STBI who were unemployed after seven years presented with lower scores on verbal memory and information processing tasks.

Specifically, the immediate recall score on the Logical Memory subtest from the Wechsler Memory Scale (WMS-R) was the best predictor of employment.

When Ben-Yishay et al. (1987) conducted a cognitive rehabilitation study for individuals with STBI who were unsuccessful in competitive employment, the common problems demonstrated by the target group were cognitive impairments, disinhibition, poor interpersonal skills, lack of understanding or awareness about the nature of the injury sequelae, and inappropriate expectations about reemployment options. As well, individuals who were unsuccessful in returning to work had trouble remembering to apply memory strategies after participation in an experience. Thus, how proficient the individual becomes in applying compensatory memory strategies may be important in successful employment.

Mazaux et al. (1997) conducted a study of individuals who sustained mild, moderate, and severe injuries. The results demonstrated that the most common difficulties experienced by individuals who had sustained STBI were fatigue, impaired memory, depressed mood, poor initiation, lack of motivation, poor planning, and decreased mental flexibility. In particular, only 6 of the 17 individuals with STBI were able to return to work. Poor employment rates after STBI were associated with outcome as measured by the Glasgow Outcome Scale (GOS) and with neurobehavioral outcome as measured by the Neurobehavioral Rating Scale. They concluded that fatigue, motor slowing, mental inflexibility, and impaired planning skills were associated to a greater degree with poorer employment rates than were impaired attention, memory function, poor initiation, and motivation. However, they acknowledged that there were several limitations associated with their study that might have had an impact on their findings.

First, they had used the newly revised version of the Neurobehavioral Rating Scale, and the establishment of its construct validity was still ongoing. As well, they suggested that the five-year span from the initial TBI to the outcome study might have had some bearing on their findings. They suggested that other life events might have impacted upon function, and an individual who had sustained a TBI might be more inclined to attribute his/her problems solely to the TBI. Moreover, because the study was a mixed severity level sample and the numbers for STBI were relatively small, it is possible that different findings might have resulted if the sample had focused only on STBI and been larger.

Attention and Information Processing

A decrease in the ability to process information efficiently is a common problem after traumatic brain injury (Horton, Wedding, & Webster, 1997). In one study individuals with deficits in information processing, complex attention skills, visual spatial skills, and executive functioning had less favourable outcomes (Girard et al., 1996). In another study Ruff et al. (1993) reported that returning to work in 6 or 12 months is significantly associated with verbal cognitive abilities and performance on neuropsychological tasks requiring speeded performance.

Speeded information processing has been measured via administration of the Paced Auditory Serial Addition Test (PASAT). In particular, Brooks et al. (1987) determined that effective recall of the longest series of numbers on the fast rate of the PASAT was one of the best predictors in a multiple regression analysis evaluating individuals who were able to return to work. Likewise, when a multimethod approach was used to evaluate individuals with chronic postinjury employment failure, individuals who were unsuccessful in returning to work scored in the impaired range on the

Trailmaking, the Paced Auditory Serial Addition Test–Revised, and the Symbol Digit Modalities Tests (Devany, Kreutzer, Halberstadt, & West, 1991). Ponsford and Kinsella (1992) found that the oral version of the Symbol Digit Modalities Test was the best measure of reduced speeded information processing. However, their results also demonstrated that, when given the opportunity, individuals with STBI would sacrifice speed in order to preserve accuracy.

Executive Functions

After STBI, an individual may experience changes in his/her application of executive processes such as planning, sequencing, self-monitoring, self-correcting, and initiation and completion of an activity. These difficulties may occur because the brain is unable to integrate functions in a holistic manner (Horton et al., 1997). Executive-skill deficits may interfere with an individual's ability to direct and control his/her own behaviour, which can have a disastrous effect on daily function and employment. For example, even when individuals present with well-preserved attention and memory, executive-skill deficits may prevent them from functioning independently and essentially render them incapable of controlling their own destinies (Lezak, 1995; Vilkki et al., 1994).

The role of executive-skill deficits in employment has been explored through the administration of neuropsychological measures such as the Trailmaking Test B, the Category Test, and the Wisconsin Card Sorting Test. These tests are purported to provide an assessment of executive skills by measuring flexibility in dealing with changing ambiguous abstract stimuli. Good scores are largely dependent upon the ability to self-monitor and self-correct. In particular, research with the Trailmaking Test B and the

Category Test revealed that individuals who were employed after TBI were less impaired than were those who were unemployed (Fraser et al., 1988).

The Wechsler IQ Test's Performance Scale

The Performance Scale of the WAIS, WAIS-R and the WAIS-III is often used as part of the assessment battery after STBI. The scale provides a measure of several different skills, such as the following: speeded performance, visual-motor dexterity, attention to detail, synthesis and analysis of wholes to parts or parts to wholes, and detection of a logical sequence of events (Kaplan & Saccuzzo, 1997). Higher scores on the Performance Scale are associated with a greater likelihood of returning to work (Fraser et al., 1988; Girard et al., 1996; Ip et al., 1995). For example, when Lam et al. (1991) compared three groups of patients on the basis of return to competitive employment, marginal employment, and nonemployment, the competitively employed group differed significantly from both the marginally employed and the nonemployed group on the WAIS Performance IQ score. In addition, the competitively employed group differed significantly from the nonemployed and marginally employed group on two other measures, the Benton Visual Retention Test and the Distractibility subtest from Gordon's Diagnostic System. They concluded that individuals who were likely to return to employment and who tended to have higher salaries had higher cognitive abilities, more intact visual spatial memory function, and fewer problems with distractibility. However, they also hypothesised that individuals who realised that they were unable to process information quickly may in fact have been somewhat reluctant to return to work. (Lam et al. did not consider an estimate of preinjury intellectual function in their study, and some of their findings could be confounded by premorbid intellectual abilities.)

Summary

After STBI, cognitive impairments are usually common. Impairments in memory, learning, speeded information processing, and executive skills are associated with a lower rate of employment. Individuals who are unsuccessful in returning to work can present with difficulties in one or more areas of cognitive function. Research has demonstrated that those individuals who are unsuccessful in returning to employment may have lower scores on the Logical Memory subtest of the WMS-R, the Trailmaking Test (Part B), the Category Test, the PASAT, and the Symbol Digit Modalities Test. In addition, higher scores on the Performance Scale of the WAIS, WAIS-R and the WAIS-III were associated with a greater likelihood of returning to work.

Psychosocial Adjustment and Vocational Outcome

Psychosocial issues can also pose difficulties for the individual who has suffered STBI because of persistent personality changes, emotional reactivity, and affective disorders (Horton et al., 1997). Specifically, difficulties with irritability, anger, lability, frustration, impulsivity, disinhibition, depression, anxiety, hopelessness, helplessness, loneliness, denial, and decreased self-esteem have all been identified in the literature (Antonak, Livneh, & Antonak, 1993; Gray, Shepherd, McKinlay, Robertson, & Pentland, 1994; Horton et al., 1997; Kaplan, 1993; Morton & Wehman, 1995; Oddy, Coughlan, Tyerman, & Jenkins, 1985; Tate, Lulham, Broe, Strettles, & Pfaff, 1989; Weddell, Oddy, & Jenkins, 1980). Psychosocial adjustment after STBI may take many years, and many individuals will not return to their premorbid level of function (Kaplan, 1993). For this reason it is important to explore the relationship between psychosocial correlates and

vocational outcome. Thus, the focus is directed towards personality changes in general and then shifts towards more specific problems.

Personality Changes in General

Weddell et al. (1980) compared a group of individuals with STBI who were employed full time and those who were unemployed approximately two years after injury. They discovered that there were no age or social-class differences between the two groups, but that the unemployed group had a higher incidence of memory and personality disturbances. In particular, those individuals with postmorbid personality changes were less likely to return to work. Irritability, aggression, childishness, sexual disinhibition, restlessness, apathy, and emotional lability were noted as troublesome personality changes. When the same group of individuals was reassessed seven years later, employment status remained the same. Individuals who were without a job initially were still unemployed, and individuals who had held a job were still employed.

Askenasy and Rahmani (1988) summarized several research studies conducted at the Loewenstein Hospital in Israel in relation to 10 years of clinical experience. They explored the relationship between work congruence and psychiatric symptoms. *Work congruence* was defined as "the correspondence between an individual's residual capacities and the level of his employment" (p. 320). Askenasy and Rahmani found that psychiatric dysfunction was negatively associated with work congruence. They hypothesized that individuals presenting with psychiatric problems may have reduced ability to cope with the stresses associated with work and day-to-day life. Similar findings were reported by MacMillan et al. (1999) in an examination of premorbid psychiatric status, substance abuse, and later vocational status in a group of individuals

with moderate STBI. They found that there was a correlation between lower employment status and premorbid psychiatric and substance abuse history.

Although the different studies reviewed here have indeed attempted to examine personality function in a more global manner and to some degree the possible consequences in relation to work, none have directly examined the attitudes of STBI individuals pertaining to work. Only one study has examined such attitudes, and this was done indirectly (e.g., Klonoff, Lamb, Henderson, & Shepherd, 1998). Similar findings were reported by MacMillan et al. (1999) in an examination of premorbid psychiatric status and substance abuse. They found that there was a correlation between lower employment status, premorbid psychiatric, and substance abuse history in individuals with moderate and STBI who were at least two years postinjury.

Klonoff et al. (1998) examined several attitudinal outcome variables such as "patient and family working alliance, work readiness, work eagerness, and compensation status" (p. 684) via rehabilitation staff ratings in patients with TBI, cerebrovascular accidents, and other brain injuries (tumour resections, anoxia, infections). *Work eagerness* addresses an individual's motivation to return to work or school, and *work readiness* refers to the perceived ability of an individual to successfully return to premorbid level employment.

Work eagerness scores were significantly different for the poor outcome and good outcome groups. Those in the fair and good outcome groups had higher ratings, indicating that they were more eager to return to work than were the poor outcome group. However, there were not significant differences between the poor and good outcome groups in regard to work readiness.

The results demonstrated that patients who were seeking compensation presented with decreased motivation to return to work even though they had been judged as being ready to return to work (Klonoff et al., 1998). Specifically, individuals in the poor outcome groups achieved significantly higher scores on neuropsychological measures (i.e., Wechsler Adult Intelligence Scale–Revised, Symbol Digit, Controlled Oral Word Fluency) than did the fair or good outcome group. Thus, TBI compensation-seeking individuals who likely had milder injuries and better neuropsychological test scores tended to present as less eager to return to work, but the group with greater severity of injury (the good outcome group) were more motivated and productive. This finding is in keeping with the findings of other researchers in that monetary incentives have a greater impact on individuals with mild brain injuries than on individuals with moderate or STBI (Binder & Rohling, 1996).

Specific Emotional and Personality Problems After STBI

After STBI, difficulties with anger, impulsivity, disinhibition, impatience, anxiety, depression, denial, lack of awareness, and apathy have been reported. Because the focus is on employment, only the problems that have been found to be directly associated with vocational outcome are addressed.

Anger. Anger can present in lesser or greater degrees and, accordingly, ranges from minor irritability to physical aggression. Irritability is the most common behaviour change after STBI and remains a significant problem over time (Brooks, 1988; Ponsford et al., 1995; Weddell et al., 1980). In one study irritability was associated with increased fatigue and difficulty in following the gist of conversations (Hinkeldey & Corrigan, 1990). As well, lack of family cohesion has been linked to irritability and aggressiveness

in more emotionally unstable individuals with STBI living in less cohesive and less supportive family systems (Kaplan, 1991). However, irritability per se is not related to employment status when it is measured through patients' own complaints (Van Zomeren & Van den Burg, 1985) or information obtained from a significant other (Weddell et al., 1980; as cited in Crépeau & Scherzer, 1993).

Anger control may be a common complaint, because 70% of STBI patients continue to experience difficulty with anger management up to four years postinjury (Lezak, 1987). Specifically, they may have problems dealing effectively with disagreements, adapting to changes, recognising when their comments have upset others, and managing their temper (Prigatano, Altman, & O'Brien, 1990). Consequently, they may find it difficult to maintain friendships, have trouble making new friends, and be seen as childish in their interactions with others (Lezak, 1978; Oddy et al., 1985). These difficulties can be externalized towards others, which subsequently leads to further interactional difficulties (Hinkeldey & Corrigan, 1990). Specifically, inability to control anger or emotions was a highly significant predictor of failure to return to work in a study by Brooks et al. (1987).

Depression. Depression is a common psychosocial problem experienced after STBI. Rates for depressive symptoms have varied from 60% (see Ponsford et al., 1995; Tyerman & Humphrey, 1984) to 28% (Fann, Katon, Uomoto, & Esselman, 1995), depending upon the particular method of measurement, the time postinjury, and the injury severity level (Bowen, Neumann, Conner, Tennant, & Chamberlain, 1998). In relation to employment, depression has been found to be moderately correlated with work outcome (Crépeau & Scherzer, 1993). Similarly, depressive correlates such as increased feelings

of loneliness and hopelessness, decreased self-esteem, and increased social isolation have also been linked with decreased post-STBI employment status (see, e.g., Lubusko, Moore, Stambrook, & Gill, 1994; Morton & Wehman, 1995; Tyerman & Humphrey, 1984). The particular course of depression may vary for individuals. For example, some individuals may be depressed at the time of return to work and simply cannot resume the same level of work as before their STBI. On the other hand, an individual could return to work and then become depressed after recognising that his/her capacity to work has changed as a result of STBI, which could also occur even without returning to work.

Lack of awareness. Lack of awareness of deficits after STBI can have a negative impact upon rehabilitation and employment (Prigatano et al., 1990; Youngjohn & Altman, 1989). When individuals with STBI are unaware of, deny, or underestimate the nature of their neurobehavioral difficulties, they may fail to self-monitor and apply compensatory strategies. In particular, after STBI they may select employment roles "that are not within their realm of behavioral competence and continue in socially inappropriate behaviours" (Prigatano & Schacter, 1991, p. 123).

To help increase the employment rate of individuals with STBI, Ben-Yishay et al. (1987) designed a three-phase outpatient treatment program. The first phase focused on holistic interventions aimed at reducing difficulties in attention, dexterity, visual-spatial processing, verbal reasoning, interpersonal communication, social competence, and awareness and adjustment issues pertaining to their injury. The second focused on providing the STBI participant with individual occupational trials. The third phase involved the program follow-up. The results demonstrated that 84% of the 94 patients who were previously unemployable were engaged in productive activity. In fact, 63%

were engaged in competitive work, and 21% were participating in a subsidised work program. It was felt that the success of the program could be attributed to "(1) improvement in self-awareness, discipline, and regulation of emotional responses; (2) increase in the effectiveness of functional application of the residual information processing abilities; . . . and (3) significant improvement by patients in the acceptance of their existential situation" (p. 45).

On a similar note, Ezrachi, Ben-Yishay, Kay, Diller, and Rattock (1991) also explored the role of awareness and acceptance in a day treatment program. Their results reveal that when group-process measures of executive-skill function were combined with neuropsychological and demographic variables, self-acceptance and self-appraisal of function emerged as critical variables in prediction of postprogram employment status. In particular, clients who are more likely to return to work are more aware of their abilities and specific problems. As well, they are able to summarise their specific strengths and weaknesses as required.

Summary

Psychosocial issues present chronic difficulties for individuals with STBI. Loss of temper control poses problems in daily social interactions and in employment settings. Anxiety and depression are often elevated after STBI. In particular, depressive symptomatology has been linked with decreased employment status after STBI.

Professionals and family members often report that lack of awareness is a concern in individuals with STBI. Lack of awareness can have a negative impact on employment because individuals with STBI may tend to underestimate or overestimate their difficulties and subsequently fail to self-monitor and apply compensatory strategies.

Although personality changes have been identified in research, only a few studies have directly examined the work-related attitudes of individuals with STBI. Thus, it would be helpful to evaluate the clinical utility of *MMPI-2* WRK scale from the *MMPI-2* with this population.

Summary of STBI Literature Review

MVAs and falls are the leading causes of TBI. More males than females suffer severe TBIs, and mortality is greater in males than females. TBI incidence peaks at 15 to 25 years of age and is the most common cause of brain damage for people 40 years and younger.

STBI pathology is complex because a single injury may involve primary damage that is microscopic and/or macroscopic. Secondary complications such as ischemia, edema, and bleeding may also contribute to further damage. Understanding the mechanical factors involved in injury is also important because the type of force encountered produces different kinds of injuries. In particular, dynamic loading occurs most frequently and results in contact- and motion-related injuries.

Determining which factors might lead to better prediction in successful employment after STBI has led to examination of neurologic, demographic, cognitive, and psychosocial variables. Neurologic variables such as LOC, PTA, and GCS have been studied. An LOC greater than 24 hours and the highest GCS score taken in the first 24 hours are good predictors of later outcome. However, PTA is more highly correlated than is LOC or GCS with vocational outcome at six months. Nonetheless, there is no single method of evaluating neurologic function that is perfect.

The impact of other body injuries on return to work has been considered given that many individuals injured in MVAs sustain other injuries besides a traumatic brain injury. The findings suggest that individuals with the most severe brain injuries are likely to have more severe injuries to other body systems and that the severity of injuries to other body systems also has an impact upon return-to-work rates two years postinjury.

Age, educational achievement, work status, substance abuse, family support, and marital status have often been examined in the literature. Teens or younger adults fare better than individuals injured at seven years of age or younger in terms of later vocational outcome and school outcome. Controversy exists as to the age at which there is a greater probability of returning to work. Forty years of age is often heralded as an important marker in adults, with individuals 40 years or younger seen as having a greater probability of returning to work. However, lately, 60 years of age has been suggested as a better marker, with individuals 60 years and older having less probability of returning to work.

Educational achievement results have been mixed, with some reports indicating that individuals who have higher premorbid vocational achievement experience greater success with employment. In particular, individuals with junior high school or vocational education have a greater likelihood of returning to work than do individuals with less education. On the other hand, in another study, approximately 50% of those with college or university education did not return to work. The educational results are somewhat confusing to interpret, because it appears that there are many factors that may have a bearing on the results. For example, the individual characteristics of the employees and

the employers, the vocational activities themselves, the expectations of employees and employers, and the job satisfaction of the employees might be considerations.

Research has also addressed the relationship between cognitive factors and later vocational outcome. Difficulties with memory, speeded information processing, attention, and executive functions have been examined. The immediate recall score of the Logical Memory subtest of the WMS-R was found to be a good predictor in regard to employment. Higher scores on the PIQ scale of the WAIS-R and WAIS-III were associated with greater likelihood of employment (Fraser et al., 1988; Girard et al., 1996; Ip et al., 1995; Lam et al., 1991). In regard to speeded information processing, the longest string recalled from the PASAT was considered to be a good predictor in employment studies. In addition, poorer scores on the Trailmaking Test B, the Symbol Digit Modalities Test, and the Category Test were indicative of less probability of returning to work.

Psychosocial problems and personality changes were reviewed in relation to vocational outcome. Difficulties with temper control were associated with poorer vocational outcome. Depression was moderately correlated with decreased employment outcome. Individuals who demonstrate lack of awareness may tend to overestimate their own capabilities, which can have a negative impact on employment. Individuals who are more aware of their own capabilities and limitations are more likely to successfully return to employment. Individuals who present with psychiatric dysfunction have greater difficulty coping effectively at work or in day-to-day life.

The relationship of attitudinal variables and vocational outcomes has not been explored in many research studies even though the findings may significantly relate to

employment. Even though the *MMPI-2* WRK scale of the *MMPI-2* purports to examine attitudes about employment, there has been no research conducted with TBI populations. Investigating the clinical utility of the *MMPI-2* WRK scale with this population is of interest. First, a more in-depth exploration of the scale and a review of the literature are needed. This section will follow the review of the stroke literature, which comes next.

Stroke Literature

Cerebrovascular disorder, or *stroke*, was defined by the World Health Organisation as "rapidly developed signs of focal (or global) disturbance of cerebral function lasting >24 hours (unless interrupted by surgery or death), with no apparent nonvascular cause" (Thorvaldsen, Asplund, Kuulasmaa, Rajakangas, & Schroll, 1995, p. 362). Strokes have multiple causes but can be divided into two main etiologic categories, ischemic and hemorrhagic. *Cerebral ischemia* or *ischemic stroke* refers to those disorders in which the symptoms are due to an inadequate blood supply to the brain (Kolb & Whishaw, 1996). Strokes with ischemic causes may be caused by, among other things, an embolism or thrombosis that cuts off circulation in an area of the brain. *Hemorrhagic stroke* refers to those disorders in which direct bleeding into or around the brain occurs. Ruptured aneurysms, arteriovenous malformations, and spontaneous hypertensive hemorrhages are just some hemorrhagic causes of stroke. For a detailed account of ischemic and hemorrhagic causes of stroke, refer to Wiebers, Feigin, and Brown (1997).

The mortality rate of stroke has been declining (Black-Schaffer & Osberg, 1990; Churchill, 1998; Gordon, 1993; Kappelle et al., 1994). Nonetheless, stroke remains one of the leading causes of long-term disability (Bonita, 1992; Heitzner & Teasell, 1998;

Hochstenbach, Donders, Mulder, van Limbeek, & Schoonderwaldt, 1996; Mayo, 1998; Petrasovitis & Nair, 1994). Because more individuals are surviving stroke and the familial and economic burdens associated with stroke care are costly, further research is needed in prevention of strokes, intervention methods, and measurement of vocational outcome (Black-Schaffer & Osberg, 1990; Bonita, 1992; Clinchot, Kaplan, Murray, & Pease, 1994; Petrasovitis & Nair, 1994). In particular, approximately 50% to 55% of individuals who sustain a stroke are under the age of 65 (Black-Schaffer & Osberg, 1990; Churchill, 1998; Gordon, 1993; Kappelle et al., 1994). Thus, vocational rehabilitation has a critical role in assisting people in returning to employment or some form of productivity given that the survival rate from cerebrovascular events is increasing (Gordon, 1993).

Characteristics Associated With Stroke

Epidemiological studies of stroke in Canada, the United States, and Europe have provided critical information about a wide range of characteristics (e.g., Asplund et al., 1995; Bonita, 1992; Broderick, Phillips, Whisnant, O'Fallon, & Bergstralh, 1989; Garraway & Whisnant, 1987; Mayo, 1998; Modan & Wagener, 1992; Petrasovitis & Nair, 1994). However, as with TBI, concerns about epidemiological research have been raised (Bonita, 1992; Gordon, 1993; Stehbens, 1991). Specifically, the differentiation of stroke subtypes remains unstandardized, and it is likely that the overall incidence of stroke is underestimated. Utilisation of a stroke classification system has been proposed as a means to increase accuracy in diagnosis and consistency in research (Adams et al., 1996; Bamford, Sandercock, Dennis, Burn, & Warlow, 1991; Whisnant et al., 1990). To help reach a better understanding of the characteristics of the stroke population, the

literature pertaining to the mortality, incidence, prevalence, gender, age, physiology, and common sequelae after stroke are reviewed.

Mortality

Stroke is considered to be the third most common cause of death in the United States (Bonita, 1992; Wolf, 1990) and is either third (Mayo, 1993) or fourth in causes of death in Canada (Heart and Stroke Foundation of Ontario, 1998). In industrialised countries, "stroke accounts for 10-12% of all deaths" (Bonita, 1992, p. 342), and approximately 88% of the deaths associated with stroke are among individuals who are over 65 years of age. "In Canada, death due to stroke has declined approximately 50% over the past 20 years to a current level of 50 per 100,000 Canadians, which represents 7% of all-cause mortality" (Mayo, 1998, p. 355). These results are in keeping with trends documented earlier in the United States (e.g., Petrasovitis & Nair, 1994), where the annual decline has been about 5% since the 1970s (Bonita, 1992). The specific reasons for this decline have not been confirmed, because various factors may have contributed to the decline. Public education programs that address smoking, diet, weight, exercise, and improvements in the medical management of hypertension, diabetes, and cardiovascular disease are thought to be relevant (Mayo, 1998; Petrasovitis & Nair, 1994).

Incidence and Prevalence

The incidence or new occurrence of stroke is estimated to affect 50,000 persons each year in Canada and 500,000 in the United States (Mayo, 1993). The incidence of stroke increases with age, especially past the age of 50 (Lezak, 1995). Only "one third of stroke victims are under the age of 65 and after age 55 the risks of stroke doubles every ten years" (Heart and Stroke Foundation of Ontario, 1998, p. 1). In Canada the stroke rate

increases from approximately "20 per 100,000 persons between the ages of 15 to 54 years to over 1500 per 100,000 persons between the ages of 75 and 84 years" (Mayo, 1998, p. 356). When the lifetime risk or cumulative incidence of having a stroke through a life means table was calculated, Bonita (1992) found that "almost 1 in 4 men and nearly 1 in 5 women aged 45 years can expect to have a stroke if they live to their 85th year" (p. 343).

There is a higher incidence of stroke in males. The incidence for the United States has been reported to range from 1.3 to 2 times higher in males than females (see, e.g., Anderson, 1994; Davis et al., 1987; Wolf, 1990). Although there is a higher incidence of stroke in males, females have a higher lifetime risk of dying from a stroke. Specifically, "about 16% of all women are likely to die of a stroke versus 8% of all men" (Bonita, 1992, p. 343). This difference is due largely to the longer life expectancy rate for females.

Although the rate of death due to stroke has been declining, it is now believed that the incidence rate has come to a plateau and may possibly be increasing (Mayo, 1998). New diagnostic capabilities may have contributed to a decline in stroke mortality because of "improved management of secondary complications of cerebral infarction and subarachnoid hemorrhage" (Broderick, 1993, p. 476). In regard to incidence, the increased rate may have artificially occurred because of advances in stroke assessment. In particular, the introduction of computed tomography (CT scan) coincided with a rise in stroke incidence rates (Broderick, 1993). In addition, the increased incidence for stroke may also be associated with new procedures that have improved survival after coronary heart disease. Although there is a decline in coronary heart disease, stroke can occur secondary to cardiac surgery. Thus, with the increased use of surgical procedures and

with more individuals surviving coronary heart disease, there are potentially more individuals who may be at an increased risk for stroke (Kuller, 1989).

In the United States and Australia, the total prevalence of stroke is estimated at approximately 5 to 8 per 1,000 for individuals over 25 years of age (Gordon, 1993). When prevalence is estimated through a survey and calculated based on the incidence and duration, it is estimated that approximately 208,000 Canadians have survived their strokes and are currently living with stroke sequelae (Mayo, 1993).

Pathophysiology of Stroke

Brain injury due to stroke occurs as a result of an ischemic or hemorrhagic process. Strokes due to an ischemic process can be classified based on the following physiologic mechanisms: cardiac disease, large vessel disease, small vessel disease, and hematologic disease (Wiebers et al., 1997). Strokes due to a hemorrhagic process can be classified into five major categories based on the primary hemorrhage: epidural, subdural, subarachnoid, intracerebral, and intraventricular hemorrhages (Wiebers et al., 1997).

Ischemic strokes account for 80% to 85% of the strokes in middle-aged or elderly individuals, and 10% are due to intracerebral hemorrhage and approximately 6% to 8% to subarachnoid hemorrhage (Meyer, Orenia, & Biller, 1994). On the other hand, a higher incidence of hemorrhagic stroke occurs in younger individuals from 15 to 45 years of age. Intracerebral hemorrhages account for approximately 27% of the total strokes in this population, whereas subarachnoid strokes account for 25% (Meyer et al., 1994).

Common Sequelae After Stroke

The study of brain function after stroke has revealed that the different hemispheres are associated with specialized neurologic functions. The two hemispheres of the brain act in a contralateral manner, with the right hemisphere controlling the initiation of left-sided motor functions and the reception of left-sided sensory information, whereas the left hemisphere is responsible for the same functions on the right side of the body. After stroke, contralateral hemiparesis and hemiplegia are the most common difficulties encountered that require physical rehabilitation (Heitzner & Teasell, 1998). However, deficits in cognitive, emotional, and personality function also pose significant long-term problems.

In 95% of the individuals who are right handed, speech is primarily mediated by the left hemisphere, whereas this is the case for 75% of individuals who are left handed (Young &Young, 1997). The left hemisphere has been associated with language function and learning (Lezak, 1995). Specifically, the left hemisphere "excels in intellectual processes such as analytical thinking or rationalizing, calculating, and verbalization" (Young & Young, 1997, p. 197). It acts as the primary mediator for reading, writing, speaking, verbal memory, and numeracy skills. Common difficulties associated with left-sided injury are aphasia and apraxia. Expressive aphasia, namely, Broca's aphasia, is most commonly associated with left-hemisphere damage (Heitzner & Teasell, 1998). Emotional functions are also affected, with depression developing "in up to 75% of the patients with left frontal lobe lesions" (p. 392). In addition, catastrophic reactions are most often seen in individuals who have suffered a left hemispheric stroke (Heitzner & Teasell, 1998; Lezak, 1995). Catastrophic reactions refer to episodes of disorganised

behaviour in which the person is unable to cope effectively due to exposure to shocking or threatening situations (Stedman, 1998).

An injury to the right hemisphere may interfere with mediation of behaviours associated with voluntary initiation, planning, spatial-perceptual judgement, emotional function, and nonverbal communication (Heitzner & Teasell, 1998). Specifically, "the nondominant hemisphere, usually the right, excels in sensory discrimination, in emotional, non-verbal thinking, and in artistic skills such as drawing and composing music, spatial perception, and perhaps, recognition of faces" (Young & Young, 1997, p. 197). Visuoperceptual difficulties that occur after injury involve "left-sided neglect, visual field cuts, hemiinattention, and, more rarely, cortical blindness and visual agnosia" (Bornstein & Brown, 1991, p. 343). Although lack of insight has been commonly associated with right hemispheric lesions (see, e.g., Heitzner & Teasell, 1998), the concept of awareness is multifaceted, and further research is required (e.g., Hibbard, Gordon, Stein, Grober, & Sliwinski, 1992). Finally, the communication difficulties that occur after right-sided injury include difficulties in the pragmatics of communication, such as conversation turn taking, difficulties in understanding humour, tangentiality, or hyperverbality (Heitzner & Teasell, 1998; Klonoff, Sheperd, O'Brien, & Chiapello, 1990).

Although the two hemispheres have special functions, when "damage occurs in one region of the brain, not only are the specialized centers associated with the impaired region [that is] affected, but the entire brain also suffers from loss of input from the injured part" (Heitzner & Teasell, 1998, p. 388). In addition to deficits based on specific lesion location, more generalized cognitive deficits that are independent of location may

be overlooked (Hom & Reitan, 1990). Currently, there is interest in using neuropsychological measures as a means to help evaluate higher-level cognitive skills that may not be assessed in psychological assessments but may be useful in the context of assessing vocational issues (Black-Schaffer & Lemieux, 1994; Hom & Reitan, 1990; Ljunggren, Sonesson, Saveland, & Brandt, 1985).

Summary of the Characteristics of Stroke

There are two main etiologic categories of strokes: ischemic or hemorrhagic. Ischemic strokes occur as a result of insufficient blood supply, and hemorrhagic strokes occur because of direct bleeding into or around brain tissue. A higher rate of ischemic strokes occurs in the middle-aged and the elderly population. In comparison, there is a higher incidence of hemorrhagic stroke in individuals under 45 years of age. The rate of stroke increases with age and doubles after the age of 55. There is a higher incidence of stroke in males. However, there is a higher life risk of stroke in females due to the longer life expectancy of females. Although the mortality rate for stroke has been declining, stroke remains a major cause of long-term disability.

The left hemisphere is responsible for language function and learning. In particular, the left hemisphere is the primary mediator for reading, writing, speaking, verbal memory, and numeracy skills. Injuries to the left hemisphere often lead to difficulties such as aphasia and apraxia. As well, a high proportion of individuals with left-sided injury present with emotional difficulties such as depression or catastrophic reactions. On the other hand, the right hemisphere is responsible for sensory discrimination, nonverbal thinking, spatial perception, and some of the more subtle aspects of communication. An injury to the right hemisphere may produce difficulties

such as visual field cuts, poor spatial judgement, and difficulty with turn taking, lack of initiation, tangentiality, and hyperverbality. As well, a lack of insight has also been associated with injury to the right hemisphere. Although special functions have been associated with the two hemispheres, when an injury occurs the entire brain can be affected because of the loss of stimulation from the injured part.

Variables of Interest in Vocational Outcome Studies

The rate of employment for individuals who have sustained a stroke varies from 19% to 81% (Black-Schaffer & Osberg, 1990; Bogousslavsky & Regli, 1987; Churchill, 1998; Coughlan & Humphrey, 1982; Howard, Till, Toole, Matthews, & Truscott, 1985; Kotila, Waltimo, Niemi, Laaksonen, & Lempinen, 1984). Making comparisons between studies is a challenge because employment may be defined differently, the specific criteria used for inclusion in the studies (i.e., mild vs. severe stroke) vary, the particular time frame in recovery samples differs, and outcome measures can be objective or subjective (Black-Schaffer & Lemieux, 1994; Coughlan & Humphrey, 1982; Saeki et al., 1993). Unfortunately, an extensive research base addressing employment after stroke has not been established. This may be due to the view that stroke is a geriatric problem, so the focus has been directed more towards impairment measurement, level of disability, and functional mobility (Gordon, 1993; Labi, Phillips, & Gresham, 1980). Nonetheless, being productive and performing some form of work is considered critical in contributing and maintaining the psychological health of adults in all societies (Black-Schaffer & Lemieux, 1994); thus learning more about the vocational outcome of individuals who have sustained a stroke is paramount. To facilitate greater understanding of return-to-work issues, physiological, demographic, cognitive, and psychosocial variables

investigated in vocational outcome studies have been examined. Because there are not many studies pertaining to employment and stroke, the different types of stroke are not treated separately in the subsequent review.

Physiological Variables and Vocational Outcome

Functional status has been examined as a variable in vocational outcome research through objective outcome measures and clinical observation. Some researchers have taken a more global approach, whereas others have analysed variables such as maximum weakness and apraxia.

Black-Schaffer and Osberg (1990) defined *stroke* as being cerebral infarction and intracerebral and subarachnoid hemorrhage. They used the Barthel Index, a measure of functional status and stroke severity, to measure functional status at admission and discharge. The Barthel Index scores taken at admission and discharge were lower in those individuals who did not return to work. As well, the researchers looked at the relationship between the length of stay in a hospital rehabilitation unit and the vocational outcome. A strong negative relationship was associated with a greater number of days spent in the hospital and vocational outcome, because "the mean length of stay of those who returned to work was 36 days, whereas for those who did not return to work, it was 59 days ($p<0.0001$)" (p. 287). Refer to Appendix C for the Barthel Index criteria.

The utility of using more subjective measures to predict vocational outcome has also been explored in infarction patients. Howard et al. (1985) relied upon a functional capacity measure in which a subjective rating of the degree of disability, level of consciousness, and overall weakness of extremities was made by a physician and a nurse at the time of admission. The subjective clinical impression of degree of disability was

found to be a better indicator of vocational prognosis than level of consciousness or weakness of extremities. Similarly, level of consciousness was not associated with outcome in Kotila et al.'s (1984) study, although it was identified as a good prognostic predictor in terms of survival.

Several studies have examined the relationship between muscle weakness and employment. Muscle weakness and employment institution were the strongest predictors in a return-to-work study of mixed stroke survivors (e.g., injuries due to cerebral infarction, subarachnoid hemorrhage, cerebral hemorrhage, or other as defined in the *International Classification of Diseases*, WHO, 1977) between 24 and 65 years of age (Hsieh & Lee, 1997). *Muscle weakness* refers to the rating for the most severely affected extremity, and *employment institution* was defined as being one of the following: employment by the government, being a housewife, working in the private sector, and being self-employed. Although Hsieh and Lee reported that several factors were associated with employment (i.e., diagnosis, consciousness, activities of daily living, side of hemiplegia, bowel and bladder incontinence, length of hospital stay, speech), maximum weakness and employment institution were selected through stepwise regression as having the best goodness of fit. Thus, their findings suggest that individuals who were employed by the Taiwanese government were more likely to return to work than were individuals employed in the private sector or those who were self-employed.

Saeki et al. (1993) reported that significant predictors for employment in their mixed stroke sample were normal muscle strength and the absence of apraxia. In an earlier study, Weisbroth, Esibill, and Zuger (1971) also indicated that "variables which

significantly differentiate left hemiplegic returnees from non-returnees include ambulation, use of affected upper extremity, and non-verbal abstract reasoning" (p. 441).

Summary of Physiologic Variables and Vocational Outcome

Return to work outcome after stroke varies, with rates ranging from approximately 19% to 80%. Unfortunately, making comparisons among studies remains problematic. Nonetheless, with more individuals surviving strokes, understanding more about vocational outcome in relation to stroke is critical. From the research conducted on functional status, it is evident that individuals who have more serious strokes (e.g., as measured by functional outcome measures) or overall muscle weakness have poorer employment rates.

Demographic Variables and Vocational Outcome After Stroke

To help understand stroke more readily, researchers have studied the demographic characteristics of individuals who have sustained strokes. In this dissertation, age, education, and occupation are examined in relation to vocational outcome.

Age

Age has been studied as a variable in stroke outcome research (Adunsky, Hershkowitz, Rabbi, Sher-Sivron, & Ohry, 1992; Black-Schaffer & Osberg, 1990; Coughlan & Humphrey, 1982; Howard et al., 1985; Saeki et al., 1993). In a study of young stroke survivors (i.e., 18 to 40), outcome after ischemic stroke was favourable, with up to 81% of the individuals returning to previous employment or alternative jobs (Adunsky et al., 1992). Similar results were found by Brooks et al. (1987), who reported that "below the age of 45 there is no evidence of any differential age effect in employment, but above that age the chances of returning reduce sharply from 39% in

those aged 45 or less, to 12% in those over 45" (p. 9). On the other hand, Howard et al. (1985) reported from their research with infarction patients that age is not a critical factor in returning to work unless the person is near 65 years of age. At that point, socioeconomic issues such as retirement come into play and subsequently decrease the chances of returning to work. Similar findings were reported by Saeki et al. (1993), who reported that age was not associated with vocational outcome for those individuals 64 years and younger, as did Hsieh and Lee (1997).

Premorbid Education and Vocation

An association between premorbid educational level, occupational status, and later vocational outcome after stroke has been reported by several researchers (e.g., Howard et al., 1985; Saeki et al., 1993; Smolkin & Cohen, 1974). Individuals who have less than a high school education have poorer vocational outcome after stroke. Prior occupation, particularly white-collar, was considered a significant positive predictor of employment (see, e.g., Bergmann, Kuthmann, Ungern-Sternberg, & Weimann, 1991; Saeki et al., 1993).

In contrast, Hsieh and Lee (1997) examined whether employment institution was a significant predictor of vocational outcome. They defined *employment institution* as one of the following: employment by the government, being a housewife, working in the private sector, and being self-employed. Hsieh and Lee found that government workers were the most likely to return to work, because 8 out of 10 government workers who sustained a stroke returned to work. They hypothesized that these findings may have been related to the fact that the Taiwanese government provides the workers in their study with

good job stability, and they were accordingly accommodated more readily than those employed by other employers (i.e., private sector).

Summary of Demographic Variables and Vocational Outcome

The relationship between age and employment after stroke varies across studies. There seems to be a trend that individuals who are 45 years or younger are more likely to return to work successfully. The relationship between education and premorbid employment appears to be fairly consistent, with individuals with less education being less likely to return to work after stroke and individuals with white-collar jobs having a better chance of returning to work. However, the possibility that it is not the *type* of work that is critical, but rather prestroke *job stability,* has been raised for consideration.

Cognitive Variables and Vocational Outcome

After stroke, cognitive deficits are frequent (Ebrahim, Nouri, & Barer, 1985; Tatemichi, Desmond, Paik, Sano, & Bagiella, 1994) and may contribute to failure to return to work (Teasell & McRae, 1998). Because research has focused primarily on specific impairments (i.e., aphasia, apraxia, neglect) or mental status issues (i.e., Mini Mental Status Examination), "studies concerning an overall view of the cognitive consequences of stroke are still rare" (Hochstenbach, Mulder, van Limbeek, Donders, & Schoonderwaldt, 1998, p. 503). Studies contributing to understanding the relationship between cognition and vocational outcome are reviewed next.

Memory Function, Intellectual Capacity, and Information Processing

Kotila et al (1984) examined recovery after stroke in 154 individuals from Finland. The majority of the patients had brain infarctions, with 39% in the right hemisphere and 40% in the left hemisphere. They reported that after one year 55% of the

58 people who were employed prior to their stroke had returned to work. Individuals who did not demonstrate impairments in intelligence or have hemiparesis tended to return to work more often than did those who had cognitive deficits or hemiparesis. Of those who did not return, memory dysfunction was noted to be the primary problem impacting upon their ability to return to work. There was no difference in the recovery of individuals with subarachnoid hemorrhage (SAH) in comparison to individuals with brain infarction. Kotila et al. (1984) relied on the Wechsler Memory Scales–Revised, the Wechsler Adult Intellectual Scale–Revised, the Benton Visual Retention Test, and visual constructional drawing tasks to measure cognitive function.

Ogden, Mee, and Henning (1993), in a prospective study of cognitive impairment after subarachnoid hemorrhage, reported that "shortly after SAH, alert patients perform slightly below their premorbid level on a range of verbal memory tests, but well below their premorbid abilities on demanding visual, non-verbal memory tests" (p. 581). As well, relatives of the study participants reported that 31% had memory dysfunction at 12 months post injury on a Memory Observation Questionnaire. In contrast, the participants rated their memory function at a significantly lower level (i.e., 6%). Furthermore, Ogden et al. concluded that subtle cognitive impairments combined with fatigue and low mood likely lowered an individual's work outcome.

Communication Skills

The relationship between aphasia and employment has been examined extensively (Black-Schaffer & Osberg, 1990; Carriero, Faglia, & Vignolo, 1987; Howard et al., 1985; Kotila et al., 1984; McMahon & Crown, 1998). In regard to employment, Black-Schaffer and Osberg determined that aphasia, but not right hemiplegia, was significantly related to

employment. They reported that individuals with right hemiplegia who did not have aphasia returned to work at a higher rate (i.e., 82%) than did individuals with right hemiplegia who had aphasia (i.e., 25%). They acknowledged that their sample was from a metropolitan area where sophisticated verbal skills were required, and different results might have been achieved if the sample had been selected from a rural area.

Similarly, McMahon and Crown (1998) reported that 30% of the individuals with aphasia in their study returned to work. Although their sample description does not denote whether the participants were from rural or urban areas, the individuals who were more likely to return to work had a diagnosis of left brain stroke with aphasia and had employers who were willing to make accommodations for their difficulties. On the other hand, the individuals who did not return to work had a right brain stroke and accompanying cognitive and perceptual deficits.

A slightly different perspective was taken by Carriero et al. (1987). Their findings demonstrated that a significant number of aphasics were able to return to gainful employment. They concluded that, although formal language assessment revealed impairment, many individuals who were highly motivated subsequently returned to work. In particular, individuals who were self-employed were often more motivated to monitor their own capabilities and make use of compensatory strategies. In contrast, those individuals who were employed in roles that were delineated solely by bureaucratic guidelines appeared to be less likely to return to gainful employment.

Summary of Cognitive Variables and Vocational Outcome

Studies investigating the impact of stroke on cognitive function are few. However, from those available, difficulties with memory function, lowered intellectual status, and poorer information processing emerge as primary areas of difficulty interfering with employment. In addition, aphasia was considered to be more detrimental in employment than was right hemiplegia.

Psychosocial Adjustment and Vocational Outcome

After an individual has suffered a stroke, psychosocial issues can pose significant problems because of personality changes and changes in emotional status (Armstrong, 1991; Robinson, 1986; Woznizk & Kittner, 2002). Increased irritability, reduced tactfulness, low frustration tolerance, emotional lability, and lack of initiative are common personality changes after stroke (Coughlan & Humphrey, 1982; Fisher & Bogousslavsky, 1996). As well, depression, anxiety, emotional lability, and euphoria are common emotional changes that can have an impact upon function (Coughlan & Humphrey, 1982, Fisher & Bogousslavsky, 1986; Robinson, 1986; Woznizk & Kittner, 2002). However, the majority of the research pertaining to vocational outcome and emotional and personality function addresses these issues in a global manner. Thus, types of personality changes are addressed first, and then information on depression is examined.

Personality Changes

Ogden, Utley, and Mee (1997) examined the neurological and psychosocial outcome of individuals four to seven years after they had sustained a subarachnoid hemorrhage. They reported that 48.3% of their participants reported personality changes

after SAH. Increased irritability, poorer temper control, decreased self-confidence, and slower thinking were identified as key problems. In particular, 26% of the participants indicated that they were more irritable or short tempered and 15.4% commented that they were more anxious after the SAH. Significant associations were found to exist between personality change and two problems: poor memory function and a lowered work status. In general, 20% of the participants felt that their SAH had decreased their work status.

Motivation

Vilkki, Holst, Ohman, Servo, and Heiskanen (1990) examined a series of outcome variables in a group of patients with SAH (i.e., Glasgow Outcome Scale, work status, social relations, and emotional status). From their research they concluded that memory deficits and reduced cognitive efficiency were likely causes of poor work status. However, 10% to 22% of the patients were misclassified when predictions about their social recovery were based solely on test scores. Thus, they hypothesised that difficulties in social recovery were likely due to emotional and motivational impairments that were not detected with cognitive measures.

Unfortunately, few outcome studies have directly studied the work-related attitudes of individuals who have suffered strokes even though the need for research in this area has been identified (Bergmann et al., 1991; Carriero et al., 1987; Kotila et al., 1984). Individuals who are more skilled may be highly motivated to return to work because they receive support from their employers and are not as easily replaced as less-skilled workers (Howard et al., 1985). On the other hand, some individuals may be less motivated to return to work because they have initiated the disability application process early in recovery due to economic strain and are fearful that returning to work may

negatively affect their application for funding (Flick, 1999). As well, individuals in their 50s are in the prime of their career and may be reluctant to return to work for fear of being laid off due to corporate downsizing or job reassignment and, consequently, see retirement on disability benefits or insurance funds as more viable (Flick, 1999).

At this time only two studies have been conducted that address work attitudes—albeit indirectly. Klonoff et al. (1998) examined work eagerness and work readiness in a mixed sample that included individuals with TBI, stroke, and brain tumour. Work eagerness was evaluated through a questionnaire in which the researchers attempted to address an individual's motivation to return to work or school. *Work readiness* refers to the perceived ability of an individual to return to premorbid level employment. As noted above, Klonoff et al.'s findings reveal that work eagerness scores were significantly different for the poor outcome and good outcome groups. Those in the fair and good outcome groups had higher ratings, indicating that they were more eager to return to work than were the poor outcome group. However, there were not significant differences between the poor and good outcome groups in regard to work readiness. Individuals in the poor outcome groups achieved significantly higher scores on neuropsychological measures (i.e., Wechsler Adult Intelligence Scale–Revised, Symbol Digit, Controlled Oral Word Fluency) than did the fair or good outcome group. In particular, individuals seeking compensation for their injuries who likely had milder injuries tended to present as less eager to return to work, but the group with greater severity of injury (the good outcome group) were more motivated and productive. These researchers defined *compensation status* as seeking funds due to social security assistance, worker's compensation, or litigation.

On a similar note, a qualitative study by Carriero et al. (1987) examined 10 case studies of aphasic individuals who had returned to gainful employment. The researchers found that the individuals in their study were likely "workaholics" before injury and had a strong motivation to return to work. Although the researchers did not assess work attitudes directly, they suggested that the study participants adopted compensatory strategies as a means to employment and subsequently self-regulated their work according to their own capabilities.

Depression

Angeleri, Angeleri, Foschi, Giaquinto, and Nolfe (1993) examined the influence of depression on social activity and family functioning after stroke. They reported that depression was greater in women than in men and that a reduction in social activities was greater in women than in men. They concluded that social support from the family, other people, and other institutions was important in employment. In particular, they emphasised that individuals who returned to work had a better outlook on life and handled problems more optimistically.

Similarly, in an earlier study Feibel and Springer (1982) examined the relationship between depression and failure to resume social activities after stroke. They defined *social activities* broadly (e.g., work, hobbies or sports, community activities, socialising with family and friends). For each individual the percentage of activities was calculated. These researchers concluded that there was a strong association between depression and social activities, with depressed patients losing up to 67% of their premorbid social activities. On a positive note, four out of five individuals showed

improvement after receiving antidepressant medication and subsequently returned to work.

Summary of Psychosocial Variables and Vocational Outcome

Higher rates of depression and personality changes are associated with poorer employment rates after stroke. Motivation and positive work attitudes were considered critical factors in a study of stroke individuals with aphasia who successfully returned to work. The relationship between attitudinal variables and vocational outcome after stroke is an area worthy of investigation given the limited research conducted thus far. To date, no research has examined the *MMPI-2* WRK scale in relation to stroke survivors, even though the scale was designed to provide users with information about work attitudes.

Summary of Stroke Literature

A stroke or cerebrovascular event refers to either an ischemic or hemorrhagic process in which a focal disturbance occurs for greater than 24 hours. Ischemic stroke refers to those strokes that occur because of insufficient blood supply to the brain caused by, among other things, a thrombosis or embolism. Hemorrhagic stroke results in a bleeding into the brain or surrounding tissues caused by, in addition to other things, an aneurysm or an arteriovenous malformation. Ischemic stroke is most common and tends to occur in the middle-aged or elderly population. Hemorrhagic strokes are more common in individuals younger than 45 years of age.

Although the mortality rate for stroke has been declining, stroke remains one of the major sources of long-term disability. There is a higher incidence of stroke in males, but females have a higher lifetime risk of dying from a stroke. Stroke incidence increases with age, with the risk for stroke doubling after 55 years of age.

After stroke, difficulties with physiologic, cognitive, and emotional function may pose long-term problems. In particular, difficulties with muscle weakness, memory function, information processing, verbal reasoning, communication, depression, initiation, visuospatial skills, nonverbal reasoning, and awareness of difficulties may be present. Although strokes produce focal injuries, and areas of difficulty may be lateralized to either the left or the right hemisphere, whole-brain function may be impacted on by the loss of input from the injured area.

Because more individuals who suffer strokes are surviving and stroke remains a major cause of long-term disability, the rate at which survivors return to work has been investigated. Comparison between studies is difficult due to differences in sample selection, inconsistency in stroke diagnosis, different outcome measures, and the period in which the investigations occurred. Consequently, the rates for employment after stroke range from approximately 19% to 81%. To help learn more about vocational outcome after stroke, physiologic, demographic, cognitive, emotional, and psychosocial variables have been investigated.

A subjective assessment measure of disability soon after stroke was found to be a better predictor of vocational outcome than level of consciousness or weakness of extremities. Individuals younger than 45 are likely more successful in employment than those 65 years of age. Those individuals who have higher levels of education or are white-collar workers are more likely to return to work. The job stability associated with being a government employee may be key in that government workers were identified as more likely to return to work. In particular, government workers were accommodated more readily than those individuals engaged in free enterprise. Poor employment was

related to memory impairments, lower overall intellectual capacity, and aphasia. After stroke, individuals who were depressed tended to have a significant decrease in their psychosocial activities. Personality changes may impact on their success in returning to work. Those individuals who were more motivated to return to work or hold positive work attitudes may be more likely to return to work. In general, there was consensus that multiple factors such as fatigue, depression, higher level cognitive impairments, and attitude variables were likely contributing to poor vocational outcome. At this time there is very little research dealing with attitudinal variables and vocational outcome after stroke.

Investigating the clinical utility of the *MMPI-2* WRK Scale of the *MMPI-2* with stroke populations may help to uncover more information about their work attitudes. As described earlier, investigating the clinical utility of the *MMPI-2* WRK scale with STBI populations is also of interest. Therefore, the next section examines the *MMPI-2* WRK scale and the related literature in greater depth.

The *MMPI-2* and the WRK Scale

Given the quest for effective intervention programs that will increase the employment rate of TBI individuals and decrease the impact of personality sequelae on vocational outcome, investigation of the personality characteristics or work-related attitudes of STBI and stroke individuals is of interest. A newly developed content scale from the *MMPI-2*, the WRK Scale, may be helpful here.

First, a brief introduction to the *MMPI-2* is provided. For the purposes of this dissertation only the validity and clinical scales are discussed. Next, the rationale for the *MMPI-2* content scales is discussed generally, and then the focus shifts towards the target

scale—the *MMPI-2* WRK scale. Finally, studies conducted with the *MMPI-2* WRK scale and the content scales are discussed, and then the relevance of the *MMPI-2* WRK scale items to STBI and stroke is explored.

The Minnesota Multiphasic Personality Inventory: Second Edition (MMPI-2)

The MMPI was developed in the 1930s to serve as an objective measure of personality function or abnormal behaviour. It was based on empirical principles rather than a theoretical rationale and made no prior assumptions about the relationship between an individual's behaviour and self-report. A key feature of the measure that was not available in other personality tests at the time was that it provided examiners with the opportunity to evaluate a test participant's test-taking attitudes or tendencies to over- or underreport pathology. Although the MMPI has been used extensively, the composition of the original standardisation sample was felt to be a major shortcoming, so the MMPI was restandardized in 1989 (Newmark, 1996). Thus, the restandardized version, the *MMPI-2*, is now used extensively in clinical practice. The *MMPI-2* is a complex measure that contains validity scales, clinical scales, supplementary scales, and content scales. For the purposes of this dissertation only the validity, clinical, and WRK content scale are discussed.

The *MMPI-2* contains four traditional validity scales: the Cannot Say Scale, the Lie Scale (L Scale), the Infrequency Scale (F Scale), and the Correction Scale (K Scale). The Cannot Scale is actually just the number of questions that have been omitted or double marked on the test protocol. The L Scale was designed to assess the possibility that the test taker had spoiled the protocol by responding in a particular manner (i.e., exaggeration of emotional problems, idealized personality; Hathaway & McKinley,

1989). The F scale measures items that are rarely endorsed by test takers. The K Scale provides a measure of sophisticated attempts to present oneself in a very favourable manner and to deny faults (Newmark, 1996).

Three other validity scales are also used in profile examination: the Back F Scale (FB Scale), the True Response Inconsistency Scale (TRIN Scale), and the Variable Response Inconsistency Scale (VRIN Scale). The FB scale measures items that are rarely endorsed by test takers on the latter portion of the test. The TRIN scale examines the internal consistency of a participant's responses and provides the examiner with an understanding of whether the participant responds in an acquiescent or nonacquiescent manner. The VRIN Scale is helpful in determining how the participant has responded to pairs of items that are similar or opposite. It also provides the examiner with an understanding of response consistency.

The 10 clinical scales on the *MMPI-2* were retained from the original MMPI. The scales are named as follows: Scale 1 (Hypochondriasis), Scale 2 (Depression), Scale 3 (Conversion Hysteria), Scale 4 (Psychopathic Deviate), Scale 5 (Masculinity-Femininity), Scale 6 (Paranoia), Scale 7 (Psychasthenia), Scale 8 (Schizophrenia), Scale 9 (Hypomania), and Scale 10 (Social Introversion). Scale 1 contains items that address excessive concern about health and bodily function. Scale 2 contains items sensitive to depressive symptoms such as pessimism, discouragement, hopelessness, and sadness. It also examines personality features such as hyperresponsibility and intrapunitiveness. Scale 3 contains items that reflect physical problems or complaints and items pertaining to symptom denial. Scale 4 items are sensitive to a lack of concerns about social standards and morals. Scale 5 contains a variety of items in which men and

women differ with respect to hobbies, work, interests, emotional responses, and relationships. Scale 6 is sensitive to interpersonal sensitivity and misinterpretation of other's actions or beliefs. Scale 7 is reflective of items that examine anxiety, worry, compulsions, and self-criticalness. Scale 8 is sensitive to unusual experiences, thoughts, and sensations. Scale 9 reflects some of the behavioural tendencies associated with manic conditions. Finally, Scale 10 examines social introversion and social extroversion. (Refer to the *MMPI-2* manual by Hathaway and McKinley [1989] for further information about the clinical scales.)

Rationale for the Work Interference Scale

With the restandardization of the MMPI, Butcher et al. (1990) developed the *MMPI-2* content scales to help strengthen communication between clients and clinicians and to provide a set of scales that were psychometrically and semantically sound (Ben-Porath & Sherwood, 1993; Butcher et al., 1990). A deductive approach that included rational and empirical analyses was utilised in the development of the content scales. This approach provided an alternative way in which to uncover information about personality characteristics rather than relying solely upon the *MMPI-2*'s traditional empirical approaches.

With the content scales, meaning is attributed to the content itself and is not based solely on empirical correlates. Content scale items are interpreted at face value and are easily communicated to patients by clinicians (Butcher et al., 1990). In particular, responses to items on the *MMPI-2* content scales are "communications about one's feelings, personality style, and past or current problems" (Butcher & Williams, 1992, p. 135). Given the ease of interpretation and communicability of the content scales, the

MMPI-2 WRK Scale may be useful to clinicians who work with individuals with STBI and stroke.

In keeping with the rationale outlined for the development of the content scales, the Work Interference Scale (*MMPI-2* WRK) purports to allow the clinician to explore work-related attitudes from the patient's perspective. The *MMPI-2* WRK scale provides information about negative attitudes and problems presumably related to achievement and employment. High scores are said to be indicative of greater work-adjustment difficulties, and low scores are believed to be indicative of fewer work-adjustment problems. Individuals who score highly may have problems that "relate to low self-confidence, concentration difficulties, obsessiveness, tension and pressure, and indecision" (Butcher & Williams, 1992, p. 146). Items on the *MMPI-2* WRK scale may also reveal how individuals view familial support for their career choices and how they perceive their own interactions with colleagues (Butcher & Williams, 1992).

Research With the Work Interference Scale and the Content Scales

Unfortunately, very little research has been conducted with the *MMPI-2* content scales, especially the WRK Scale. The original study conducted by Butcher et al. (1990) in the development of the content scales remains the most important. However, the research of Crowe (1995), Szirony (1997), and Fox and Lees-Haley (2001) includes the *MMPI-2* WRK scale. Therefore, their findings are briefly discussed. The work of Ben-Porath and Sherwood (1993), Jackson et al. (1997), and Ben-Porath et al. (1993) are also addressed, although their focus is on the content scales in general.

The Development of the MMPI-2 WRK Scale

In 1990 Butcher et al. developed the content scales for the *MMPI-2*. The construction of the scales encompassed both rationale and statistical means. It was surmised that the content scales required little inference and provided a clear description of individual's attitudes and symptoms (Butcher et al., 1990), enabling examiners to communicate findings more effectively.

Specific test items for the WRK scale were not developed solely for the WRK scale, but were simply derived from the original *MMPI-2* test items (Butcher et al. 1990; Hathaway & McKinley, 1989). Given that the items were drawn from the original *MMPI-2*, overlap occurs between some scales. In particular, the greatest item overlap occurs in the WRK scale and the Negative Treatment content scales. External validity of the content scales was determined by completing a factor analysis on the personality ratings of the normative sample completed by their spouses. Six factors were derived: general maladjustment, outgoing-helpful, histrionic-verbosity/hyperactive behaviours, perfectionistic-responsibility, and antisocial behaviour. The results from the factor analysis of the *MMPI-2* WRK scale ratings reveal that, for males, high scores on the *MMPI-2* WRK scale were associated with factor 1, general maladjustment. In general, the high *MMPI-2* WRK scoring male was seen as being distant and uncooperative and having adjustment problems. Lacking an interest in life, difficulty in making decisions, putting themselves down, giving up on tasks, and poor self-confidence were characteristic of this group. Similar results were obtained for females on the general-maladjustment factor.

To further evaluate whether the *MMPI-2* WRK scale was able to discriminate between samples with good work adjustment versus samples with poor work adjustment, the *MMPI-2* WRK scale was administered to four different samples: airline pilots, active-duty military personnel, hospitalised alcoholics, and psychiatric patients (Butcher et al., 1990). The results demonstrate that the mean differences on the *MMPI-2* WRK scale were in the directions anticipated. As indicated previously, airline pilots scored two standard deviations (i.e., $N = 274$, Raw Score $M = .79$, $SD = 1.43$) below the normative sample mean (i.e., $N = 1138$, Raw Score $M = 7.30$, $SD = 4.98$), purportedly indicating highly developed work-adjustment skills and positive attitudes pertaining to work. Active-duty military personnel also achieved scores indicative of good work adjustment (i.e., $N = 1478$, Raw Score $M = 7.49$, $SD = 5.77$). However, the results achieved by hospitalised alcoholics (i.e., $N = 832$, Raw Score $M = 11.39$, $SD = 6.86$) and psychiatric patients (i.e., $N = 232$, Raw Score $M = 15.26$ and $SD = 7.93$) were indicative of individuals who presented with negative work-related attitudes.

Butcher et al. (1990) did not include *T* score comparisons in his original validation study for the *MMPI-2* WRK scale for all of the aforementioned samples (i.e., airline pilots & military sample). However, they included raw scores and uniform *T* scores (i.e., Tables 18, 19, 20, and 21) for the content scales when the psychometric characteristics of the data were examined. This information can be used to obtain a better understanding of the *T* score elevations and can be used to infer what the *T* scores might be for some of the aforementioned samples. Butcher et al's (1990) *MMPI-2* WRK scale data for the different samples are provided in Table 1.

Table 1

WRK Data for Normative, Psychiatric, Alcoholic, and Military Samples

Sample	Raw score males	Raw score females	*T* score for males	*T* score for females
Normative	*N* = 1138 *M*=7.3, *SD*=5.0	*N* = 1462 *M*=8.5, *SD*=5.4	*N* = 1138 *M*=50.0, *SD*=9.9	*N* = 1462 *M*=50.0, *SD*=9.9
Psychiatric	*N* = 232 *M*=15.3, *SD*=7.9	*N* = 191 *M*=16.6, *SD*=7.8	*N* = 232 *M*=65.1, *SD*=14.8	*N* = 191 *M*=65.9, *SD*=15.2
Alcoholic	*N* = 832 *M*=11.4, *SD*=6.9	*N* = 380 *M*=13.3, *SD*=7.0	*N* = 832 *M*=57.8, *SD*=13.1	*N* = 380 *M*=58.7, *SD*=13.2
Military	*N* = 1156 *M*=6.9, *SD*=5.5	*N* = 167 *M*=7.0, *SD*=5.0	*N* = 1156 *M*=54.4, *SD* = 6.8	*N* = 167 *M*=47.0, *SD*=9.4

A review of Table 1 indicates that Butcher et al. (1990) relied on the male *MMPI-2* normative sample mean (i.e., Raw Score Mean $M = 7.3$, $SD = 5.0$; *T* scores $M = 50.0$, $SD = 9.9$) to compare his findings for the pilot, military, alcoholic, and psychiatric samples. The raw score and *T* score transformations that he used for the psychiatric sample (Raw Score Mean $M = 15.3$, $SD = 7.9$; *T* score Mean $M = 65.1$, $SD = 14.8$) and the alcoholic sample (Raw Score Mean $M = 11.4$, $SD = 6.9$; *T* score Mean $M = 57.8$, $SD = 13.1$) are consistent with the raw score information reported for the WRK scale given that the sample size for the male participants is the same. However, he did not provide any information for the airline pilots to facilitate conversion to *T* scores in Table 1. As well, the military sample information in Table 1 ($N = 1156$, Raw Score Mean $M = 6.9$, $SD = 5.5$; T score Mean M = 54.1, $SD = 6.8$) differs from that reported in the original *MMPI-2* WRK scale study because the sample size was reported to be 1478 and the scores differed (i.e., Raw Score $M = 7.49$, $SD = 5.77$).

Butcher et al. (1990) also investigated the correlation between the *MMPI-2* WRK scale and the *MMPI-2* clinical scales. They reported that several clinical scales

"demonstrate high intercorrelations with *MMPI-2* WRK: Pt (.81 for males and .82 for females), Sc (.73 for males and .72 for females), and Si (.59 for males and .63 for females)" (Butcher et al., 1990, p. 90). In addition, reliability coefficients for the content scales were also examined. Reliability coefficients for test-retest and internal consistency ranged from .82 to .91 (Butcher et al., 1990). These results are promising because reliability coefficients of .70 or greater are recommended for research purposes (Fraenkel & Wallen, 1996).

The MMPI-2 WRK Scale in Research

Crowe (1995) examined the efficacy of the *MMPI-2* content scales in predicting outcome in a chronic pain treatment sample as part of his doctoral dissertation. He explored the relationship between three *MMPI-2* content scales (i.e., Health Concerns [HEA], Work Interference [WRK], and Negative Treatment [TRT]) and treatment outcomes with respect to psychological functioning. His main goal was to identify which psychological features would be helpful in determining chronic pain patients' responses to rehabilitation treatment. Selected subscales from the Coping Strategy Questionnaire (CSQ), the McGill Pain Questionnaire (MPQ), the Multidimensional Pain Inventory (MPI), and the Beck Depression Inventory (BDI) were used as criterion measures. The HEA, WRK, and TRT *MMPI-2* content scales were used as predictor variables. Crowe surmised that the aforementioned scales might be useful in determining outcome in a chronic pain program because they address problems and attitudes that might impact upon rehabilitation treatment.

Of the 27 criterion variables, only 12 revealed significant differences between pre- and posttreatment. When demographic and background variables were used to

predict the criterion measures, only three measures were identified: the Affective Distress subscale from the MPI, the Life Control subscale from the MPI, and the Castrophizing subscale from the CSQ. With respect to the aforementioned *MMPI-2* content scales, Crowe (1995) reported that only the *MMPI-2* WRK scale contributed significantly to the criterion measures after the addition of the background and demographic variables. Higher (i.e., worse) WRK scores predicted a decrease in a participant's perception of his/her ability to control his/her life with respect to pain and with increased depressive symptoms. As well, he reported one unexpected finding pertaining to the *MMPI-2* WRK scale that he was unable to explain. Specifically, increases (i.e., higher scores) on the *MMPI-2* WRK score predicted improvement on the participant's report of pain on the Visual Analogue Scale (VAS) from the MPQ. Given that he anticipated that a decrease in the *MMPI-2* WRK score would be associated with a better (i.e., lower) pain rating on the VAS, this was unexpected.

Szirony (1997) investigated the impact of "work personality" and self-esteem in relation to vocational goals among incarcerated substance abuse offenders in his doctoral research. (Szirony did not provide a definition for work personality in his dissertation but presented a review of several different personality theorists' findings with respect to employment.) He used the *MMPI-2* WRK scale and the Low Self-Esteem (LSE) scale in his research. He examined whether demographic characteristics predict work interference, the differences in treatment programs as measured by the *MMPI-2* WRK scale, the relationship between the *MMPI-2* WRK and the LSE scales, and the work interference score differences in employed and unemployed substance abuse offenders. His total sample consisted of 404 *MMPI-2* profiles; however, for some of the questions

his sample decreased in number. The participants were divided into five treatment groups: Residential Institution Probation Program (RIP), Residential Correctional Centre (RCC), Summit County Community Based Corrections Facility (CBCF), Drug and Alcohol Training Program (DUI), and Multiple Offender Program (MOP).

Szirony (1997) concluded that age, gender, and race explained a mere 5% of the variance in the *MMPI-2* WRK scale. However, a significant difference was detected on the *MMPI-2* WRK scale and the LSE scale when the study participants were divided into groups according to Super's stage theory. In particular, there was a significant difference detected on *MMPI-2* WRK scale scores for the CBCF group in relation to the DUI and the MOP groups. The mean score was significantly higher for the CBCF group (Summit County Community Based Corrections Facility). A significant correlation was found between the *MMPI-2* WRK and LSE scales. Employment data were available for only 79 participants. The results reveal a significant difference between the employed and unemployed incarcerated substance abuse groups. The results from a *t test* comparing the means of the groups indicated a significant difference on WRK (i.e., $t = 2.17$, $p < .05$). The mean difference between the two groups was 7.86. The mean of the unemployed group was 59.66 ($SD = 9.73$, $N = 9$), and the mean of the employed group was 52.13 ($SD = 9.84$, $N = 70$). Although there was a statistically significant difference between the two groups and the mean of the unemployed group was in the right direction (i.e., higher), the findings are not clinically significant given that the WRK for the unemployed group was not in the so-called high range ($T > 65$), and the small sample for the unemployed group may not necessarily be appropriate in making conclusive statements. The unemployed group had higher *MMPI-2* WRK interference scores than the employed

group. Szirony concluded that specialized interventions could be determined if incarcerated substance abusers were assessed on an individual basis with the *MMPI-2* WRK scale to determine work interference levels. (Given the concerns pertaining to the clinical significance that I identified, further caution is recommended.)

Fox and Lees-Haley (2001) examined the correlation between *MMPI-2* scores and employment status in a sample of 292 consecutive litigation claimants. They investigated whether there was empirical support for psychological distress impacting upon productivity and whether any *MMPI-2* scales were associated with employment status. Of their sample, 25% reportedly claimed that they had a brain injury. When the differences between the employed (i.e., those employed full or part time or college students) and the unemployed groups (those not working or attending college) were examined, there were not significant differences on the following variables: age, sex, education, and race. For the *MMPI-2* scales only the Antisocial Practice Scale (ASP) and the Addiction Admission Scale (AAS) showed modest correlations. However, the *T* scores for ASP and AAS scales for the employed and unemployed groups were less than 50 and relatively similar. With respect to the *MMPI-2* WRK scale, there were not significant differences detected between the unemployed and the employed group. Therefore, Fox and Lees-Haley concluded that the *MMPI-2* WRK scale was likely not "an effective indicator of work disability in litigating patients" (p. 3).

Studies With a More General Focus

Ben-Porath and Sherwood (1993) conducted a study in which they attempted to determine whether the individual content scale items could be broken down into a series of subgroups. They hoped to create a series of subscales much like those of the Harris

Lingoes clinical subscales. The results from their study demonstrated that subscales could be developed for 12 of the 15 content scales. Unfortunately, the Anxiety, Obsessiveness, and Work Interference scales did not meet their criteria for subscale development because the "correlations between items on each provisional component scale and scores on the other component scale belonging to the same parent content scale" (p. 7) were found to be deficient.

As noted earlier in this dissertation, criticisms have been raised about the content scales by Jackson et al. (1997). They examined the role of social desirability in responding and concluded that the "convergent and discriminant validity of the *MMPI-2* content scales are seriously compromised by the presence of substantial, confounding, general variance" (p. 111). However, they also acknowledged that the impact of social desirability on the MMPI/*MMPI-2* has been an ongoing argument and that the results cannot provide definitive evidence that confounding effects due to social desirability can extend towards the content scales.

On the other hand, the work of Ben-Porath et al. (1993) revealed that the content scales added incrementally "to the prediction of variance in self-report measures of personality and psychopathology above and beyond what is predicted by the clinical scales alone" (p. 569). They surmised that, with a cooperative participant, the scales could be reliably counted upon to communicate information about the findings.

Work Interference Scale Items, STBI and Stroke

Selected items on the *MMPI-2* WRK scale appear to focus on some aspects of behaviour that may be relevant when considering vocational-outcome issues of individuals who have suffered STBI or stroke. Specifically, problems with anxiety,

mood, social interactions, decision making, information processing, and energy level have all been linked with STBI or stroke and employment (i.e., Ben-Yishay & Diller, 1983; Brooks et al., 1987; Crépeau & Scherzer, 1993; Fraser et al., 1988; Girard et al., 1996; Horton et al., 1997; Lezak, 1995; Rosenthal et al., 1990). Although Butcher et al. (1990) did not break down the items from the *MMPI-2* WRK Scale into representative categories, a series of descriptors that I selected were used to facilitate communication. The following seven categories were utilised: cognitive issues, fatigue, mood and emotional function, social interaction, self-esteem, tenacity, and vocational issues. Table 2 illustrates the classification of the items into the categories. The *MMPI-2* WRK scale items are found in Appendix D.

Cognitive difficulties such as less efficient information processing, poor memory, trouble with decision making, and poor initiation are common after STBI and stroke. Unfortunately, these difficulties may pose problems when returning to work (Ben-Yishay & Diller, 1983; Brooks et al., 1987; Crépeau & Scherzer, 1993; Fraser et al., 1988; Girard et al., 1996; Horton et al., 1997; Lezak, 1995; Mazaux et al., 1997; Rosenthal et al., 1990). Several *MMPI-2* WRK scale items address cognitive sequelae. Decreased efficiency in information processing and getting started on tasks is covered by items 525 ("Everything is going on too fast for me"), 545 ("I always have too little time to get things done"), and 233 ("I have difficulty starting to do things"). It seems that problem-solving and decision-making skills are addressed by *MMPI-2* WRK scale items 135 ("I have often lost out on things because I couldn't make up my mind soon enough"), 491 ("I feel helpless when I have to make important decisions"), 509 ("Having to make important

Table 2

The Work Interference Scale in Relation to Severe Traumatic Brain Injury and Stroke

Work Interference Scale item #	Cognitive issues	Fatigue	Mood and emotional function	Interactions with others	Self-esteem	Tenacity	Vocation
10					*		*
15			*				*
17			*				
31			*				*
54				*			*
73					*		
98				*			
108					*		*
135	*						
233	*						
243				*			
299			*				
302				*			
318					*		
339			*				
364						*	
368						*	
394						*	
409			*		*		*

(table continues)

Work Interference Scale item #	Cognitive issues	Fatigue	Mood and emotional function	Interactions with others	Self-esteem	Tenacity	Vocation
428							*
445				*			
464		*					
491	*		*				
505			*				
509	*		*				
517						*	*
521	*			*			*
525	*						
545	*						
554						*	
559				*			*
561		*					*
566			*				*

decisions makes me nervous"), and 521 ("I like making decisions and assigning jobs to others").

Decreased energy or fatigue is common after traumatic brain injury and stroke. This can be a significant problem in returning to work (see, e.g., Mazaux et al., 1997). Therefore, activities may need to be reduced to help compensate for a reduced energy level. This problem is addressed by *MMPI-2* WRK items 561 ("I usually have enough energy to do my work") and 464 ("I feel tired most of the time").

Anxiety and depressive symptoms are common after STBI and stroke. In addition, depression is associated with poor vocational outcome (Antonak et al., 1993; Bowen et al., 1998; Crépeau & Scherzer, 1993; Fann et al., 1995; Lezak, 1987; Ponsford et al., 1995; Rosenthal et al., 1990; Tyerman & Humphrey, 1984). Anxiety issues can be examined via questions 15 ("I work under a great deal of tension"), 31 ("I find it hard to keep my mind on a task or job"), 299 ("I cannot keep my mind on one thing"), 339 ("I have sometimes felt that difficulties were piling up so high that I could not overcome them"), 409 ("It bothers me to have someone watch me at work even though I know I can do it well"), and 509 ("Having to make decisions makes me nervous"). Feelings associated with depression may be detected via items 566 ("When I am sad and blue, it is my work that suffers") and 554 ("When life gets tough, I just want to give up"). However, as identified earlier, some of the items under anxiety may also pertain to depression.

Interpersonal skills are of interest because changes in personality characteristics are known to occur after injury and can have a negative impact on employment (Brooks et al., 1987; Lezak, 1987; Ponsford et al., 1995; Weddell et al., 1980) and familial

relations (Arokiasamy & Millington, 1994; Ip et al., 1995; Kaplan, 1991; Wehman et al., 1995). Views about interactions with others can be gleaned from responses on items 98 ("Some people are so bossy that I feel like doing the opposite of what they request, even though I know they are right"), 243 ("When in a group of people I have trouble thinking of the right things to talk about"), 302 ("I easily become impatient with others"), 368 ("I shrink from facing a crisis or difficulty"), and 559 ("The people I work with are not sympathetic to my problems"). As well, the role of familial support was also queried on item 54 ("My family does not like the work I have chosen or the work I intend to choose for my lifework").

After STBI or stroke, decreased self-esteem can occur when individuals are faced with the cognitive, physical, and emotional changes in themselves (Tyerman & Humphrey, 1984). *MMPI-2* WRK items 10 ("I am about as able to work as I ever was"), 73 ("I am certainly lacking in self-confidence"), 108 ("Anyone who is willing to work hard has a chance of succeeding"), and 318 ("I usually expect to succeed in things I do") may help to reveal how individuals view their own capabilities.

Tenacity is a desirable quality in both employment and rehabilitation. Individuals with STBI and stroke must endure a great deal as they try to adjust to changes in function. Returning to the same level of work may not be possible after STBI and stroke, which can be very difficult for individuals to accept. Questions on the *MMPI-2* WRK scale that seem to address tenacity are listed as follows: 364 ("I feel like giving up quickly when things go wrong"), 368 ("I shrink from facing a crisis or difficulty"), 394 ("My plans have frequently seemed so full of difficulties that I have had to give them

up"), 517 ("I find it difficult to hold down a job"), and 554 ("When my life gets difficult it makes me want to give up").

Research by Klonoff et al. (1998) revealed that work eagerness or attitudes pertaining to work were positive factors in successful employment. On the *MMPI-2* WRK scale, positive work attitudes are examined on items 10 ("I am about as able to work as I ever was") and 108 ("Anyone who is able and willing to work hard has a good chance of succeeding"). Negative attitudes about work are also examined by items 517 ("I find it difficult to hold down a job") and 428 ("I have several times had a change of heart about my lifework"). Item 505 ("I am so sick of what I have to do every day that I just want to get out of it all") may also pertain to work.

Moreover, when the categories that I proposed are considered, it must also be noted that there were two questions (i.e., 17 ["I am sure I get a raw deal in life"] and 428 ["I have several times had a change of heart about my lifework"]), that did not appear to fit any of the proposed categories. It is difficult to ascertain whether item 17 pertains to anger, bitterness, resentment, depression, or even paranoia; and it is difficult to determine whether item 428 pertains to anxiety, self-esteem, or tenacity. As well, several of the WRK questions appeared to have more than one connotation (i.e., 409, 491, 509, 521) and were placed in more than one category. Specifically, item 409 ("It bothers me to have someone watch me at work even though I know I can do it well") was placed under mood and self-esteem; item 491 ("I feel helpless when I have to make important decisions") was placed under cognitive and mood categories, but could have been considered under self-esteem as well; item 509 ("Having to make important decisions makes me nervous") was placed under cognitive and mood categories, but could also have been considered

under self-esteem; and, finally, item 521 ("I like making decisions and assigning jobs to others") was placed under cognitive and interactions with others, but could also have been considered under self-esteem.

In addition, another issue that must be emphasized is that the *MMPI-2* WRK scale contains 33 items that were drawn from the original *MMPI-2* item pool. Although the questions themselves may deal with work-related issues, only 12 of the 33 contain employment-related words such as *work* or *job*. Therefore, it is possible that when people answer the WRK questions, they may or may not be answering them with a work context in mind.

Summary

Little research has been conducted with the *MMPI-2* WRK scale, and essentially none has explored the clinical utility of the *MMPI-2* WRK scale with individuals who have sustained STBI or stroke. When individual items from the *MMPI-2* WRK Scale were examined in relation to issues relevant to individuals with STBI and stroke, many pertinent issues were addressed. Although the *MMPI-2* WRK scale might potentially be used by clinicians to obtain information about the vocational attitudes and characteristics of individuals with STBI and stroke, it needs to be empirically demonstrated that is useful for these populations. Because little research has been conducted with the *MMPI-2* WRK scale, new research can stimulate new ideas relevant to STBI and stroke, which in turn will serve to refine the *MMPI-2* knowledge base (Ben-Porath et al., 1993).

Synthesis of the STBI and Stroke Literature

After a review of the STBI and stroke literature, it is apparent that there are similarities and differences between the populations. More males than females suffer

brain injuries due to STBI or stroke, and more males than females die from STBI. However, more females than males die from a stroke. This is largely due to the fact that females have a longer life expectancy than males.

STBI is considered a disorder of the young, because many individuals under 40 years of age are injured in MVAs, and the peak age for injury is between 15 and 25. On the other hand, the stroke population tends to be older, with approximately only one third being under the age of 65 years.

Although the causes of injury differ in STBI and stroke, the pathophysiology of injury is somewhat similar. Specifically, individuals who sustain STBI can sustain both microscopic or diffuse injuries and macroscopic or focal injuries. Microscopic injuries refer to those injuries in which there is direct damage to the nerve fibres. Macroscopic injuries refer to those injuries in which there is contusion or a visible mass in a specific area. Injuries after stroke are considered to be primarily macroscopic rather than microscopic. With macroscopic or focal injuries there has been a tendency to discuss injury in regard to lateralization. However, it has now been acknowledged that an injury to one area of the brain will impact upon performance in other areas because function is interrelated.

Given the fact that more individuals with STBI and stroke are surviving their injuries, there is an interest in studying which variables are related to vocational outcome. In relation to STBI, neurologic variables such as LOC, GCS, and PTA have been examined in the literature. Overall, PTA emerged as the best predictor of later vocational outcome. For stroke, the literature has tended to look at functional status as indicated by the Barthel Index, the GOS, muscle weakness, or subjective predictors of functional

outcome. Unfortunately, there does not appear to be consistent use of similar measures in this research.

Both STBI and stroke literature have examined the demographic variables of age, education, and occupation. Interestingly, both the STBI and the stroke literature has identified similar findings about age. For example, there is a body of research indicating that individuals who are approximately 45 years of age or younger who sustain an injury experience greater success in returning to work. However, there is also a body of research indicating that age is not an issue for employment unless individuals are around 60 to 65 years of age.

The literature pertaining to education and occupation is similar for STBI and stroke. In general, individuals who have achieved at least a high school education are more likely to return to work than are those with less education. On the other hand, in the STBI and stroke literature there have been a few studies in which differing results have been obtained. For example, some studies have recognized that, after STBI, individuals in trades and services were least affected by their injury and that individuals with college or university education were more likely to be unemployed. Some of the literature on stroke revealed that individuals in white-collar occupations were more likely to return to work, as were those individuals who had good job stability. Thus, education may simply be too broad a variable, and individual issues may need to be considered.

Cognitive deficits are common after STBI. There has been a fair amount of research examining the relationship between cognitive difficulties and vocational outcome. Difficulties with memory function, speeded information processing, and executive functions after STBI were identified as impacting upon employment. Lower

scores on the Logical Memory Test of the WMS-R, the Booklet Category Test, the PASAT, and the Symbol Digit Modalities Test were correlated with less success in returning to work after STBI.

In contrast, after stroke, studies have focused more on specific impairments or broader mental status issues rather than cognitive consequences in relation to employment. Difficulties due to memory dysfunction, slowed information processing, intellectual capacity, and aphasia were identified as impacting upon employment. Good scores on the Wechsler Memory Scales, the Wechsler Adult Intellectual Scale–Revised, the Benton Visual Retention Test, and visual constructional drawings were associated with employment. Difficulties due to fatigue, depression, and higher level cognitive function were acknowledged as likely impacting on vocational outcome.

Emotional and psychosocial changes after STBI or stroke may occur. Depression has been linked with poor employment. Motivational disorders or attitudes about work have been suggested as being possible sources of psychosocial difficulty. However, little research about work-related attitudes has been conducted with either STBI or stroke, and exploring the work-related attitudes of STBI and stroke populations via the use of the *MMPI-2* WRK scale has been proposed. Examination of the individual questions on the *MMPI-2* WRK scale of the *MMPI-2* revealed that many of the items that seemed relevant to individuals who had sustained STBI or stroke were identified in the literature reviews. Moreover, the scale was able to discriminate between the work-related attitudes of airline pilots, military personnel, hospitalised alcoholics, and psychiatric patients in the original development study; and the psychometric properties of the scale are considered to be appropriate for research purposes. On the other hand, because little research has been

conducted with the *MMPI-2* WRK scale, it remains unknown whether the *MMPI-2* WRK actually measures work-related attitudes and is related to actual work/vocational function or whether it is merely an indicator of psychological distress.

Statement of Purpose

The primary purpose of this research was to explore the clinical utility of the *MMPI-2* WRK scale with individuals with STBI and stroke. Uncovering more knowledge about the work-related attitudes of these two populations might serve to guide rehabilitation professionals in evaluating these individuals in regard to employment. On the other hand, if the scale does not demonstrate clinical utility with these populations, it would be useful for clinicians to know this and not rely on the scale for its intended, but as yet inadequately validated, purpose. Thus, determining whether the *MMPI-2* WRK score correlates with concurrent work status or predicts future work status is also of interest.

STBI Hypotheses

Hypothesis 1: Hypothesis 1 states that there will be a relationship between the *MMPI-2* WRK score and vocational functioning at Assessment 1. People who (a) are employed at their former level of work will have a lower *MMPI-2* WRK score than people who (b) are employed but at a reduced level and than people who (c) are unemployed. The mean and standard deviation WRK scores for each group were calculated. Then an analysis of variance followed by planned comparisons was calculated to see whether there was a significant difference among the means of the three groups. It was anticipated that the mean *MMPI-2* WRK score of Group A would be less than the

mean of Groups B and C. Likewise, the mean of Group B would be less than the mean of Group C. Group C was anticipated to have the highest mean *MMPI-2* WRK score.

This hypothesis is based on the work of Butcher et al. (1990), who examined the utility of the *MMPI-2* WRK scale in discriminating between groups with good adjustment (airline pilots, active-duty military personnel) and groups with poor work adjustment (hospitalised alcoholics, psychiatric inpatients). Their findings reveal that the mean *MMPI-2* WRK scores of persons with good work adjustment were significantly lower than were those of persons with poor work adjustment.

For Hypothesis 1, only those individuals who were employed prior to their injury were included in the Assessment 1 analysis. Premorbid work status is defined as being employed in full-time paid work or part-time paid work. Unemployed status refers to not being engaged in paid, gainful employment. Thus, homemakers, students, retirees, and volunteers were not included in the analysis because the focus of this study was on return to paid work.

Hypothesis 2: A high score on *MMPI-2* WRK ($T > 65$) will be a better indicator of unemployment than a low *MMPI-2* WRK score ($T < 40$) will be of employment at any level at Assessment 1. The analysis simply evaluated whether among high *MMPI-2* WRK scorers the proportion of unemployed persons was higher than the proportion of employed persons among low *MMPI-2* WRK scorers. A chi-square analysis was used to test for statistical significance.

This hypothesis is based on the premise that a high score on *MMPI-2* WRK may be a better indicator of unemployment than a low score of employment, because even when work attitudes are favourable (and the WRK score is low), physical, cognitive, or

emotional problems may prevent employment after STBI (e.g., Brooks et al., 1987; Dikmen et al., 1994; Ponsford et al., 1995; Rao & Kilgore, 1992; Rao et al., 1990; Ruff et al., 1993). Moreover, individuals who hold unfavourable attitudes about return to work may be less inclined to return to work (e.g., Klonoff et al., 1998) than would those with good attitudes.

Hypothesis 3: There will be a significant increase in the Work Interference scores from Assessment 1 to Assessment 2 for those persons with STBI who were employed at Assessment 1 but were unemployed at Assessment 2. Dependent *t tests* (paired *t tests*) were used to determine whether there was a significant difference in the mean *MMPI-2* WRK scores of the individuals who were employed at Assessment 1 but were unemployed at Assessment 2.

Based on the literature, it is possible to conclude that individuals who return to work at Assessment 1 may do so for a variety of reasons, such as financial pressures, familial pressures (e.g., Arokiasamy & Millington, 1994), employer demands, or limited awareness about the breadth of their problems in regard to employment (e.g., Prigatano & Altman, 1990; Youngjohn & Altman, 1989). However, by Assessment 2 these individuals may not be working due to increased awareness about brain injury sequelae and the impact on employment, substance abuse (e.g., Ip et al., 1995), or acceptance of compensation packages (Ben-Yishay et al., 1987; Binder & Rohling, 1996; Klonoff et al., 1998). Thus, Hypothesis 3 proposes that there will be an increase in the scores on the *MMPI-2* WRK Scale from Assessment 1 to Assessment 2 for those individuals who were unemployed at Assessment 2.

Hypothesis 4: There will be no significant change in the *MMPI-2* WRK scores of patients with STBI who maintained the same employment status (i.e., employed at same level or unemployed) at Assessments 1 and 2. A dependent *t test* was used.

This hypothesis is simply based on the assumption that the *MMPI-2* WRK scale is a reliable measure of an individual's work attitudes or characteristics. Thus, when an individual's employment status remains the same from Assessment 1 to Assessment 2, this should be reflected by no significant changes in his/her *MMPI-2* WRK score.

Hypothesis 5: There will be a statistically significant improvement (i.e., drop) in the *MMPI-2* WRK scores for those persons with STBI who were unemployed at Assessment 1 but employed at Assessment 2. Paired *t test*s were used to determine whether there was a significant difference in the means of the individuals who were unemployed at Assessment 1 but employed at Assessment 2.

The rationale for this hypothesis is based on two assumptions drawn from the literature. The first is that individuals with STBI who were unemployed at first assessment may have more favourable attitudes about work when assessed a second time (i.e., Assessment 2). They may be more aware of their difficulties and able to apply compensatory strategies to accommodate for their problems (Ben-Yishay et al., 1987; Ezrachi et al., 1991). As well, they may be experiencing less fatigue, have greater endurance, and subsequently feel more able to cope with work demands. Therefore, the *MMPI-2* WRK score would be expected to decrease from Assessment 1 to Assessment 2. Also, if they are actually working, their attitudes about work (e.g., confidence) may be better.

Hypothesis 6: The *MMPI-2* WRK scale will contribute incrementally to the prediction of employment after TBI. The incremental contribution of the *MMPI-2* WRK scale in differentiating vocational status (i.e., same level of employment, reduced level of employment, and unemployment) in relation to a set of known predictors identified earlier in the literature as being correlated to vocational outcome (i.e., posttraumatic amnesia [PTA], age, education, and age-scaled scores on the WAIS-R Digit Symbol subtest, the age and education corrected Booklet Category Test score, the Trailmaking Test B, and the Logical Memory Immediate subtest raw and transformed *z* score) was examined. Two stepwise discriminant function analyses were conducted. In the first analysis, PTA, age, and education were used to predict group membership. In addition, an Injury Severity Score (ISS) was calculated and included as a variable in the data analysis to determine whether injuries other than the brain injury contributed to group prediction. A second analysis was conducted with a subsample of the first group who had data from the Digit Symbol subtest from the WAIS-R, The Booklet Category Test, the Trailmaking Test B, and the Logical Memory Immediate subtest of the WMS-R. Group membership was defined as employment at the same level as before injury, employment at a reduced level, and unemployment.

Knowing which combinations of measures could be used to predict employment after STBI is of clinical interest (e.g., Dikmen et al., 1994; Rao & Kilgore, 1992; Rao et al., 1990). Because the *MMPI-2* is often administered to individuals with STBI, knowing whether the *MMPI-2* WRK scale contributes to prediction will serve to either discourage or encourage clinicians to consider this scale in their vocational-outcome decision making. Determining which measures can predict which patients have a greater

likelihood of returning to work may enable clinicians to triage patients to more appropriate rehabilitation services.

Hypothesis 7: The *MMPI-2* WRK scale scores will add to the vocational predictive validity of the traditional *MMPI-2* clinical scales. The average of the clinical scales (1-4 and 6-9) will serve as an indicator of overall emotional distress. A discriminant function analysis was conducted. The clinical scales average and the *MMPI-2* WRK score served as predictor variables. Vocational status (employed at same level as before, employed but at reduced level, or unemployed) served as the criterion variables. First, the ability of the average of the clinical scale scores to predict group membership was examined. Then the *MMPI-2* WRK score was included in the analysis to see whether it increased prediction of the criterion variables.

After STBI, difficulties with emotional and personality function such as anger, irritability, anxiety, depression, denial, and decreased self-esteem have been reported. Individuals with greater emotional difficulties or personality changes have been less successful in returning to work (Brooks et al., 1987; Lubusko et al., 1994; Morton & Wehman, 1995; Prigatano & Altman, 1990; Tyerman & Humphrey, 1984; Weddell et al. 1980). Because the *MMPI-2* is commonly used in assessment and a great deal of information is known about the *MMPI-2* in relation to TBI (e.g., Reitan & Wolfson, 1997), determining whether the clinical scales average can predict vocational status and whether the *MMPI-2* WRK Scale can add to that prediction is of interest to clinicians.

Hypothesis 8: There will be a statistically significant correlation between the *MMPI-2* WRK score and the premorbid Blishen score (i.e., socioeconomic status) for individuals with STBI at Assessments 1 and 2. The correlation between the premorbid

Blishen score and *MMPI-2* WRK at Assessment 1 will be stronger than that at Assessment 2. The Blishen score will serve as a measure of premorbid work status.

For this question, premorbid status was defined by the Blishen Socioeconomic Index for Occupations. Because Blishen's index does not take into account individuals who are unemployed, students, homemakers, or retirees, Paniak et al.'s (1990) methods were applied. Thus, unemployed individuals were assigned a score of 5.0000, retirees a score of 10.0000, homemakers a score of 15.0000, and students a score of 20.0000.

Based on the work of MacMillan et al. (1999), who proposed that preinjury characteristics might have a bearing on later outcome, it is possible to conclude that work attitudes may be enduring qualities that remain stable even after STBI. Individuals with poor job stability premorbidly tend to have poorer vocational outcome after STBI (e.g., Dikmen et al., 1994; MacMillan et al., 1999). In contrast, an individual with a good attitude about work premorbidly may still continue to hold the same values about work across assessments. Nonetheless, over time (i.e., Assessment 2) a change in work attitudes may occur as the individual develops greater insight into his/her difficulties.

Stroke Hypotheses

Hypothesis 1: Hypothesis 1 states that there will be a relationship between the *MMPI-2* WRK score and vocational functioning at Assessment 1. People who (a) are employed at their former level of work will have a lower *MMPI-2* WRK score than people who (b) are employed but work in a reduced capacity and people who (c) are unemployed. The mean and standard deviation WRK score for each group was calculated. Then an analysis of variance followed by planned comparisons was calculated to see whether there was a significant difference in the means of the three groups. It was

anticipated that the mean *MMPI-2* WRK score of Group A would be less than the mean of Groups B and C. Likewise, the mean of Group B would be less than the mean of Group C. Group C was anticipated to have the highest mean *MMPI-2* WRK score.

This hypothesis is based on the work of Butcher et al. (1990), who examined the utility of the *MMPI-2* WRK scale in discriminating between groups with good adjustment (airline pilots, active-duty military personnel) and groups with poor work adjustment (hospitalised alcoholics, psychiatric inpatients). Their findings reveal that the mean *MMPI-2* WRK scores of persons with good work adjustment were significantly lower than those of persons with poor work adjustment.

For Hypothesis 1, only those individuals who were employed prior to their injury were included in the Assessment 1 analysis. Premorbid work status is defined as being employed in full-time paid work or part-time paid work. Unemployed status refers to not being engaged in gainful employment. Thus, homemakers, students, and volunteers were not included in this analysis because the focus of this study was on return to paid work.

Hypothesis 2: A high score on *MMPI-2* WRK ($T > 65$) will be a better indicator of unemployment than a low *MMPI-2* WRK score ($T < 40$) will be of employment at any level at Assessment 1. The analysis simply evaluated whether among high *MMPI-2* WRK scorers the proportion of unemployed persons was higher than the proportion of unemployed persons among low *MMPI-2* WRK scorers. A chi-square analysis was used to test for statistical significance.

This hypotheses is based on the premise that a high score on *MMPI-2* WRK may be a better indicator of unemployment than a low score is of employment, because even when work attitudes are favourable (i.e., the WRK score is low), physical, cognitive, or

emotional problems may prevent employment after stroke (e.g., Black-Schaffer & Osberg, 1990; Ljunggren et al., 1985; Ogden et al., 1993; Saeki et al., 1993). Moreover, individuals who hold unfavourable attitudes about employment may be less inclined to return to work (e.g., Klonoff et al., 1998).

Hypothesis 3: There will be a significant increase in the Work Interference scores from Assessment 1 to Assessment 2 for those persons with stroke who were employed at Assessment 1 but were unemployed at Assessment 2. Paired *t tests* were used to determine whether there was a significant difference in the mean *MMPI-2* WRK scores of the individuals who were employed at Assessment 1 but were unemployed at Assessment 2.

Based on the literature, it is possible to conclude that individuals who return to work at Assessment 1 may do so for a variety of reasons, such as financial pressures, family pressures, employer demands, and limited awareness as to the nature of their deficits (e.g., Howard et al., 1985; Hsieh & Lee, 1997). However, by Assessment 2 these individuals may not be working due to increased awareness about brain injury sequelae, depression, or motivational disorders (e.g., Feibel & Springer 1982; Flick, 1999; Ogden et al., 1993; Vilkki et al., 1990). Thus, Hypothesis 3 proposes that there will be an increase in the scores on the *MMPI-2* WRK Scale from Assessment 1 to Assessment 2 for those individuals who are unemployed.

Hypothesis 4: There will be no significant change in the *MMPI-2* WRK scores of patients with stroke who maintained the same employment status (i.e., employed at same level or unemployed) at Assessments 1 and 2. A dependent *t test* was used.

This hypothesis is simply based on the assumption that the *MMPI-2* WRK scale is a reliable measure of an individual's work attitudes or characteristics. Thus, when an individual's employment status remains the same from Assessment 1 to 2, this should be reflected by no significant changes in the *MMPI-2* WRK score.

Hypothesis 5: There will be a statistically significant improvement (i.e., drop) in the *MMPI-2* WRK scores for those persons with stroke who were unemployed at Assessment 1 but employed at Assessment 2. Paired *t tests* were used to determine whether there was a significant difference in the means of the individuals who were unemployed at Assessment 1 but employed at Assessment 2.

The rationale for this hypothesis is based on two assumptions drawn from the literature. The first is that individuals with stroke who were unemployed at first assessment may hold more favourable attitudes about work when assessed a second time (i.e., Assessment 2). They may be more aware of their difficulties and may be able to apply compensatory strategies to accommodate for their problems (e.g., Carriero et al., 1987), or their employers may be more willing to make accommodations (Hsieh & Lee, 1997). As well, they may be experiencing less fatigue, have greater endurance, and subsequently be more motivated to return to work. Therefore, the *MMPI-2* WRK score would be expected to decrease from Assessment 1 to Assessment 2. As indicated previously, if they are working, their attitudes about work may be better.

Hypothesis 6: The *MMPI-2* WRK scale will contribute incrementally to the prediction of employment after stroke. The incremental contribution of the *MMPI-2* WRK scale in differentiating vocational status in relation to a set of known predictors identified earlier in the literature as being correlated to vocational outcome (i.e., age,

education, scaled scores on the WAIS-R Digit Symbol subtest, the age and education corrected Booklet Category Test, the Trailmaking Test B, and the Logical Memory Immediate subtest raw and transformed *z* score from the WMS-R) will be examined. Two sequential discriminant analyses were conducted. In the first analysis, age and education were used to predict group membership. The second analysis was conducted with a subsample of the first group who had data from the Digit Symbol subtest from the WAIS-R, the Booklet Category Test, the Trailmaking Test B, and the Logical Memory Immediate subtest from the WMS-R. Group membership was defined as employment at the same level as before injury, employment at a reduced level, and unemployment.

Knowing which combinations of measures could be used to predict employment after stroke is of clinical interest (e.g., Black-Schaffer & Osberg, 1990; Kotila et al., 1984; Ogden et al., 1993). Because the *MMPI-2* is often administered to individuals with stroke, knowing whether the *MMPI-2* WRK scale contributes to prediction will serve to either discourage or encourage clinicians' consideration of this scale in their vocational-outcome decision making. Determining which measures can predict which patients have a greater likelihood of returning to work may enable clinicians to triage patients to more appropriate rehabilitation services.

Hypothesis 7: The *MMPI-2* WRK scale scores will add to the vocational predictive validity of the traditional *MMPI-2* clinical scales. The average of the clinical scales (1-4 and 6-9) will serve as an indicator of overall emotional distress. A discriminant function analysis was used here. The clinical scales average and the *MMPI-2* WRK score served as predictor variables. Vocational status (employed at same level as before, employed but at reduced level, or unemployed) served as the criterion variables.

First, the ability of the average clinical scale scores to predict group membership was examined. Then the *MMPI-2* WRK score was included in the analysis to see whether it increased prediction of the criterion variables.

After stroke, difficulties with emotional and personality function such as anger, irritability, anxiety, depression, denial, and decreased self-esteem have been reported. Individuals with greater emotional difficulties or personality changes have been less successful in returning to work (Feibel & Springer, 1982; Ogden et al., 1993; Ogden et al., 1997). Because the *MMPI-2* is commonly used in assessment and a great deal of information is known about the *MMPI-2* in relation to TBI (e.g., Reitan & Wolfson, 1997), determining whether the clinical scales average can predict vocational status and whether the *MMPI-2* WRK Scale can add to that prediction is of interest to clinicians.

Hypothesis 8: There will be a statistically significant correlation between the *MMPI-2* WRK score and the premorbid Blishen score (i.e., socioeconomic status) for individuals with stroke at Assessments 1 and 2. The correlation between the premorbid Blishen score and *MMPI-2* WRK score at Assessment 1 will be stronger than at Assessment 2. The Blishen score served as a measure of premorbid work status.

For this question, premorbid status was defined by the Blishen index. Because Blishen's index does not take into account individuals who are unemployed, retirees, students, or homemakers, Paniak et al.'s (1990) methods were applied. Thus, unemployed individuals were assigned a score of 5.0000, retirees a score of 10.0000, homemakers a score of 15.0000, and students a score of 20.0000.

Based on the work of MacMillan et al. (1999), who proposed that preinjury characteristics might have a bearing on later outcome, it is possible to conclude that work

attitudes may be enduring qualities that remain stable even after stroke. Individuals with poor job stability premorbidly tend to have poorer vocational outcome after stroke (e.g., Howard et al., 1985; Saeki et al., 1993; Smolkin & Cohen, 1974). In contrast, an individual with a good attitude about work premorbidly may still continue to hold the same values about work as he/she did before the injury. However, over time (i.e., Assessment 2) a change in work attitudes may occur as the individual develops greater insight into his/her difficulties.

CHAPTER THREE

METHODOLOGY

STBI and Stroke Samples

This dissertation is comprised of two studies that focus on separate samples: an STBI sample and a stroke sample. The STBI sample includes participants who (a) sustained STBI; (b) were seen in a Brain Injury Rehabilitation Program Outpatient Clinic of an urban rehabilitation hospital in Western Canada for neuropsychological follow-up approximately one to three years post injury, from 1991 to 2002; and (c) were administered an *MMPI-2*. For the stroke study, hemorrhagic stroke patients who were seen for assessment in a Brain Injury Rehabilitation Program Outpatient Clinic and ischemic stroke patients who were seen for assessment in a Stroke Program Outpatient Clinic of an urban rehabilitation hospital in Western Canada comprised the sample. All of the stroke study participants were seen approximately one to two years postinjury, from 1991 to 2001.

Although it was originally thought that data for the STBI study would be obtained from a database at the rehabilitation hospital, this was not feasible. Therefore, a list of approximately 300 patients was obtained from the Brain Injury Rehabilitation Program Outpatient Clinic records. Then I reviewed patients' psychological and medical charts to determine whether they met the study inclusion criteria. In order to facilitate data analysis, I created a new database for the STBI study with SPSS (1999) statistical software.

For the stroke sample, a list of approximately 150 patients with a diagnosis of stroke who were seen for assessment was obtained from several neuropsychologists and psychologists. Then patients' medical and psychological files were searched and the data coded. Next, I constructed a second database for the stroke sample.

STBI and Stroke Study Inclusion Criteria

Specific inclusion criteria were applied for both studies. For the STBI study, all participants had STBI. STBI was defined by the duration of coma being greater than six hours or by a score of 8 or less on the first GCS taken or by posttraumatic amnesia extending past 24 hours. Because the focus of the study was on employment, STBI participants were of working age ranging from 18 to 56 years.

In regard to the stroke study, only those individuals who had documented evidence of stroke by either a computed tomography or magnetic resonance scan of the brain were included in the study. This excluded individuals with strokes that were less severe and/or were not radiologically documented. (If there were questions pertaining to the diagnoses for either the stroke or STBI study, I consulted a neuropsychologist.) Only participants from 20 to 60 years of age were considered in the stroke study to ensure capture of working age. There was a slight difference in the ages of the two samples, because a higher proportion of younger individuals sustain STBIs and a higher proportion of older individuals sustain strokes.

For the STBI study, individuals who were able to read at a Grade 6 or higher level completed the *MMPI-2* in the current study (Schinka & Borum, 1993). Only participants who achieved valid scores on the validity scales of the *MMPI-2* were included. The criteria outlined in the *MMPI-2* administration and scoring manual (Hathaway &

McKinley, 1989), the guidelines for conducting research with the *MMPI-2* as outlined by Greene, Gwin, and Staal (1997), and the criteria used by other researchers (Archer, Elkins, Aiduk, & Griffin, 1997; Ben-Porath et al., 1993; Butcher & Williams, 1992; Hjemboe & Butcher, 1991) were utilised to determine the criteria for profile validity and subsequent exclusion in this study. In the literature review there was consensus that a Cannot Say scale raw score greater than 30 excluded profiles. In regard to the TRIN and VRIN scores, the cut-off scores varied with some researchers, suggesting that profiles should be considered invalid and excluded when *T* scores of 80 or greater (i.e., Archer et al., 1997; Ben-Porath et al., 1993) were obtained. In contrast, others considered *T* scores greater than 84 as rendering profiles as invalid and subject to exclusion (i.e., Berry et al., 1991; Greene, 1991). When the F and FB Infrequency scales were considered, the research varied, with some researchers relying on *T* scores as low as 89 to render profiles as invalid and subject to exclusion (Hoffman, Scott, Emick, & Adams, 1999). On the other hand, others considered *T* scores greater than 110 to be an appropriate cut-off score (i.e., Ben-Porath et al., 1993; Butcher & Williams, 1992; Greene, 1991). Across studies the use of the L and K scale in determining profile validity varied. Some advocated that the L and K scale scores not be used as exclusion criteria because a significant number of valid profiles might be excluded (Archer et al., 1997; Hjemboe & Butcher, 1991). On the other hand, others simply excluded profiles based on *T* scores greater than 65 (Butcher & Williams, 1992; Gass, 1991).

In the STBI and stroke studies, the criterion outlined in the manual was utilised for the L scale. Thus L scale *T* scores of greater than 80 rendered profiles as invalid and subject to exclusion (Hathaway & McKinley, 1989). The K scale was not used to exclude

profiles in this study because the scale refers to an individual's response style. Moreover, the *MMPI-2* manual does not provide cut-off scores to determine profile invalidity. In regard to the F and FB scales, profiles were excluded when scores were greater than 100. For the TRIN and VRIN scales, profiles were excluded if *T* scores greater than 81 were obtained.

For the stroke study, the criteria outlined in the STBI study were all applied, except one. Fewer participants had been administered a measure of reading comprehension, so their profiles were excluded primarily on the basis of *MMPI-2* validity measures.

Tests/Materials

A variety of tests were utilised in the STBI and stroke studies: the *MMPI-2*, the Logical Memory Immediate subtest of the Wechsler Memory Scale (WMS-R), part B of the Trailmaking Test, the Booklet Category Test (BCT), and the WAIS-R Digit Symbol subtest. Because not all of the participants completed all of the tests, a subsample that completed all of the measures was examined. For the stroke sample, an Injury Severity Score (i.e., Association for the Advancement of Automotive Medicine, 1990) was not calculated because the participants were not traumatically injured.

Minnesota Multiphasic Personality Inventory: Second Edition

The *MMPI-2* is a self-report personality inventory designed to assess personality and emotional disorders. It is a broad-band test that provides the clinician with objective information about psychopathology that can be used to guide treatment planning. The test is comprehensive in that it contains validity, clinical, supplementary, and content scales. It remains one of the most researched instruments to this date; consequently, an extensive

knowledge base has been established over the years. The research has primarily been focused on the clinical scales, and, to this date, research with the content scales is limited (Greene et al., 1997). *T* scores are used in interpreting the findings from this measure.

Wechsler Memory Scale–Revised (WMS-R)

The Wechsler Memory Scale–Revised was designed to be used in clinical assessment of memory function. The Logical Memory subtests are untimed and were designed to examine verbal memory. An immediate recall and a delayed recall condition are utilized. The average internal consistency coefficients for the Logical Memory subtests are as follows: Immediate Recall subtest = .74, and Delayed Recall = .75 (Wechsler, 1987). In the current study the Logical Memory Immediate Recall score that was utilized was of interest because it was identified as being a good predictor in regard to employment (e.g., Brooks et al., 1987). For the Logical Memory Immediate Recall task, the subject listens to two stories read by the examiner and then tells what he/she recalls directly after hearing each story. For this measure, raw scores are provided and then converted to *z* scores via the test manual.

Trailmaking Test

The Trailmaking Test is part of the Halstead-Reitan Battery (HRB) and consists of Part A and Part B. The test is sensitive to "visual conceptual and visual motor tracking" (Lezak, 1995, p. 381). On Part A the subject is required to track a numerical pattern as quickly as he/she can. On Part B the subject is required to quickly track an alternating letter and number pattern. The Trailmaking Test is sensitive to effects of cerebral dysfunction and attention/concentration difficulties, but it is "misleading to Consider the TMT as the test for organic brain pathology" (Mitrushina, Boone, & D'Elia,

1999, p. 63). The Part B score was used in the current study because one study reported that individuals who were unsuccessful in returning to work scored in the impaired range (Devany et al., 1991). *T* scores were used to communicate the findings for this measure. These were obtained from Heaton, Grant, and Matthews' (1991) normative manual.

Booklet Category Test

> The Category Test is seen primarily as a measure of reasoning. This untimed test involves several different abilities, including attention and concentration, learning and memory, and visuospatial skills, as well as concept formation, abstraction of similarities and differences among stimuli, and modification of problem-solving hypotheses in responses to feedback. (Mitrushina et al., 1999, p. 451)

Essentially, participants are presented with a series of flip cards with different designs and are required to formulate a series of rules by integrating the visual stimuli with examiner feedback. This measure was included in the current study because in one study individuals with STBI who achieved better scores on the Booklet Category Test were found to be more likely to return to work (Fraser et al., 1988). *T* scores were used to communicate the findings for this measure. These were obtained from Heaton et al.'s (1991) normative manual.

Wechsler Adult Intelligence Scale–Revised (WAIS-R) Digit Symbol Subtest

The Digit Symbol subtest is from the Wechsler Adult Intelligence Scale–Revised (WAIS-R). This particular subtest requires the individual to copy a symbol from a printed key to match a digit as quickly as he/she can within 90 seconds. Of all the WAIS-R subtests, this subtest is the most consistently sensitive to the effects of brain injury (Lezak, 1995). In particular, it was found to be correlated with coma duration after traumatic brain injury (Wilson, Vizor, & Bryant, 1991) and PTA duration (Paniak, Silver,

Finlayson, & Fuff, 1992). The average test-retest reliability coefficients for the Digit Symbol test on the WAIS-R is .82 (Wechsler, 1981). Scaled scores from the WAIS-R manual were obtained from the WAIS-R manual.

Blishen Socioeconomic Index for Occupations

The Blishen index is a socioeconomic class scale that has been commonly used in Canada. The Blishen scale relies upon three specific components of an individual's occupation to determine socioeconomic status: income, education, and prestige. Scores are assigned according to approximately 500 occupations and range from 14.3963 to 101.74 (Blishen & McRoberts, 1976). Because Blishen's scale does not account for individuals who are unemployed or are retirees, students, or homemakers, Paniak et al.'s (1990) methods were applied. Thus, unemployed individuals were assigned a score of 5.0000, retirees a score of 10.0000, homemakers a score of 15.0000, and students a score of 20.0000.

The Abbreviated Injury Scale (AIS)

An injury severity score (ISS) was calculated based on the rules outlined in the Abbreviated Injury Scale (AIS; Association for the Advancement of Automotive Medicine, 1990) or individuals with STBI. The ISS provided a numeric by which injury severity could be ranked, which took into account the impact of injury factors other than head injury (Dikmen et al., 1994). Essentially, "the ISS is the sum of the squares of the highest AIS code in each of the three most severely injured ISS body regions" (Association for the Advancement of Automotive Medicine, 1990, p. 10). For example, one individual obtained an ISS score of 19.00. He obtained this score based on the

following injuries: retroperitoneal hematoma (Highest AIS = 3 → 3^2), fractured femur (Highest AIS = 3 → 3^2), and abrasion (Highest AIS = 1 → 1^2).

Experimental Design for the STBI and Stroke Studies

The research for this dissertation was archival in nature, because patient records were searched to obtain information about demographic, neurologic, and neuropsychological variables for the two separate studies. The research was essentially exploratory in nature, inasmuch as prior investigations have not been conducted with the *MMPI-2* WRK scale and these populations.

Analysis of the data on the databases was conducted with SPSS (1999) statistical software. In the STBI study, descriptive statistics were used to describe the neurologic and demographic characteristics of the STBI sample at first assessment. The mean and standard deviation of the length of posttraumatic amnesia (PTA) and loss of consciousness (LOC) were calculated. In addition, the number of individuals injured as a result of an MVA, a fall, or other causes were tabulated. For the stroke study, only the different types of stroke were reported (hemorrhagic and or ischemic).

Demographic information about age, education, gender, marital status, and employment was obtained for both the STBI and stroke samples. Specifically, the mean and standard deviation were calculated for age and education. Then the number of males and females in the sample was determined. Marital status was described via the following categories: married or common-law relationship, divorced, widowed, separated, and single. Employment status at Assessment 1 was to be defined according to the following categories: employed at former level, employed at a reduced level, and unemployed. Similar criteria have been used by other researchers to define employment (e.g., Fraser

et al., 1988; Ponsford et al., 1995). To provide a more fine-grained measure of the extent to which levels of employment had changed, the Blishen Socioeconomic Index for Occupations was used (Blishen, 1967; Blishen & McRoberts, 1976). This scale was modified by Paniak et al. (1990) to include scores for unemployed individuals, homemakers, retirees, and students.

Analysis of the dissertation hypotheses was conducted with SPSS (1999) statistical software. Because complete data were not always available for each study subject, the number of subjects sometimes varied from hypothesis to hypothesis.

Ethical Considerations

The proposal for the current dissertation was submitted to the University of Alberta Research Ethics Board for ethical consideration and review. As well, a copy of the proposal was provided to the Health Research Ethics Board for ethics review. Both of the aforementioned ethics boards granted approval for the proposed dissertation research.

CHAPTER FOUR

RESULTS

Data were analysed through the SPSS (1999) statistical software package. The results are presented in terms of tests of each hypothesis. First, the results from the STBI study will be presented, and then the stroke study results will follow.

STBI Study Results

One hundred seventy-three patients met all of the respective *MMPI-2*, injury severity, chronicity, and age inclusion criteria. PTA duration was obtained from medical charts for 169 of the 173 individuals and ranged from approximately a day and a half to 180 days. In the current study, ISS scores ranged from 0 to 59.00. A score of 0 simply signifies that the individual did not have injuries other than a brain injury. The highest ISS score (59.00) indicated that the individual sustained a complete paraplegic spinal cord injury and a pulmonary embolism. For the total sample the average ISS score was 11.20 (SD = 11.09). An individual with a similar numeric rating had a fractured femur and two rib fractures, and another had a retroperitoneal hematoma and an ear laceration. Chronicity, the time from the initial injury to the neuropsychological assessment, ranged from 12 days to 3 years, 3 months, and 15 days. The average age of the sample (i.e., M = 30.55 years old, SD = 9.71, Range = 18 to 56 years of age) was relatively young and in keeping with other samples reported in the STBI literature. The level of education for the participants ranged from 8 to 24 years of schooling. See Table 3 for additional demographic information.

Table 3

Total Sample Frequencies

Total sample frequencies (n = 173)	N	f
Males	124	71.68%
Females	49	28.32%
Injury due to a motor vehicle accident	126	72.83%
Injury due to a fall	26	15.03%
Injury due to blunt force trauma	12	6.94%
Injured as a pedestrian	8	4.62%
Injury due to unknown cause	1	.58%
Preinjury marital status = single	87	50.29%
Preinjury marital status =married	53	30.64%
Preinjury marital status = common-in-law	16	9.25%
Preinjury marital status = separated	7	4.04%
Preinjury marital status = divorced	10	5.78%

Prior to their injury, 9 individuals were unemployed, 2 were homemakers, 27 were students, and 135 were employed. None of the individuals in the sample were retired prior to their injury. There were 164 individuals who were considered to be productive (i.e., employed, student, or homemaker) and nine who were unemployed prior to their injury. Blishen scores ranged from 5.00 (individuals who were unemployed) to 79.23 (employed as a manager in a natural science or engineering role). The average Blishen score was 36.26. (SD = 16.42). Refer to Table 4 for additional demographic information.

Table 4

Total Sample Demographic Information

Total sample demographics ($N = 173$)	*M*	*SD*
Education (years)	12.79	2.72
Socioeconomic status (preinjury)	36.26	16.42
Chronicity (days)	349.41	287.46
Posttraumatic amnesia (days) *$N = 169$	25.19	26.26

Hypothesis 1: Hypothesis 1 stated that there would be a relationship between the *MMPI-2* WRK score and vocational functioning at Assessment 1. Specifically, people who were employed at their former level of work would obtain a lower *MMPI-2* WRK score than people who were employed, but working in a reduced capacity, or people who were unemployed. The data analysis for Hypothesis 1 initially involved calculation of the mean and standard deviation for the *MMPI-2* WRK scores for each group. Then an ANOVA was calculated to see whether there was a significant difference in the means of the groups. The significance level was set at .05 for the current hypothesis and all subsequent hypotheses in the STBI study unless otherwise stated.

Only those individuals who were employed prior to their injury were included in the Assessment 1 analysis. Premorbid work status was defined as being employed at any capacity. Homemakers and students were not included in the analysis because the focus of the current study was on return to work. Because there were a small number of participants who had returned to work, two groups were selected for Hypothesis 1 rather than the three originally proposed.

The first group, the employed group, was comprised of those individuals who returned to the same level of employment and those who returned but were at a modified level (i.e., the return-to-work sample). There were 30 of these subjects. Twelve of the participants returned to the same level of work, and 18 returned at a modified level. With respect to the second group, the unemployed group, 105 did not return to work. See Tables 5 and 6 for additional demographic information.

The results demonstrate the opposite of what was predicted. Specifically, the mean score on the *MMPI-2* WRK subscale for those participants who were working after injury ($M = 60.90$, $SD = 14.20$) was significantly higher than the mean of the participants who were not working ($M = 55.00$, $SD = 12.36$). A one-way ANOVA was conducted with the *MMPI-2* WRK scale of the *MMPI-2* as the dependent variable and return to work (RTW) as the independent variable. There was a significant difference between the two groups, $F(1, 133) = 4.97$, $p < .05$. Power calculations revealed that observed power was moderate (.60). Partial eta, a measure of effect or strength of the relationship, revealed a low effect size, with the *MMPI-2* WRK score accounting for only 3.6% of the total variance. Although the difference was statistically significant, it was not clinically significant because the effect size was so small. In any event, the results were in the opposite direction of those hypothesised, with the employed group scoring higher (i.e., worse) on the *MMPI-2* WRK scale.

Table 5

Hypothesis 1: Demographic Frequencies for Employed Participants and Unemployed Participants at Assessment 1

Employed (n = 30)	n	f	Unemployed (n = 105)	n	f
Males	24	80.00%	Males	74	70.48%
Females	6	20.00%	Females	31	29.52%
Injury due to a motor vehicle accident	22	73.33%	Injury due to a motor vehicle accident	74	70.48%
Injury due to a fall	6	20.00%	Injury due to a fall	16	15.20%
Injury due to blunt force trauma	1	3.33%	Injury due to blunt force trauma	10	9.52%
Injured as a pedestrian	1	3.33%	Injured as a pedestrian	5	4.76%
Marital status at Assessment 1 = single	13	43.33%	Marital status at Assessment 1 = single	48	45.71%
Marital status at Assessment 1 = married	11	36.66%	Marital status at Assessment 1 = married	33	31.43%
Marital status at Assessment 1 = common-in-law	0	0%	Marital status at Assessment 1 = common-in-law	10	9.52%
Marital status at Assessment 1 = separated	3	10.00%	Marital status at Assessment 1 = separated	6	5.71%
Marital status at Assessment 1 = divorced	3	10.00%	Marital status at Assessment 1 = divorced	8	7.62%

Table 6

Hypothesis 1: Demographic Information for Employed Participants and Unemployed Participants

Employed (n = 30)	*M*	*SD*	Unemployed (n = 105)	*M*	*SD*
Age	32.70	9.91	Age	31.66	9.42
Education (years)	13.20	3.06	Education (years)	12.69	2.61
Socioeconomic status (preinjury)	43.06	15.27	Socioeconomic status (preinjury)	41.58	13.30
Chronicity (days)	463.20	344.12	Chronicity (days)	290.00	234.00
Posttraumatic amnesia (days)	13.25	12.57	Posttraumatic amnesia (days)	24.65	28.02
Injury severity score	9.17	9.32	Injury severity score	13.35	11.97

Post hoc analyses were conducted to evaluate whether other variables differed between the group who returned to work versus those who did not. Significant differences were detected between the two groups for PTA and chronicity. The group who returned to work at any level had shorter PTA (M = 13.25 days, SD = 12.57) than those who did not return to work (M = 27.65 days, SD = 28.02), $t(108.74) = -4.03$, $p < .001$. In regard to chronicity, the group that returned to work had their assessments later (M = 463.20 days, SD = 344.12) than those who did not return to work (M = 290.15 days, SD = 234.71), $t(37.04) = 2.59$, $p < .05$.

Hypothesis 2: Hypothesis 2 stated that a high score ($T > 65$) on *MMPI-2* WRK would be a better indicator of unemployment than a low *MMPI-2* WRK score ($T < 40$) would be of employment at any level at Assessment 1. A chi-square analysis was used to evaluate whether among high *MMPI-2* WRK scorers the proportion of unemployed

persons was higher than the proportion of employed persons among low *MMPI-2* WRK scorers. Two analyses were conducted to allow for slight changes in sample selection. In the first analysis the sample included all participants who were deemed productive (i.e., students, homemakers, and employed individuals). The second analysis included only those individuals who were employed. The different analyses were conducted because it was felt that stronger results might be obtained for the employed sample.

In the first analysis the total sample was comprised of 60 individuals, 18 with low *MMPI-2* WRK scores and 42 with high *MMPI-2* WRK scores. For this analysis, individuals who were productive prior to their injury were considered as being employed. Thus, "employed" persons included students and homemakers. Age at first assessment ranged from 18 to 53 years. PTA ranged from a minimum of two days to a maximum of 161.28 days. Chronicity, or time from the first assessment, ranged from 38 to 1,185 days. Individuals were considered to be productive or employed at the time of assessment if they had returned to their former employment role, returned at a modified level of employment, or were students or homemakers. See Tables 7 and 8 for further information.

The results demonstrate that the chi-square test was nonsignificant, X^2 (1) = .74, $p > .05$, n = 60, indicating that there was not an association between returning to work and *MMPI-2* WRK scores (extreme scores). Of the 18 participants who obtained a low *MMPI-2* WRK score, 66.7% or 12 participants did not return to work, whereas 33.3% or six participants with low scores did return to work. Of the 42 participants with high scores, 54.8% or 23 participants did not return to work, and 45.2% or 19 participants did return to work.

Table 7

Hypothesis 2: First Analysis Frequencies

First analysis frequencies (n = 60)	n	f
Males	43	71.67%
Females	17	28.33%
Injury due to a motor vehicle accident	42	70.00%
Injury due to a fall	10	16.67%
Injury due to blunt force trauma	5	8.33%
Injured as a pedestrian	3	5.00%
Marital status at Assessment 1 = single	29	48.33%
Marital status at Assessment 1 = married	16	26.67%
Marital status at Assessment 1 = common-in-law	4	6.67%
Marital status at Assessment 1 = separated	6	10.00%
Marital status at Assessment 1 = divorced	6	10.00%

Table 8

Hypothesis 2: First Analysis Demographic Information

First analysis demographics (n = 60)	M	SD
Age	30.43	9.24
Education (years)	12.83	2.91
Socioeconomic status (preinjury)	39.63	15.26
Chronicity (days)	24.63	313.03
Posttraumatic amnesia (days) (n = 59)	24.63	31.16
Injury severity score	9.65	9.54

For the second analysis, students and homemakers were not included in the "employed" sample. Only those individuals who were employed and obtained either a high score (*MMPI-2* WRK *T* score > 65) or a low score (*MMPI-2* WRK *T* score < 40) were included. This sample was comprised of 50 participants, 15 with low work scores and 35 with high work scores. Age at testing ranged from 20 to 53 years of age. PTA ranged from a minimum of 2 days to a maximum of 161.28 days. Refer to Tables 9 and 10 for additional demographic information.

Table 9

Hypothesis 2: Second Analysis Frequencies

Second analysis frequencies (n = 50)	n	f
Males	36	72.00%
Females	14	28.00%
Injury due to a motor vehicle accident	32	64.00%
Injury due to a fall	10	20.00%
Injury due to blunt force trauma	5	10.00%
Injured as a pedestrian	3	6.00%
Marital status at Assessment 1 = single	21	42.00%
Marital status at Assessment 1 = married	15	30.00%
Marital status at Assessment 1 = common-in-law	4	8.00%
Marital status at Assessment 1 = separated	4	8.00%
Marital status at Assessment 1 = divorced	6	12.00%

Table 10

Hypothesis 2: Second Analysis Demographic Information

Second analysis demographics (n = 50)	*M*	*SD*
Age	32.44	8.70
Education (years)	12.98	3.13
Socioeconomic status (preinjury)	43.55	13.64
Chronicity (days)	378.22	315.06
Posttraumatic amnesia (days)	22.77	28.70
Injury severity score	10.20	9.94

The results demonstrate that the chi-square test was again nonsignificant—X^2 (1) = 1.87, $p > .05$, n = 50—indicating that there was no association between returning to work and the *MMPI-2* WRK score (extreme scores). Of the 15 individuals who obtained a low *MMPI-2* WRK score, 20% (n = 3) returned to work, and 80% (n = 12) with low WRK scores did not return to work. For the 35 participants who obtained a high *MMPI-2* WRK score, 60% (n = 21) did not return to work, whereas 40% (n = 14) did return to work.

Hypothesis 3: Hypothesis 3 stated that there would be a significant increase in the WRK scores from Assessment 1 to Assessment 2 for those persons with STBI who were employed at Assessment 1 but not employed at Assessment 2. Unfortunately, it was not possible to examine this hypothesis because there were no participants who met the aforementioned criterion.

Hypothesis 4: Hypothesis 4 stated that there would be no significant change in the *MMPI-2* WRK scores of patients with STBI who maintained the same employment status

(i.e., employed at same level or unemployed) at Assessments 1 and 2. This hypothesis was simply based on the assumption that when an individual's employment status remains the same from Assessment 1 to Assessment 2, this should be reflected by no significant changes in his/her *MMPI-2* WRK score. A dependent *t test* was used in the analysis.

Twenty-five participants who had completed two assessments comprised the sample. They ranged in age from 18 to 51 years. Years of education ranged from 10 to 18 years. PTA ranged from a minimum of 7 days to a maximum of 180 days. Chronicity or time of assessment from injury ranged from 35 to 496 days for the first assessment. The difference in time from the first assessment to the second assessment ranged from 120 to 1,494 days. Twenty-two of the participants were unemployed at the first and second assessment. Only three participants were employed at any level (i.e., full-time work or return to work but at a modified level) at the first and second assessment. See Tables 11 and 12 for additional demographic information.

The results reveal that the *MMPI-2* WRK mean for Assessment 1 was 54.04 (SD = 12.05), and the *MMPI-2* WRK mean for Assessment 2 was 53.28 (SD = 13.64). There was a moderate correlation (.55). A paired *t test* was used in analysis. The findings are commensurate with the expected results in that there was not a significant difference between the *MMPI-2* WRK mean scores, $t(24) = .76$, $p > .05$. Given the small sample, a power estimate was calculated based on Cohen's (1988) recommendations for statistical power analyses. A one-sample *t test* with the dependent variable being equal to the *MMPI-2* WRK score at Assessment 1 minus the *MMPI-2* WRK score at Assessment 2 divided by the population standard deviation was used to determine the mean difference

Table 11

Hypothesis 4: Second Analysis Frequencies

Second analysis frequencies (n = 25)	n	f
Males	17	68.00%
Females	8	32.00%
Injury due to a motor vehicle accident	17	68.00%
Injury due to a fall	3	12.00%
Injury due to blunt force trauma	2	8.00%
Injured as a pedestrian	3	12.00%
Marital status at Assessment 1 = single	13	52.00%
Marital status at Assessment 1 = married	6	24.00%
Marital status at Assessment 1 = common-in-law	3	12.00%
Marital status at Assessment 1 = separated	1	4.00%
Marital status at Assessment 1 = divorced	2	8.00%

Table 12

Hypothesis 4: Demographic Information

Demographic information (n = 25)	*M*	*SD*
Age	29.64	8.82
Education (years)	13.40	2.24
Social economic status (preinjury)	41.48	16.54
Chronicity assessment 1 (days)	191.60	121.47
Time difference from assessment 1 to assessment 2 (days)	325.63	287.63
Posttraumatic amnesia (days)	38.40	40.29
Injury severity score	10.56	10.16

(MD) for the power analysis ($MD = |M_1-M_2| \div SD$). The results indicate that the mean difference was .76 ($SD = 12.23$), and the power was equal to .06. Although the anticipated results were obtained, the power estimate suggests very low experimental power, and thus cautious support for the aforementioned hypothesis. In particular, even though power was low, the mean scores were almost identical.

Hypothesis 5: Hypothesis 5 stated that there would be a statistically significant difference in the *MMPI-2* WRK score for those persons with STBI who were unemployed at Assessment 1 but employed at Assessment 2. Dependent *t tests* were used to determine whether there was a significant difference between the means of the individuals who were unemployed at Assessment 1 but employed at Assessment 2.

Ten participants comprised the sample that was unemployed at Assessment 1 but was working at some level at Assessment 2. The participants ranged in age from 19 to 37 years. Years of education ranged from 9 to 19. PTA ranged from a minimum of 7 days to a maximum of 56 days. Chronicity ranged from 41 to 942 days for Assessment 1. The difference in time from the first assessment to the second assessment ranged from 188 to 1,085 days. Refer to Tables 13 and 14 for additional demographic information.

The *MMPI-2* WRK score mean for Assessment 1 was 56.60 ($SD = 16.735$), and for Assessment 2 the *MMPI-2* WRK mean was 53.60 ($SD = 14.073$). There was a high correlation ($r = .88$) between the two scores. There was not a significant difference between the *MMPI-2* WRK scores, $t(9) = 1.15$, $p > .05$. Thus, the findings differed from the anticipated results because it was expected that a difference in the *MMPI-2* WRK score would have been obtained if the individuals had improved their employment status from nonemployed to employed. Specifically, it was anticipated that the *MMPI-2* WRK

score at Assessment 2 would have been significantly lower. Given the small sample, a power estimate was calculated based on Cohen's (1988) recommendations for statistical power analyses. A one-sample *t* test with the dependent variable the *MMPI-2* WRK score at Assessment 1 minus the *MMPI-2* WRK score at Assessment 2 divided by the population standard deviation was used to determine the mean difference (MD) for the power analysis ($MD = |M_1 - M_2| \div SD$). The results indicate that the mean difference was 2.9 ($SD = 7.98$), and the power was equal to .12. The effect size was .17, suggesting an extremely small magnitude. Although the anticipated results were obtained, the power estimate suggests very low experimental power, and thus the null findings must be viewed cautiously.

Table 13

Hypothesis 5: Frequencies

Frequencies ($n = 10$)	*n*	*f*
Males	6	60.00%
Females	4	40.00%
Injury due to a motor vehicle accident	8	80.00%
Injury due to a fall	1	10.00%
Injury due to blunt force trauma	0	0%
Injured as a pedestrian	1	10.00%
Marital status at Assessment 1 = single	4	40.00%
Marital status at Assessment 1 = married	4	40.00%
Marital status at Assessment 1 = common-in-law	1	10.00%
Marital status at Assessment 1 = separated	1	10.00%
Marital status at Assessment 1 = divorced	0	0%

Table 14

Hypothesis 5: Demographic Information

Demographic information (n = 10)	*M*	*SD*
Age	27.40	6.00
Education (years)	12.80	2.74
Socioeconomic status (preinjury)	43.03	14.73
Chronicity Assessment 1 (days)	247.50	275.02
Time difference from Assessment 1 to Assessment 2	473.30	320.57
Posttraumatic amnesia (days)	274.00	18.09
Injury severity score	14.00	12.61

Hypothesis 6: Hypothesis 6 stated that the *MMPI-2* WRK scale would contribute incrementally to the prediction of employment after STBI. The incremental contribution of the *MMPI-2* WRK scale in differentiating vocational status (i.e., same level of employment, reduced level of employment, and unemployment) in relation to a set of known predictors identified earlier in the literature as being correlated to vocational outcome (i.e., PTA, age, education, and age-scaled scores achieved on the Digit Symbol subtest of the WAIS-R, the Booklet Category Test, the Trailmaking Test B, and the Logical Memory I subtest), was examined.

Prior to the discriminant function analyses being conducted to test hypotheses 6 and 7, a series of assumptions were investigated. First, sample size was examined and determined generally not to be problematic for the majority of the analyses because Norman and Streiner (1999) suggested that the sample size should be approximately 5 to 10 times the number of the variables selected for analyses. Given that the current study is an exploratory one, a sample of 5 per variable was applied. The homogeneity of variance-

covariance matrixes was assessed via application of Box's M Test. This test was used to test the null hypothesis that the covariance matrixes do not differ between the groups formed by the dependent variable (i.e., employment groups). The findings from this statistic were not significant ($p > .001$) and suggest that although the sample sizes are unequal, robustness can be assumed. These findings are based on criteria by Tabachnick and Fidell (1996) that indicated that "if sample sizes are unequal and Boxes M test is significant at $p<.001$, then robustness is not guaranteed" (p. 382).

Three stepwise discriminant function analyses were conducted. In the first analysis, PTA, age, education, ISS, and the *MMPI-2* WRK score were used to predict group membership. A second analysis was conducted with a subsample of the total group that had data from the Digit Symbol subtest of the WAIS-R, The Booklet Category Test, Trailmaking Test (Part B), the Logical Memory Immediate subtest of the WMS-R and the *MMPI-2* WRK score. Finally, a third analysis was conducted with all of the aforementioned variables. Group membership was defined as being employed (employment at the same level as before injury or employment at a reduced level) or unemployed. This change was necessary due to the restricted sample size for individuals who were employed.

In the first analysis a stepwise discriminant function analysis was performed using five variables as predictors of membership in two employment groups. The predictors were age, education, PTA, ISS, and the *MMPI-2* WRK score. Employment group membership was broken down into two groups: those who were employed (employment at the same level as before injury or employment at a reduced level [$n = 50$]) and those who were unemployed ($n = 123$). Of the original 173 cases, four were dropped from

analysis because of missing PTA scores. One participant was included in the sample although the exact cause of injury was unknown. Of the 169 cases, 47 were women and 122 were men. There were 48 participants who returned to work at any level and 121 who did not return to work at first assessment.

When the first stepwise discriminant function analysis was performed using age, education, PTA, ISS, and the *MMPI-2* WRK score as predictors of the two employment levels, only the ISS was kept in the function and the remaining four were dropped. The Boxes M was not significant (i.e., >.001), indicating that the covariance matrixes did not differ between employment groups based on criteria by Tabachnick and Fidell (1996). Wilks' Lambda was used to test the significance of the discriminant function as a whole. The findings are significant (i.e., $p < .05$) and suggest that ISS contributes to the discriminating power of the function. Although ISS was found to contribute to the discriminating power of the function, the summary of the canonical discriminant function indicated that only 5% of the dependent variables variance could be explained by the ISS. This suggests that there is a very small relationship between the ISS score and predicting possible employment outcome. When the aforementioned discriminant function was used to classify the participants into the two employment groups, the classification results demonstrated that only 58.6% of the group were classified correctly. Specifically, 35 of the 48 individuals who were expected to return to work were classified correctly, and 64 of the 121 individuals who were expected not to return to work were classified correctly.

When only the means for PTA, ISS, and the *MMPI-2* WRK score are considered, all of them are in the anticipated direction (i.e., better scores were obtained by participants who returned to work) except the *MMPI-2* WRK score. With regard to the

latter, the mean score for individuals who returned to work was greater than (i.e., $M = 58.98$, $SD = 14.29$) the mean score for those who did not return to work (i.e., $M = 55.45$, $SD = 12.02$). Refer to Tables 15 and 16 for more information about the sample in this analysis.

Table 15

Hypothesis 6: Employed Participants and Unemployed Participants

Employed ($n = 48$)	*M*	*SD*	Unemployed ($n = 121$)	*M*	*SD*
Age	28.48	9.81	Age	31.36	9.50
Education (years)	13.19	2.93	Education (years)	12.65	2.64
Posttraumatic amnesia (days)	19.80	24.46	Posttraumatic amnesia (days)	27.33	26.74
Injury severity score	7.06	8.38	Injury severity score	12.77	11.75
MMPI-2 WRK score	58.98	14.29	*MMPI-2* WRK score	55.45	12.02

Table 16

Hypothesis 6: Gender of Employed Participants and Unemployed Participants

	Employed ($n = 48$)	Unemployed ($n = 121$)
Females	11	36
Males	37	85

A second analysis was conducted with another subsample of the total hypothesis 6 sample. This smaller subsample had data from the Digit Symbol subtest of the WAIS-R, the Booklet Category Test, Trailmaking Test (Part B), the Logical Memory Immediate Memory subtest of the WMS-R and the *MMPI-2* WRK score. Group membership was again defined as being employed (employment at the same level as before injury or employment at a reduced level) or unemployed. For this analysis, there were 23 participants who returned to work at some level and 61 who did not return to work. The homogeneity of variance-covariance matrixes was assessed via application of Box's M Test. The findings from this statistic were not significant (i.e., $p > .001$) and suggest that robustness can be assumed based on the aforementioned criteria by Tabachnick and Fidell (1996).

When the second stepwise discriminant function analysis was performed using the *MMPI-2* WRK score, the WAIS-R Digit Symbol score, the WMS-R Logical Memory Immediate Memory score, the Booklet Category score, and the Trailmaking (Part B) score as predictors of the two employment levels, only the WAIS-R Digit Symbol score was kept in the function. Next, Wilks' Lambda was used to test the significance of the discriminant function as a whole. The findings are significant (i.e., $p < .05$) and suggest that the WAIS-R Digit Symbol score contributes to the discrimination power of the function. The summary of the canonical discriminant function indicated that the aforementioned function (i.e., WAIS-R Digit Symbol score) could explain approximately 15% of the dependent variables variance. This suggests that there is a relationship between the WAIS-R Digit Symbol score and predicting possible employment outcome. When the aforementioned discriminant function was used to classify the participants into

the two employment groups, the classification results demonstrated that 69.7% of the group were classified correctly. Specifically, 24 of the 33 individuals who were expected to return to work were classified correctly, and 61 of the 89 individuals who were expected not to return to work were classified correctly.

When only the means of the aforementioned independent variables were considered, almost all of them were in the anticipated direction (i.e., better scores were obtained by participants who returned to work). On the other hand, the *MMPI-2* WRK score findings are again not in the anticipated direction. In particular, the mean score for individuals who returned to work (i.e., $M = 60.52$, $SD = 15.56$) was greater than the mean score for those who did not return to work (i.e., $M = 54.85$, $SD = 12.57$). Refer to Tables 17 and 18.

Table 17

Hypothesis 6: Employed Participants and Unemployed Participants

Employed ($n = 23$)	*M*	*SD*	Unemployed ($n = 61$)	*M*	*SD*
Age	28.48	9.54	Age	31.26	9.59
Education	13.26	3.03	Education	12.92	2.78
WAIS-R Digit Symbol age scaled score	9.65	2.59	WAIS-R Digit Symbol age scaled score	7.41	2.41
Booklet Category Test *T* score	44.04	10.13	Booklet Category Test *T* score	39.79	12.85
Trailmaking B *T* score	48.87	11.63	Trailmaking B *T* score	44.84	10.51
Logical Memory Immediate Memory *Z* score	-.09	1.28	Logical Memory Immediate Memory *Z* score	-.23	.95
MMPI-2 WRK *T* score	60.52	15.56	*MMPI-2* WRK *T* score	54.85	12.57

Table 18

Hypothesis 6: Gender of Employed Participants and Unemployed Participants

	Employed (n = 23)	Unemployed (n = 61)
Females	5	17
Males	18	44

The third stepwise discriminant function analysis was conducted with all of the aforementioned independent variables: PTA, age, education, ISS, Digit Symbol subtest score from the WAIS-R, Booklet Category Test score, Trailmaking Test (Part B) score, the Logical Memory Immediate Memory subtest score from the WMS-R, and the *MMPI-2* WRK score. This sample was comprised of 83 participants, 23 of whom returned to work at any level and 60 of whom did not return to work who had data available for the aforementioned variables. There were 61 males and 22 females. The homogeneity of variance-covariance matrixes was assessed via application of Box's M Test. Specifically, Box's M Test was used to test the null hypothesis of equal population covariance matrixes between groups formed by the dependent variable (i.e., the employed group and the unemployed groups). The findings for this statistic were not significant, indicating that there was no difference between the population covariance matrixes of the two groups (p >.001), which suggests that robustness can be assumed based on criteria by Tabachnick and Fidell (1996). When the analysis was conducted, only the Digit Symbol score and the ISS score were kept in the function. Wilks' Lambda was used to test the significance of the discriminant function as a whole and indicated that both of the

aforementioned variables contributed to the discriminating power of the function (i.e., $p < .05$). The summary of canonical discriminant functions (.43) indicated that approximately 19% of the dependent variables' variance was explained by the independent function. The classification results demonstrated that 69.7% of the group were classified correctly. Specifically, 25 of the 33 individuals who returned to work were classified accurately, and 60 of the 89 individuals who did not return to work were classified correctly.

When only the means of the aforementioned independent variables were considered (i.e., education, age, PTA, ISS, Trailmaking Test (Part B), the Booklet Category Test, and the Logical Memory Immediate Memory subtest), almost all of them were in the anticipated direction (i.e., better scores were obtained by the participants who returned to work). On the other hand, the *MMPI-2* WRK score findings are again not in the anticipated direction. In particular, the mean score for individuals who returned to work (i.e., $M = 60.52$, $SD = 15.56$) was greater than the mean score for those who did not return to work (i.e., $M = 54.72$, $SD = 12.63$). Refer to Tables 19 and 20 for additional information about the sample used in this analysis.

Overall, the most noteworthy findings are that the *MMPI-2* WRK scale did not contribute to the discriminating power of the function in the three different analyses that were conducted. However, the Digit Symbol score from the WAIS-R and the ISS score were found to contribute to the discriminating power of the function.

Hypothesis 7: Hypothesis 7 stated that the *MMPI-2* WRK scale scores would add to the vocational predictive validity of the traditional *MMPI-2* clinical scales. The average of the clinical scales (1-4 and 6-9) would serve as an indicator of overall

Table 19

Hypothesis 6: Employed Participants and Unemployed Participants

Employed (n = 23)	M	SD	Unemployed (n = 60)	M	SD
Age	28.48	9.54	Age	31.22	9.66
Education	13.26	3.03	Education	13.00	2.73
Posttraumatic amnesia (days)	20.00	20.01	Posttraumatic amnesia (days)	32.25	33.57
Injury severity score	6.61	8.70	Injury severity score	14.33	12.93
Digit Symbol WAIS-R age score	9.65	2.59	Digit Symbol WAIS-R age score	7.43	2.42
Trailmaking Test Part B *T* score	48.87	11.63	Trailmaking Test Part B *T* score	44.82	10.60
Booklet Category Test *T* score	44.04	10.13	Booklet Category Test *T* score	39.90	12.93
Logical Memory I *Z* score	-.09	1.28	Logical Memory I *Z* score	-.22	.95
MMPI-2 Work Interference score	60.52	15.56	*MMPI-2* Work Interference score	54.72	12.63

Table 20

Hypothesis 6: Gender of the Employed and Unemployed Participants

	Employed (n = 23)	Unemployed (n = 60)
Females	5	17
Males	18	43

emotional distress. According to the *MMPI-2* manual, only the aforementioned scales are used in the calculation of an average profile elevation. Specifically, Scale 5 and Scale 0 are not used in this calculation. Scale 5 examines whether an individual has traditional feminine or masculine interests. Scale 0 provides information about whether an individual responds in an introverted or extroverted manner. A series of discriminant functional analyses were conducted. The clinical scales average and the *MMPI-2* WRK score served as predictor variables. Vocational status (employed at same level as before, employed but at a reduced level, or unemployed) served as the criterion variables. As indicated previously, only the two levels of vocational status were used for employment status. First, the ability of the average of the clinical scale scores to predict group membership was examined. Then the *MMPI-2* WRK score was included in the analysis to determine whether it increased prediction of the criterion variables.

Of the original 173 cases, 4 were dropped from analysis because of missing scores. Therefore, there was a total of 169 participants. There were 49 participants who returned to work at any level and 120 who did not return to work. Refer to Tables 19 and 20 for further information about the employed at any level sample and the unemployed sample.

First, the average of the clinical scales (1-4 and 6-9) of the total group ($N = 169$) was determined. Then the average of the clinical scales for the employed and unemployed groups was determined. The clinical scale mean of the individuals who returned to work at any level was 59.24 ($SD = 8.36$), and for the individuals who did not return to work, the mean was 59.21 ($SD = 8.92$). The homogeneity of variance-covariance matrixes was assessed via application of Box's M Test. The findings from the

statistic were not significant ($p > .001$) based on criteria by Tabachnick and Fidell (1996). Wilks' Lambda was used to test the significance of the function as a whole. The findings are not significant ($p > .05$), indicating that the function does not contribute to the discriminating power. When the aforementioned discriminant function was used to classify participants into the two employment groups, the classification results demonstrated that only 50.3% of the group were classified correctly. Of the 49 individuals who returned to work at any level, 22 were classified correctly. Of the 120 individuals who did not return to work, 63 were classified correctly. This suggests that the function was essentially no better than chance at predicting vocational outcome.

Another discriminant function analysis was conducted with the same group to determine whether adding the *MMPI-2* WRK score to the *MMPI-2* Clinical Average score function contributed to the discriminating power of the function. The average of the *MMPI-2* WRK scores for the individuals who returned to work was 58.55 ($SD = 14.49$), and the average of the *MMPI-2* WRK scores for those who were unemployed was 55.71 ($SD = 12.01$). The homogeneity of variance-covariance matrixes was assessed via application of Box's M Test. The findings from the statistic were not significant ($p > .001$) based on criteria by Tabachnick and Fidell (1996). Wilks' Lambda was used to test the significance of the function as a whole. The findings are not significant ($p > .05$), indicating that the function does not contribute to the discriminating power. The summary of canonical discriminant function was .12. This indicates that 1.5% of the dependent variables' variance was explained by the function. When the aforementioned discriminant function was used to classify participants into the two employment groups, the classification results demonstrated that only 52.10% of the group were classified

correctly. Of the 49 individuals who returned to work at any level, 24 were classified correctly. Of the 120 individuals who did not return to work, 64 were classified correctly. This suggests that the function was essentially no better than chance at predicting vocational outcome.

When the contribution of the clinical scales average was considered in classification, it was 50.3%. When the *MMPI-2* WRK score was added to the clinical scales average, the function classified 52.10% of the participants correctly. This suggests that there was only approximately a 2% increase. As well, the anticipated directions of the mean of the *MMPI-2* WRK scores for those individuals who were unemployed was lower than for the individuals who had returned to work at any level, which is in the anticipated direction. Refer to Tables 21 and 22.

Table 21

Hypothesis 7: Employed Participants and Unemployed Participants

Employed (n = 49)	M	SD	Unemployed (n = 120)	M	SD
Age	28.35	9.75	Age	31.50	9.604
Education	13.22	2.89	Education	12.59	2.66
Socioeconomic status (preinjury)	33.81	16.83	Socioeconomic status (preinjury)	37.01	16.25
PTA (days)	17.25	17.03	PTA (days)	24.90	19.36
Chronicity	457.14	346.86	Chronicity	301.21	238.21
Injury severity score	7.35	8.52	Injury severity score	12.40	10.99
MMPI-2 WRK T score	58.55	14.49	*MMPI-2* WRK T score	55.71	12.01

Table 22

Hypothesis 7: Gender of the Employed and Unemployed Participants

	Employed (n = 49)	Unemployed (n = 120)
Females	13	35
Males	36	85

A third discriminant function analysis was also conducted with the 169 participants. This time a stepwise discriminant function analysis was conducted using each of the *MMPI-2* clinical scales (i.e., 1-4 and 6-9) and the *MMPI-2* WRK score. I felt that this change was necessary because the *MMPI-2* clinical scales average compromised the findings by not allowing extreme scores to be considered in the analysis. Refer to Table 21 for information pertaining to the *MMPI-2* clinical scales. The homogeneity of variance-covariance matrixes was assessed via application of Box's M Test. The findings from the statistic were not significant ($p > .001$) based on criteria by Tabachnick and Fidell (1996). As per a stepwise solution, the variables are considered one at a time. The equation first considers the variable that best discriminates among the groups and then the next one. Thus, the variables are added until adding the remaining variables does not appreciably improve the power of the function.

Wilks' Lambda indicated that one function was significant ($p < .05$) and that the function contributed to the discriminating power. The function was comprised of the following variables: Scale 6 (Paranoia), Scale 1 (Hypochondriasis), Scale 7 (Psychasthenia), and Scale 2 (Depression). The standardized canonical discriminant function coefficients indicated that the relative importance of the different variables in the

function was Scale 7 (Psychasthenia), Scale 1 (Hypochondriasis), Scale 2 (Depression), and Scale 6 (Paranoia). The summary of the canonical discriminant function coefficients (.35) revealed that 12% of the dependent variables variance was explained by the independent function. When the aforementioned discriminant function was used to classify participants into the two employment groups, the classification results demonstrated that 65.7% of the group were classified correctly. Of the 49 individuals who returned to work at any level, 32 were classified correctly. Of the 120 individuals who did not return to work, 79 were classified correctly. Overall, it was notable that the *MMPI-2* WRK scale did not enter into the function solution and that poorer scores on Scales 6 and 7 were associated with employment. Refer to Table 23 for additional information.

Table 23

Hypothesis 7: Employed Participants and Unemployed Participants

	Employed ($n = 49$)		Unemployed ($n = 120$)	
MMPI-2 Scales	*M*	*SD*	*M*	*SD*
MMPI-2 WRK Scale	58.55	14.49	55.71	12.09
Scale 1: Hypochondriasis	58.86	13.10	63.16	13.13
Scale 2: Depression	61.92	14.06	63.31	13.83
Scale 3: Conversion hysteria	56.78	13.85	60.64	14.75
Scale 4: Psychopathic deviance	57.71	10.07	57.17	10.57
Scale 6: Paranoia	57.53	11.53	53.51	11.32
Scale 7: Psychasthenia	62.14	12.67	59.04	12.42
Scale 8: Schizophrenia	63.14	11.33	61.20	12.35
Scale 9: Hypomania	56.53	12.48	55.63	12.90

Hypothesis 8: Hypothesis 8 stated that there would be a relationship between the WRK score and the premorbid Blishen score (i.e., socioeconomic status) for individuals with STBI at Assessments 1 and 2 (Analysis 1). It was also anticipated that the correlation between the premorbid Blishen score and MMPI-2 WRK at Assessment 1 would be stronger than that at Assessment 2 (Analysis 2). As indicated previously, the Blishen score served as a measure of premorbid work status (Blishen & McRoberts, 1976; Paniak, Shore, et al., 1992).

To address the aforementioned hypothesis, two analyses were conducted. The first analysis was conducted with the total sample at Assessment 1 ($N = 173$) and a subsample at Assessment 2 ($n = 35$). In this case the premorbid Blishen score was used in the analysis. The second analysis was conducted with the same subsample ($n = 35$) at both assessments. The premorbid Blishen score was also used in this analysis. It was felt that completing the two analyses would help to provide additional information about the utility of the WRK scale with larger and smaller samples.

Analysis 1. In the first analysis 173 participants had one assessment with the MMPI-2 WRK Scale. As stated previously, the level of education for the participants ranged from 8 to 24 years of schooling. Chronicity, the time from the initial injury to the neuropsychological assessment, ranged from 12 days to 3 years, 3 months, and 15 days. The average age of the sample was 30 ($SD = 9.71$) and ranged from 18 to 56. Refer to Tables 3 and 4 for additional demographic information about the total sample.

For the first assessment the mean MMPI-2 WRK score for the 173 participants was 56.32 ($SD = 12.79$), and the average of the premorbid Blishen score was 36.26 ($SD = 16.42$). The results demonstrate that there was not a statistically significant

correlation between the MMPI-2 WRK score and the premorbid Blishen score for individuals with STBI at Assessment 1, $r(172) = -.13$, $p > .05$.

Thirty-five participants had a second assessment with the MMPI-2 WRK scale. They ranged in age from 19 to 51 years. Years of education ranged from 9 to 19 years. PTA ranged from a minimum of 7 days to a maximum of 180 days. For the second assessment, chronicity ranged from 178 days to 1,454 days. Refer to Tables 24 and 25 for additional demographic information.

Table 24

Hypothesis 8: Frequencies Assessment 2

Frequencies ($n = 35$)	n	*f*
Males	23	65.71%
Females	12	34.29%
Injury due to a motor vehicle accident	25	71.43%
Injury due to a fall	4	11.43%
Injury due to blunt force trauma	2	5.71%
Injured as a pedestrian	4	11.43%
Employed at some level at Assessment 1	3	8.57%
Unemployed at Assessment 1	32	91.43%
Employed at some level at Assessment 2	13	37.14%
Unemployed at Assessment 2	22	62.86%

Table 25

Hypothesis 8: Demographic Information Assessment 2

Assessment 2 demographics (n = 35)	M	SD
Age	29.97	8.11
Socioeconomic status (preinjury)	41.92	15.84
Chronicity (days) Assessment 2	554.71	331.37
MMPI-2 WRK score Assessment 2	53.37	13.56

For the second assessment the mean MMPI-2 WRK score for the 35 participants was 53.37 (SD = 13.56), and the average of the premorbid Blishen for assessment two was 41.92 (SD = 15.84). The results demonstrated that there was not a statistically significant correlation between the MMPI-2 WRK score and the premorbid Blishen Score for individuals with STBI at Assessment 2, $r(34) = -.19, p > .05$.

Analysis 2. In this analysis, the subsample was composed of 35 participants who completed the MMPI-2 WRK scale at the first and second assessment. They ranged in age from 18 to 51 years. Years of education ranged from 9 to 19 years. PTA ranged from a minimum of 7 days to a maximum of 180 days. For the first assessment, chronicity ranged from 35 to 942 days, and for the second assessment, chronicity ranged from 178 to 1,454 days. For the first assessment the mean MMPI-2 WRK score was 54.74 (SD = 13.34), and for the second assessment the mean MMPI-2 WRK score was 53.37 (SD = 13.56). The average of the premorbid Blishen score was 41.92 (SD = 15.84). At Assessment 1, 32 individuals were unemployed and 3 were employed. For Assessment 2, 22 individuals were unemployed and 13 were employed. The results show that there was not a significant correlation between the MMPI-2 WRK score and the premorbid Blishen

Score for individuals with STBI at Assessment 1, $r(34) = -.02$, $p > .05$ or at Assessment 2, $r(34) = -.19$, $p > .05$.

Given that it cannot be assumed that the above correlation coefficients are independent because they are based on the same sample, a Hotellings *t* test was used to test the differences between the strength of the dependent correlation coefficients. The obtained result (1.20) was below the critical value of 1.70 for a sample of 32, as outlined in Glass and Hopkins (1996). This suggests that one cannot conclude that there is a stronger correlation between the premorbid Blishen score and the WRK score at Assessment 1 and the premorbid Blishen score and the WRK score at Assessment 2.

Stroke Study Results

Eighty-two patients met the respective *MMPI-2*, documented evidence of injury, time from injury, and age inclusion criteria. Chronicity (i.e., the time from the initial injury to the neuropsychological assessment) ranged from 27 days to 3 years and 65 days. The age of the sample ranged from 20 to 60 years of age. The level of education ranged from 7 years to 20 years of schooling. See Table 26 for sex, stroke-related, and marital-status data.

All 82 of the participants were employed prior to their injury. Preinjury Blishen scores ranged from 23.21 (employment as an air transportation foreman) to 79.93, (employment as a natural science manager). Refer to Table 27 for additional demographic information.

Overall age, education, socioeconomic status, and chronicity data are presented in Table 27, and such information is broken down by stroke type in Table 28. Demographic information broken down by ischemic or hemorrhagic stroke is presented in Table 29.

Table 26

Total Sample Frequencies

Frequencies (n = 82)	n	f
Males	50	60.98%
Females	32	39.02%
Ischemic stroke	39	47.56%
Hemorrhagic stroke	43	52.44%
Preinjury marital status = single	9	10.98%
Assessment 1 marital status = single	9	10.98%
Preinjury marital status = married	53	64.63%
Assessment 1 marital status = married	54	65.85%
Preinjury marital status = common-law	6	7.32%
Assessment 1 marital status = common-law	5	6.10%
Preinjury marital status = separated	4	4.88%
Assessment 1 marital status = separated	5	6.10%
Preinjury marital status = divorced	10	12.20%
Assessment 1 marital status = divorced	9	10.98%

Table 27

Total Sample Demographic Information

Total sample demographics (n = 82)	*M*	*SD*
Age at Assessment 1	45.56	8.67
Education (years)	13.61	3.05
Socioeconomic status (preinjury)	48.43	13.95
Chronicity Assessment 1 (days)	290.10	216.01
MMPI-2 WRK scale score	55.56	11.94

Table 28

Ischemic and Hemorrhagic Frequency Information

Frequencies	*na*	*fa*	*nb*	*fb*
Males	21	53.85%	29	67.44%
Females	18	46.15%	14	32.56%
Preinjury marital status = single	5	12.82%	4	9.30%
Assessment 1 marital status = single	5	12.82%	4	9.30%
Preinjury marital status = married	23	58.97%	30	69.77%
Assessment 1 marital status = married	24	61.54%	30	69.77%
Preinjury marital status = common-in-law	2	5.13%	3	6.98%
Assessment 1 marital status = common-in-law	2	5.13%	3	6.98%
Preinjury marital status = separated	3	7.69%	2	4.65%
Assessment 1 marital status = separated	4	7.69%	2	4.65%
Preinjury marital status = divorced	6	15.38%	4	9.30%
Assessment 1 marital status = divorced	5	12.82%	4	9.30%

a = ischemic stroke (n = 39); *b* = hemorrhagic stroke (n = 43)

Table 29

Ischemic and Hemorrhagic Demographic Information

Demographics	*Ma*	*SDa*	*Mb*	*SDb*
Age at Assessment 1	44.97	8.52	46.09	8.87
Education (years)	13.90	2.94	13.35	3.16
Socioeconomic status (preinjury)	49.77	14.58	47.21	13.42
MMPI-2 WRK scale score	57.33	13.34	53.95	10.41
Assessment 1 chronicity (days)	290.92	236.06	289.35	198.93

a = ischemic stroke (n = 39); *b* = hemorrhagic stroke (n = 43),

There were no major differences between the aforementioned demographic variables for the ischemic and hemorrhage samples. However, it must be acknowledged that there was a greater proportion of persons with hemorrhage strokes who were unemployed after their stroke. Specifically, 71.8% of the individuals who had ischemic strokes were unemployed at Assessment 1, and 88.4% of those with hemorrhagic strokes were unemployed. Nonetheless, when a chi-square analysis was conducted to determine whether there was a greater proportion of individuals with ischemic or hemorrhagic stroke who were unemployed, there was not a significant difference between the two stroke samples, X^2 (1) = .06, $p > .05$. Given that there was not a significant difference detected between the two types of CVA patients and that there was such a small number of participants who had returned to work after their stroke (i.e., Ischemic Stroke $n = 11$ and Hemorrhagic Stroke $N = 5$), the total stroke sample was combined for subsequent analyses.

Hypothesis 1: Hypothesis 1 stated that there would be a relationship between the *MMPI-2* WRK score and vocational functioning at Assessment 1. Specifically, it was anticipated that people who were employed at their former level of work would obtain a lower *MMPI-2* WRK score than would people who were employed but working in a reduced capacity or people who were unemployed. The data analysis for Hypothesis 1 initially involved calculation of the mean and standard deviation for the *MMPI-2* WRK scores for each group. Then an ANOVA was calculated to see whether there was a significant difference between the means of the groups. The significance level was set at .05 for the current hypothesis and all subsequent hypotheses in the study unless otherwise stated.

For Hypothesis 1, premorbid work status was defined as being employed at any capacity. Because there was a small number of participants who had returned to work after their stroke at Assessment 1, two groups were selected for Hypothesis 1 rather than the original three. The first group, the employed group, was comprised of those individuals who returned to the same level of employment and those who returned but at a modified level. There were 16 of these subjects. With respect to the second group, the unemployed group, 66 participants did not return to competitive work at any level. Refer to Tables 30 and 31 for additional demographic information.

The results demonstrate that the mean score on the *MMPI-2* WRK subscale for those participants who were employed after injury ($M = 52.81$, $SD = 11.32$) was lower (i.e., better), but not significantly lower than for those who were unemployed ($M = 56.23$, $SD = 12.07$). A one-way ANOVA was conducted with the *MMPI-2* WRK scale of the *MMPI-2* as the dependent variable and return to work (RTW) as the independent variable. There was not a significant difference between the two groups, $F(1, 80) = 1.05$, $p > .05$. The power was low (i.e., .17), and partial eta squared revealed a low effect size, with the *MMPI-2* WRK score accounting for only 1.3% of the variance.

Table 30

Hypothesis 1: Demographic Frequencies for Employed Participants and Unemployed Participants After Stroke

Employed (n = 16)	n	n	Unemployed (n = 66)	n	n
Males	6	37.50%	Males	44	66.66%
Females	10	62.50%	Females	22	33.33%
Marital status at Assessment 1 = single	2	12.50%	Marital status at Assessment 1 = single	7	10.60%
Marital status at Assessment 1 = married	9	56.25%	Marital status at Assessment 1 = married	45	68.18%
Marital status at Assessment 1 = common-in-law	3	18.75%	Marital status at Assessment 1 = common-in-law	2	3.03%
Marital status at Assessment 1 = separated	0	0	Marital Status at Assessment 1 = separated	5	7.58%
Marital status at Assessment 1 = divorced	2	12.50%	Marital Status at Assessment 1 = divorced	7	10.61%

Table 31

Hypothesis 1: Demographic Information for Employed Participants and Unemployed Participants After Stroke

Employed (n = 16)	*M*	*SD*	Unemployed (n = 66)	*M*	*SD*
Age	45.88	9.72	Age	45.48	8.47
Education (years)	13.00	1.93	Education (years)	13.76	3.26
Socioeconomic status (preinjury)	46.19	15.74	Socioeconomic status (preinjury)	48.97	13.56
MMPI-2 WRK Scale	52.81	11.32	*MMPI-2* WRK Scale	56.23	12.07
Chronicity (days)	286.94	168.57	Chronicity (days)	290.86	227.13

Hypothesis 1 was re-examined by splitting the total sample into the ischemic and hemorrhage stroke groups. For the ischemic group, there were 11 participants who returned to work at any level and 28 participants who were unemployed. The results demonstrate that although the mean score on the *MMPI-2* WRK subscale for those participants who were employed after their ischemic stroke ($M = 54.18$, $SD = 11.92$) was lower than for those who did not return to work ($M = 58.57$, $SD = 13.87$), it was not significantly lower. In particular, there was not a significant difference detected between the two groups, $F(1, 37) = .85$, $p > .05$. The power was low (i.e., .15), and partial eta squared revealed a low effect size, with the *MMPI-2* WRK score accounting for only 2.2% of the variance.

For the hemorrhagic sample, only five participants returned to work at any level, and 38 did not return to work. The results reveal that the mean score on the *MMPI-2* WRK subscale for those participants who were employed after their hemorrhagic stroke was $M = 49.80$ ($SD = 10.43$), and for those who were unemployed the mean score was 54.50 ($SD = 10.42$). Although the *MMPI-2* WRK scale score was lower for the employed group, there was not a significant difference detected between the two groups, $F(1, 41) = .90$, $p > .05$, and the power was low (i.e., .15). However, the partial eta squared, a measure of effect or strength of the relationship, revealed a low effect size, with the *MMPI-2* WRK score accounting for only 2.1% of the variance.

Hypothesis 2: Hypothesis 2 stated that a high score on *MMPI-2* WRK ($T > 65$) would be a better indicator of unemployment than a low *MMPI-2* WRK score ($T < 40$) would be of employment at any level at Assessment 1. A chi-square analysis was planned to evaluate whether among high *MMPI-2* WRK scorers the proportion of unemployed

persons was higher than the proportion of employed persons among low *MMPI-2* WRK scorers.

Individuals who were employed and obtained either a high score (*MMPI-2* WRK *T* score > 65) or a low score (*MMPI-2* WRK *T* score < 40) were selected for the sample. The total sample was comprised of 22 participants. Unfortunately, it was not possible to conduct the chi-square test because the assumption that there must be an expected frequency of five participants per cell for analysis was violated in three cells. In regard to the aforementioned cut-off scores, of the 19 people who were unemployed, 17 (89.47%) had high *MMPI-2* WRK scores; and of the three people who were employed, 0 (0%) had low *MMPI-2* WRK scores. Even though the chi-square analysis was not completed, the findings are still consistent with the proposed hypothesis in that the proportion of unemployed persons among high work scorers (17/22 or 77.27%) was higher than the proportion of employed persons among low work scores (0/3 or 0%). When the entire stroke sample was examined, 60 of the 82 *MMPI-2* WRK scores were in the middle range (i.e., *T* scores from 40 to 65).

Hypothesis 3: Hypothesis 3 stated that there would be a significant increase in the Work Interference scores from Assessment 1 to Assessment 2 for those persons with stroke who were employed at Assessment 1 but were unemployed at Assessment 2. Dependent *t* tests were planned to be used to determine whether there was a significant difference between the mean *MMPI-2* WRK scores of the individuals who were employed at Assessment 1 but were unemployed at Assessment 2. Unfortunately, it was not possible to examine this hypothesis because there were no participants who met the aforementioned criterion.

Hypothesis 4: Hypothesis 4 stated that there would be no significant change in the *MMPI-2* WRK scores of patients with stroke who maintained the same employment status (i.e., employed at same level or unemployed) at Assessments 1 and 2. A dependent *t* test was used. This hypothesis was simply based on the assumption that the *MMPI-2* WRK scale is a reliable measure of an individual's work attitudes or characteristics. Thus, when an individual's employment status remains the same from Assessment 1 to Assessment 2, this should be reflected by no significant changes in the *MMPI-2* WRK score. A dependent *t* test was used in the analysis.

Twenty-three participants, who had completed two assessments, comprised the sample. Twenty-two of the participants were unemployed at the first and second assessment. Only one participant was employed at any level at the first assessment and second assessment. See Tables 32 and 33 for demographic information.

The results reveal that the *MMPI-2* WRK mean for Assessment 1 was 54.61 ($SD = 12.14$), and the *MMPI-2* WRK mean for Assessment 2 was 57.00 ($SD = 13.28$). There was a high correlation (.78) between the two assessments. A paired *t* test was used in the analyses. The findings are commensurate with the expected results in that there was not a significant difference between the *MMPI-2* WRK mean scores, $t(22) = .20$, $p > .05$. Given the small sample, a power estimate was calculated based on Cohen's (1988) recommendations for statistical power analyses. A one sample *t* test with the dependent variable being equal to the *MMPI-2* WRK score at Assessment 1 minus the *MMPI-2* WRK score at Assessment 2 divided by the population standard deviation was used to determine the mean difference (MD) for the power analysis ($MD = |M_1 - M_2| \div SD$). The results indicate that the mean difference was -.28, and the power was equal to

.16. Although the anticipated results were obtained, the power estimate suggests very low experimental power to detect group differences.

Table 32

Hypothesis 4: Frequencies

Frequencies (n = 23)	n	f
Males	15	65.22%
Females	8	34.78%
Ischemic injury	10	43.48%
Hemorrhagic injury	13	56.52%
Marital status at Assessment 1 = single	2	8.70%
Marital status at Assessment 2 = single	2	8.70%
Marital status at Assessment 1 = married	17	73.91%
Marital status at Assessment 2 = married	16	69.57%
Marital status at Assessment 1 = common-in-law	1	4.35%
Marital status at Assessment 2 = common-in-law	1	4.35%
Marital status at Assessment 1 = separated	1	4.35%
Marital status at Assessment 2 = separated	1	4.35%
Marital status at Assessment 1 = divorced	2	8.70%
Marital status at Assessment 2 = divorced	3	13.04%

Table 33

Hypothesis 4: Additional Demographic Information

Demographics (n = 23)	*M*	*SD*
Age Assessment 1	46.26	7.66
Age Assessment 2	47.35	7.65
Education (years)	14.09	3.33
Socioeconomic status (preinjury)	51.36	14.06
Chronicity of Assessment 1 (days)	175.17	104.20
Chronicity of Assessment 2 (days)	482.30	209.49
Time difference from Assessment 1 to Assessment 2 (days)	307.13	161.01

Hypothesis 5: Hypothesis 5 stated that there would be a statistically significant difference in the *MMPI-2* WRK score for those persons with stroke who were unemployed at Assessment 1 but employed at Assessment 2. Dependent *t* tests were used to determine whether there was a significant difference between the means of the individuals who were unemployed at Assessment 1 but employed at Assessment 2.

Only three participants comprised the sample that was unemployed at Assessment 1 but was working at some level at Assessment 2. Therefore, it was not possible to conduct the proposed analyses, and only a descriptive account of the three participants is presented. The *MMPI-2* WRK score mean for Assessment 1 was 63.33 (SD = 16.29), and for Assessment 2 the *MMPI-2* WRK mean was 65.33 (SD = 9.71). Essentially, the difference was minimal and in the opposite direction of that anticipated. Refer to Tables 34 and 35 for additional demographic information.

Table 34

Hypothesis 5: Frequencies

Frequencies (n = 3)	n	f
Males	2	66.67%
Females	1	33.33%
Ischemic	1	33.33%
Hemorrhagic	2	66.67%
Marital status at Assessment 1 = married	1	33.33%
Marital status at Assessment 2 = married	1	33.33%
Marital status at Assessment 1 = separated	1	33.33%
Marital status at Assessment 2 = separated	1	33.33%
Marital status at Assessment 1 = divorced	1	33.33%
Marital status at Assessment 2 = divorced	1	33.33%

Table 35

Hypothesis 5: Demographic Information

Demographics (n = 3)	M	SD
Age Assessment 1	46.67	1.53
Age Assessment 2	48.67	1.53
Education (years)	12.67	2.89
Socioeconomic status (preinjury)	52.21	7.84
Chronicity Assessment 1 (days)	213.67	61.78
Chronicity Assessment 2 (days)	510.50	157.68

Hypotheses 6: Hypothesis 6 stated that the *MMPI-2* WRK scale would contribute incrementally to the prediction of return to work after stroke. The incremental contribution of the *MMPI-2* WRK scale in differentiating vocational status in relation to a set of known predictors identified earlier in the literature as being correlated to vocational outcome (i.e., age, education, the Digit Symbol subtest of the WAIS-R, the Booklet Category Test, the Trailmaking Test B, and the Logical Memory Immediate subtest from the WMS-R) was examined. Two stepwise discriminant analyses were conducted. In the first analysis, age and education were used to predict group membership. The second analysis was conducted with a subsample of the first group who had data from the Digit Symbol subtest from the WAIS-R, The Booklet Category Test, the Trailmaking Test B, and the Logical Memory Immediate subtest from the WMS-R. Group membership was defined as return to work at the same level or at a reduced level and not returning to work (unemployed) due to a small sample size.

Prior to the discriminant function analyses being conducted in Hypothesis 6 and Hypothesis 7, a series of assumptions were investigated. First, sample size was examined. Norman and Streiner (1999) suggested that the sample size should be approximately 5 to 10 times the number of the variables selected for analyses. Given that the current study is an exploratory one, a sample of 5 per variable was applied. Nonetheless, it must be acknowledged that, for some of the hypotheses, discriminant function analyses were run even though the sample was lower than desired. The homogeneity of variance-covariance matrixes was assessed via application of Box's M Test. This test was used to test the null hypothesis that the covariance matrixes do not differ between the groups formed by the dependent variable (i.e., employment groups). The findings from this statistic were

generally not significant ($p > .001$) and suggest, that although the sample sizes are unequal, robustness can be assumed. These findings are based on criteria by Tabachnick and Fidell (1996) that indicated that "if sample sizes are unequal and Boxes M test is significant at $p < .001$, then robustness is not guaranteed" (p. 382).

In the first analysis a stepwise discriminant function analysis was planned using age, education, and the *MMPI-2* WRK score as predictors of membership in two employment groups. There were 82 participants in the sample who were working prior to their stroke. At the first assessment 16 individuals were employed at some level ($n = 16$), and 66 were unemployed ($n = 66$). Unfortunately, it was not possible to conduct the first discriminant function analysis because none of the variables entered into the function.

When only the means of the aforementioned independent variables were considered (i.e., education, age, *MMPI-2* WRK score), the majority were in the anticipated direction (i.e., better scores were obtained by the participants who returned to work). An independent *t* test was used to determine whether there were significant differences between the aforementioned variables in the two groups. All of the findings are nonsignificant—age: $t(80) = .87$, $p > .05$; education: $t(80) = .38$, $p > .05$; *MMPI-2* WRK: $t(80) = .31$, $p > .05$—suggesting that there was no difference between the groups on the aforementioned variables. Refer to Tables 36 and 37 for more information about the sample in this analysis.

Table 36

Hypothesis 6: Employed Participants and Unemployed Participants: Age, Education, and WRK Scores

Employed (n = 16)	*M*	*SD*	Unemployed (n = 66)	*M*	*SD*
Age	45.88	9.72	Age	45.48	8.47
Education (years)	13.00	1.93	Education (years)	13.76	3.26
MMPI-2 WRK score	52.81	11.32	*MMPI-2* WRK score	56.23	12.07

Table 37

Hypothesis 6: Gender of Employed and Unemployed Participants

	Employed (n = 16)	Unemployed (n = 66)
Females	10	22
Males	6	44

A second stepwise discriminant function analysis was planned with a subsample of the total sample. This subsample had data from the Digit Symbol subtest of the WAIS-R, the Booklet Category Test, Trailmaking Test (Part B), the Logical Memory Immediate Memory subtest of the WMS-R, and the *MMPI-2* WRK score. Group membership was again defined as being employed (employment at the same level as before injury or at a reduced level) or unemployed. For this analysis, there were 6 participants who returned to work at some level and 40 who did not return to work.

Unfortunately, it was not possible to conduct a discriminant function analysis because the assumptions for conducting this analysis were not met (i.e., insufficient sample size).

Hypothesis 7: Hypothesis 7 stated that the *MMPI-2* WRK scale scores would add to the vocational predictive validity of the traditional *MMPI-2* clinical scales. The average of the clinical scales (1-4 and 6-9) served as an indicator of overall emotional distress. First, the ability of the average of the clinical scale scores to predict group membership was examined. Then a discriminant function analysis was used with the clinical scales average and the *MMPI-2* WRK score serving as predictor variables. Vocational status (employed at same level as before, employed but at a reduced level, and unemployed) served as the criterion variable.

First, the average of the clinical scales (1-4 and 6-9) of the total group ($N = 82$) was determined. Then the average of the clinical scales for the employed and unemployed groups was determined. The clinical scale mean of the individuals who returned to work at any level was 59.40 ($SD = 6.60$), and for the individuals who did not return to work, the mean was 58.63 ($SD = 8.12$). The homogeneity of variance-covariance matrixes was assessed via application of Box's M Test. The findings from the statistic are not significant ($p > .001$) based on criteria by Tabachnick and Fidell (1996). Wilks' Lambda was used to test the significance of the function as a whole. The findings are not significant ($p > .05$), indicating that the function does not contribute to the discriminating power. When the aforementioned discriminant function was used to classify participants into the two employment groups, the classification results demonstrated that only 51.2% of the group were classified correctly. Of the 16 individuals who returned to work at any level, only 9 were classified correctly. Of the 66

individuals who did not return to work, 33 were classified correctly. This suggests that the function was essentially no better than chance at predicting vocational outcome.

A second discriminant function analysis was conducted with the same group to determine whether adding the *MMPI-2* WRK score to the *MMPI-2* Clinical Scales Average function contributed to the discriminating power of the function. The average of the *MMPI-2* WRK score for the individuals who returned to work was 52.81 ($SD = 11.32$), and the average of the *MMPI-2* WRK score for those who were unemployed was 56.23 ($SD = 12.07$). The homogeneity of variance-covariance matrixes was assessed via application of Box's M Test. The findings from the statistic are not significant ($p > .001$) based on the criteria outlined by Tabachnick and Fidell (1996). Wilks' Lambda was used to test the significance of the function as a whole. The findings are not significant ($p > .05$), indicating that the function does not contribute to the discriminating power. The summary of canonical discriminant function was .20. This indicates that 4% of the dependent variables' variance was explained by the function. When the aforementioned discriminant function was used to classify participants into the two employment groups, the classification results demonstrated that only 58.5% of the group were classified correctly. Of the 16 individuals who returned to work at any level, 12 were classified correctly; and of the 66 individuals who did not return to work, 36 were classified correctly. This suggests that the function was hardly better than chance at predicting vocational outcome. Refer to Table 38 for demographic information about the participants.

Table 38

Demographic Information Employed Participants and Unemployed Participants

Employed (n = 16)	*M*	*SD*	Unemployed (n = 66)	*M*	*SD*
Age	45.88	9.72	Age	45.48	8.47
Education (years)	13.00	1.93	Education (years)	13.76	3.26
Socioeconomic status (preinjury)	46.19	15.74	Socioeconomic status (Preinjury)	48.97	13.56
MMPI-2 WRK scale	52.81	11.32	*MMPI-2* WRK scale	56.23	12.07
Chronicity (days)	286.94	168.57	Chronicity (days)	290.86	227.13

A third discriminant function analysis was also conducted with the sample of 82 participants. This time a stepwise discriminant function was conducted with scales (1-4 and 6-9) and the *MMPI-2* WRK score. I felt that this change was necessary because the *MMPI-2* clinical scales average did not allow extreme scores to be considered in the analysis. Wilks' Lambda was not significant ($p > .05$) for any of the variables, which suggests that none of the variables were qualified to predict the two vocational outcome groups, and therefore it was not possible to conduct the analysis. Especially notable was that the *MMPI-2* WRK did not enter into the function. Refer to Table 39 for information pertaining to the *MMPI-2* clinical scales.

Hypothesis 8: Hypothesis 8 stated that there would be a relationship between the WRK score and the premorbid Blishen score for individuals with stroke at Assessments 1 and 2 (Analysis 1). It was also anticipated that the correlation between the premorbid Blishen score and the WRK score at Assessment 1 would be stronger than at Assessment 2 (Analysis 2). The Blishen score served as a measure of premorbid work status.

Table 39

Hypothesis 7: Employed Participants and Unemployed Participants

	Employed (n = 16)		Unemployed (n = 66)	
MMPI-2 Scales	Mean	*SD*	Mean	*SD*
MMPI-2 WRK Scale	52.81	11.32	56.23	12.07
Scale 1: Hypochondriasis	62.00	8.27	62.15	10.51
Scale 2: Depression	66.56	15.28	65.98	13.09
Scale 3: Conversion hysteria	65.81	10.52	62.91	13.19
Scale 4: Psychopathic deviance	55.81	10.99	53.38	10.84
Scale 6: Paranoia	56.38	8.80	54.56	10.63
Scale 7: Psychasthenia	58.25	12.12	59.14	11.97
Scale 8: Schizophrenia	62.31	7.90	56.62	11.69
Scale 9: Hypomania	48.06	7.12	51.29	12.43

Two different analyses were conducted to examine Hypothesis 8. In the first analysis the total sample (N= 82) was used at Assessment 1, and at Assessment 2 a subsample was used (n = 26). The second analysis was conducted with the same subsample (n = 26) at both assessments. It was felt that completing the two analyses would help to provide additional information about the utility of the WRK scale with larger and smaller samples.

Analysis 1. For the first assessment, 82 participants had an assessment with the *MMPI-2* WRK scale. The mean of the premorbid Blishen score at Assessment 1 was 48.43 (SD=13.95). The *MMPI-2* WRK mean at Assessment 1 was 55.56 (SD = 11.94). Please refer to Tables 26 and 27 for information about the sample. The results demonstrate that there was a significant correlation between the *MMPI-2* WRK score and

the premorbid Blishen score for individuals with stroke at Assessment 1, $r(81) = -.24$, $p = .05$.

Twenty-six participants had a second assessment with the *MMPI-2* WRK scale. They ranged in age from 20 to 55 years of age. Years of education ranged from 8 to 20 years. Chronicity ranged from 152 to 824 days. For the second assessment, the premorbid Blishen score mean was 51.46 ($SD = 13.38$), and the *MMPI-2* WRK score mean was 57.96 ($SD = 13.04$). Refer to Tables 40 and 41 for additional demographic information. The results demonstrate that there was not a significant correlation between the *MMPI-2* WRK score and the premorbid Blishen Score for individuals with stroke at Assessment 2, $r(25) = -.09, p > .05$.

Table 40

Hypothesis 8: Sample Frequencies for Participants Assessment 2

Frequencies ($n = 26$)	*n*	*f*
Males	17	65.38%
Females	9	34.62%
Ischemic stroke	11	42.31%
Hemorrhagic stroke	15	57.69%
Employed at some level at Assessment 1	1	3.85%
Unemployed at Assessment 1	25	96.15%
Employed at some level at Assessment 2	4	15.38%
Unemployed at Assessment 2	22	84.62%

Table 41

Hypothesis 8: Demographic Information Assessment 2

Assessment 2	M	SD
Age	47.50	7.20
Chronicity (days)	484.56	203.28
Socioeconomic status (preinjury)	51.46	13.38
MMPI-2 WRK score	57.96	13.04

Analysis 2. In this analysis, the subsample was composed of 26 participants who completed the *MMPI-2* WRK scale at the first and second assessment. They ranged in age from 20 to 55 years of age. Years of education ranged from 8 to 20. For the first assessment the chronicity ranged from 45 to 404 days, and for the second assessment the chronicity ranged from 152 to 824 days. For the first assessment the mean *MMPI-2* WRK score was 55.62 ($SD = 12.61$), and for the second assessment the mean *MMPI-2* WRK score was 57.96 ($SD = 13.04$). The average of the premorbid Blishen score was 51.46 ($SD = 13.38$). There were 25 individuals who were unemployed and one individual who was employed at Assessment 1. For the second assessment there were 22 individuals who were unemployed and four who were employed. The results demonstrate that there was not a significant correlation between the *MMPI-2* WRK score and the premorbid Blishen Score for individuals with stroke at Assessment 1, $r(25) = -.09$, $p > .05$, or at Assessment 2, $r(25) = -.08$, $p > .05$.

Given that it cannot be assumed that the correlation coefficients are independent because they are based on the same sample, a Hotellings t test was used to test the differences between the strength of the dependent correlation coefficients. The obtained

result (-.07) was below the critical value of 1.17 for a sample of 23, as outlined in Glass and Hopkins (1996). This suggests that one cannot conclude that there is a stronger correlation between the premorbid Blishen score and the WRK score at Assessment 1 than at Assessment 2.

CHAPTER FIVE

DISCUSSION FOR STBI AND STROKE STUDIES

To help facilitate understanding of the results from this dissertation, first a general statement about the findings is presented. Second, the results will be discussed in relation to each hypothesis and will address both studies (i.e., STBI and stroke) because the results obtained are very similar. Next, the implications for professional practice, limitations, and recommendations for further research will be addressed.

General Statement of the Findings

Butcher et al. (1990) developed a new content scale on the *MMPI-2*, the Work Interference Scale (*MMPI-2* WRK), which is purported to measure the behaviours and attitudes associated with work performance. Butcher et al. surmised that the WRK scale would be useful in evaluating the ability of individuals to function in work environments and that high WRK scores are "indicative of behaviours or attitudes likely to contribute to poor work performance" (Hathaway & McKinley, 1989, p. 44).

The findings of the current study do not support the notion that the *MMPI-2* WRK scale has clinical utility in determining work status in a sample of adults who have sustained STBI or stroke. Although the scale was tested in a variety of analyses, it was not found to be concurrently or predictively correlated with work status. Moreover, the dissertation findings are not commensurate with the test developer's claims that scores on the *MMPI-2* WRK scale are useful in evaluating the ability to function in work environments.

Discussion of the Hypotheses

Hypothesis 1: Hypothesis 1 stated that there would be a relationship between the *MMPI-2* WRK score and vocational functioning at Assessment 1. It was anticipated that people who were employed at their former level of work would obtain a lower *MMPI-2* WRK score than would people who were employed and working in a reduced capacity or people who were unemployed. Because there was a small number of participants who had returned to work, only two groups were selected for Hypothesis 1 rather than the three originally proposed. Thus, there were two groups: one comprised of individuals who did not return to work and the other of individuals who returned to work at any level.

Although there was a statistically significant difference detected between the *MMPI-2* WRK scores for STBI individuals who returned to work at some level ($n = 30$) and those who did not return to work (n = 105), the difference was not in the predicted direction. Specifically, individuals who returned to work at some level obtained a significantly higher, $F(1, 133) = 4.97$, $p < .05$, mean score ($M = 60.90$, $SD = 14.20$) than did individuals who did not return to work ($M = 55.00$, $SD = 12.36$).

Slightly different results were found in the stroke study when the total stroke sample ($N = 82$) was examined. Although the *MMPI-2* WRK means were in the predicted direction, there was not a significant difference, $F(1, 80) = 1.05$, $p > .05$, between the *MMPI-2* WRK scores for individuals who returned to work at some level ($n = 16$, $M = 52.81$, $SD = 11.32$) and those who did not return to work ($n = 66$, $M = 56.23$, $SD = 12.07$). Even though power was low (i.e., .17), the effect size was very small (i.e., 1.3%), and the *T* score differences were not clinically meaningful, falling in the normal range.

When Hypothesis 1 stroke data were re-examined by splitting the total sample into ischemic and hemorrhage stroke groups, the results for the ischemic group demonstrated that, although the *MMPI-2* WRK means were in the predicted direction, there was not a significant difference, $F(1, 37) = .85, p > .05$, between the *MMPI-2* WRK scores for individuals who returned to work at some level ($N = 11$, $M = 54.18$, $SD = 11.92$) and those who did not return to work ($N = 28$, $M = 58.57$, $SD = 13.87$). Even though the power was low (i.e., .15), the effect size was very small (i.e., 2.2%), and the *T* score differences were not clinically meaningful, falling in the normal range.

For the hemorrhagic group, the results also demonstrated that, although the *MMPI-2* WRK means were in the predicted direction, there was not a significant difference, $F(1, 41) = .90, p > .05$, between the *MMPI-2* WRK scores for individuals who returned to work at any level ($N = 5$, $M = 49.80$, $SD = 10.43$) and those who were unemployed ($N = 38$, $M = 54.50$, $SD = 10.42$). Even though the power was low (i.e., .15), the effect size was very small (i.e., 2.1%), and the *T* score differences were not clinically meaningful, falling in the normal range.

The findings from the STBI and stroke studies differ from the original findings reported by Butcher et al. (1990), where the *MMPI-2* WRK raw score mean scores were compared for airline pilots, active-duty military personnel, hospitalised alcoholics, and psychiatric patients. In particular, they found that employed individuals (i.e., airline pilots, active-duty military personnel) obtained significantly lower scores on the *MMPI-2* WRK scales than did unemployed individuals (i.e., hospitalised alcoholics and psychiatric patients). Specifically, airline pilots scored two standard deviations below the normative sample mean (normative sample: $N = 1138$, $M = 7.30$, $SD = 4.98$), purportedly

indicating highly developed work-adjustment skills and positive attitudes pertaining to work (i.e., airline pilots: N =274, M = .79, SD = 1.43). Active-duty military personnel also achieved scores indicative of good work adjustment (i.e., N = 1478, M = 7.49, SD = 5.77). The results achieved by hospitalised alcoholics (i.e., N = 832, M = 11.39, SD = 6.86) and psychiatric patients (i.e., N = 232, M = 15.26, SD = 7.93) were indicative of individuals with poor work attitudes. The T scores and standard deviations were not reported for the aforementioned data in Butcher et al's (1990) validation study for the *MMPI-2* WRK scale. However, as indicated previously, an understanding of T scores can still be inferred via examination of Butcher et al.'s (1990) raw and uniform T scores content scale data (i.e., Tables 18, 19, 20, and 21). Refer to Table 1 in the current dissertation.

When reflecting upon Butcher et al.'s (1990) sample, it appears that three of the four groups represent extreme ends of the continuum. The airline pilots were very well adjusted psychologically, whereas the hospitalised alcoholics and the psychiatric samples were very poorly psychologically adjusted. Thus, it is possible that the aforementioned groups would have differed on any measure because they represent extreme samples. In contrast, the current study participants represent a range of individuals who were almost all employed preinjury, were unfortunate enough to sustain STBI or stroke, and were not extreme samples. Therefore, the current study provides a more stringent and clinically useful test of the *MMPI-2* WRK scale, and it did not perform as well as when, for example, airline pilots and hospitalised psychiatric patients were compared.

When the STBI study participants who returned to work at any level were compared on the injury-related variables with those individuals who did not return to

work on the injury-related variables, the results reveal that they were significantly different on PTA and time postinjury. Individuals who returned to work had a statistically significant, $t(108.74) = -4.03$, $p < .05$, shorter period of PTA ($M = 13.24$ days, $SD = 12.57$ days) than individuals who did not return to work (PTA: $M = 24.65$ days, $SD = 28.02$ days). Individuals who returned to work had a statistically significant, $t(37.04) = .014$, $p < .05$, longer period postinjury ($M = 463.20$ days, $SD = 344.12$) than did those who did not return to work ($M = 290$ days, $SD = 234$). These findings are consistent with those in the literature in that a shorter period of PTA is associated with better vocational outcome (Asikainen et al., 1998; Cifu et al., 1997; Paniak et al., 1992). Moreover, it can be assumed that individuals who had a longer injury test interval were likely further along in their recovery and, hence, were more able to return to work (Dikmen et al., 1994; Dikmen, Machamer, & Temkin, 1993). In any case, the *MMPI-2* WRK scale did not seem useful for the purpose for which it was intended by Butcher et al. (1990), though "the deck might have been stacked against it" because the employed group were less severely injured and had a longer postinjury period. In any case, the results suggest that the *MMPI-2* WRK scale may not be useful independently of such information (i.e., PTA and time postinjury) when considering the return-to-work potential.

When the stroke study participants who returned to work at any level were compared with those who did not return to work, on age, education, employment preinjury, time postinjury, and the *MMPI-2* WRK scale, there were not significant differences. Commensurate with the literature (i.e., Hsieh & Lee, 1997; Howard et al., 1985; Saeki et al., 1993), age did not appear to be a factor in the current study because

there was not a significant difference between the employed and unemployed groups. As well, there was no difference between the employed and the unemployed groups with respect to premorbid education or employment. Although the literature suggested that there might be a possibility that it is prestroke *job stability* (i.e., Hsieh & Lee, 1997) rather than the *type* of work that is critical, it was not possible to ascertain whether this was a factor with the available data.

The findings in the current dissertation are also similar to those obtained by Fox and Lees-Haley (2001) when they examined the relationship of the *MMPI-2* WRK scale and employment status of individuals involved in personal litigation or workers in compensation litigation who claimed that they had sustained a brain injury. Although Fox and Lees-Haley's sample was indeed different from that of the current dissertation, their findings are consistent with the findings in this study in that their *MMPI-2* WRK scale scores did not show any associations with employment status.

Although the literature review pertaining to the *MMPI-2* WRK scale is relatively sparse, Klonoff et al.'s (1998) research on attitudinal variables in outcome assessment is relevant to both the STBI and stroke studies. They defined outcome according to a specific productivity level described on a 10-point rating scale that included specific descriptors and a categorical system (e.g., *good, fair, poor*). As well, they used a series of 13 questions to obtain information about work eagerness and work readiness. The specific descriptors of this scale and the series of questions on work eagerness and work readiness can be found in Appendix E. They found that the poor outcome group had a significantly lower work eagerness rating (i.e., $M = 36.6$, $SD = 27.7$) than did the fair ($M = 73.6$, $SD = 20.1$) or good outcome groups ($M = 84.9$, $SD = 11.9$). In particular, their

findings reveal that individuals with severe injuries (i.e., TBI, cerebrovascular accidents, tumour resections, anoxia, and infection) who had a good outcome were highly motivated to increase their productivity. When the aforementioned ratings are considered in relation to the questions about work eagerness and work readiness, they seem to be helpful in delineating the sample's work-related attitudes and clearly demonstrate a difference between the outcomes of the groups. In contrast, the *MMPI-2* WRK scores in the STBI and stroke studies were not successful in differentiating between the employed and the unemployed groups. This may be because Klonoff et al.'s work eagerness ratings were clearly based on work-related variables, whereas the *MMPI-2* WRK scale items' relationship to work issues is often less clear. In fact, the majority of the questions do not actually inquire about employment or work directly. Only 13 of the 33 questions actually use the word *work* or *job* in the question. Several of the items seem to pertain to anxiety (i.e., 135, 299, 339, 394, 509, 525), whereas others seem to address social interaction skills (i.e., 98, 243, 302), self-esteem (i.e., 73, 318, 491), and coping skills (i.e., 364, 368, 505, 554). Perhaps some of the questions posed on the *MMPI-2* WRK scale are problematic because they are simply too broad and participants are not directing their focus toward how these particular attributes relate to work. This may be a direct result of the *MMPI-2* WRK scale being developed as a post hoc scale and using items drawn from the MMPI rather than constructing items for a scale in *a priori* fashion to intentionally evaluate attitudes that would affect work success.

Hypothesis 2: Hypothesis two stated that a high score ($T > 65$) on the *MMPI-2* WRK scale would be a better indicator of unemployment than a low *MMPI-2* WRK score ($T < 40$) would be of employment at any level at Assessment 1. This hypothesis was

based on the premise that a high *MMPI-2* WRK score (presumably reflecting negative work attitudes) would be enough to impair work, whereas even when work attitudes are favourable (i.e., as with a low *MMPI-2* WRK score), physical, cognitive, or emotional problems may prevent employment after STBI (e.g., Brooks et al., 1987; Dikmen et al., 1994; Ponsford et al., 1995; Rao & Kilgore, 1992; Rao et al., 1990; Ruff et al., 1993) or stroke (e.g., Black-Schaffer & Osberg, 1990; Ljunggren et al., 1985; Ogden et al., 1993; Saeki et al., 1993).

The findings from Hypothesis 2 analyses for STBI conducted with the recommended cut-off scores (i.e., a high *MMPI-2* WRK *T* score > 65 and a low *MMPI-2* WRK *T* score < 40) reveal that a high score was not a better indicator of unemployment than a low *MMPI-2* WRK score was of employment. (Two analyses were conducted with the STBI first sample including all productive individuals [i.e., homemakers, students, and employed individuals] and the second including only those individuals who were employed.) Specifically, 54.8% and 60% of the high *MMPI-2* WRK scorers were unemployed, and 33.3% and 20% of the low *MMPI-2* WRK scorers were employed. Although the results were in the anticipated direction, they were not statistically significant. This may be due to the relatively small sample size (i.e., Sample 1: 18 had low WRK scores and 42 had high WRK scores, Sample 2: 15 had low WRK scores and 35 had high WRK scores), or perhaps because the *MMPI-2* WRK scale is not actually measuring work attitudes. Overall, the results are expected given that the percentage of individuals with low scores who did not return to work was higher than the percentage of individuals with high scores who did not return to work. Thus, the "employment" status of high versus low *MMPI-2* WRK scores did not differ substantially in the STBI study.

In regard to the stroke study, it was not possible to conduct a chi-square test of independence when the original cut-off points proposed in the study were considered because the assumption that there must be an expected frequency of five participants per cell for analysis was violated in three cells.

Hypothesis 3: Hypothesis 3 stated that there would be a significant increase in the *MMPI-2* WRK scores from Assessment 1 to Assessment 2 for those persons with STBI or stroke who were employed at Assessment 1 but not employed at Assessment 2. Unfortunately, it was not possible to examine this hypothesis in either the STBI or stroke samples because there were no participants who met the aforementioned criterion.

Hypothesis 4: Hypothesis 4 stated that there would be no significant change in the *MMPI-2* WRK scores of patients with STBI and stroke who maintained the same employment status (i.e., employed at the same level or unemployed) at Assessments 1 and 2. This hypothesis was simply based on the assumption that when an individual's employment status remains the same from Assessment 1 to Assessment 2, this should be reflected by no significant changes in his/her *MMPI-2* WRK score.

The results for the STBI study revealed that the *MMPI-2* WRK mean for Assessment 1 was 54.04 ($SD = 12.05$), and the *MMPI-2* WRK mean for Assessment 2 was 53.28 ($SD = 13.64$). There was a moderate correlation ($r = .55$). The findings were commensurate with the expected results in that there was not a significant difference between the *MMPI-2* WRK mean scores, $t(24) = .76$, $p > .05$. Although the findings from the analysis lent support to the aforementioned hypothesis, it must be acknowledged that the sample was small ($n = 25$) and that the power estimate revealed low experimental power (i.e., approximately .06). Nonetheless, even though the *MMPI-2* WRK scale was

not found useful in the previous hypotheses, at least it does not fluctuate (i.e., is not unreliable) in a test-retest analysis in persons who do not change their work status after STBI.

The results from the stroke study reveal that the *MMPI-2* WRK mean for Assessment 1 was 54.61 ($SD = 12.14$), and the *MMPI-2* WRK mean for Assessment 2 was 57.00 ($SD = 13.28$). There was a high correlation (.78) between the two assessments. Although the findings are commensurate with the expected results in that there was not a significant difference between the *MMPI-2* WRK mean scores, $t(22) = .20$, $p > .05$, it must be acknowledged that the sample was small ($n = 23$). The power estimate suggests low experimental power (.16). Of most interest here was that the *MMPI-2* WRK scale was reliable from one assessment to the next given that there were no fluctuations in the scores of those participants who did not change their work status.

Hypothesis 5: Hypothesis 5 stated that there would be a statistically significant difference in the *MMPI-2* WRK score for those persons with STBI and stroke who were unemployed at Assessment 1 but employed at Assessment 2. The rationale for this hypothesis is based on two assumptions drawn from the literature. The first is that individuals with STBI who were unemployed at first assessment may have more favourable attitudes about work when assessed a second time (i.e., Assessment 2). They may be more aware of their difficulties and be able to apply compensatory strategies to accommodate for their problems (Ben-Yishay et al., 1987; Ezrachi et al., 1991). Second, they may be experiencing less fatigue, have greater endurance, and subsequently feel more able to cope with work demands. Therefore, the *MMPI-2* WRK score would be expected to decrease from Assessment 1 to Assessment 2.

Although the *MMPI-2* WRK means were in the anticipated direction for the STBI study, a significant difference was not detected (i.e., Assessment 1 *MMPI-2* WRK mean = 56.60, *SD* = 16.74; Assessment 2 *MMPI-2* WRK mean = 53.60, *SD* = 14.07). Given that the sample was small ($n = 10$) and the power estimate suggested low experimental power (.12), it is not possible to ascertain whether the *MMPI-2* WRK means were reflective of an improvement in work attitudes. When the effect size was calculated, it was only .17 of one standard deviation, suggesting that the overall magnitude was extremely small.

Another possibility that can be considered is that statistical significance was not obtained because individuals who returned to work after injury did not experience a change in work-related attitudes. Their scores were close to average on both occasions; thus it may have been factors other than attitudes toward work that led them to become employed at Assessment 2. Specifically, some possible factors under consideration are financial need; termination of disability benefits; and improvement of cognitive, emotional, and physical status. Interestingly, Fox and Lees-Haley (2001) also suggested that there might be factors other than psychopathology that might be critical in determining an individual's employment status. However, they did not indicate what these factors were in their research.

Only three participants in the stroke sample were unemployed at Assessment 1 but were working at some level at Assessment 2. Therefore, it was not possible to conduct the proposed analyses.

Hypothesis 6: Hypothesis 6 stated that the *MMPI-2* WRK scale would contribute incrementally to the prediction of employment after STBI and stroke. In the STBI study

the incremental contribution of the *MMPI-2* WRK scale in predicting vocational status (i.e., same level of employment, reduced level of employment, and unemployment) beyond a set of known predictors identified earlier in the literature as being correlated to vocational outcome (i.e., PTA, ISS, age, education, the Digit Symbol subtest age scale score of the WAIS-R, the Booklet Category Test *T* score, the Trailmaking Test B *T* score, and the Logical Memory Immediate age scaled *z*-score subtest) was examined. The stroke study analyses was essentially the same except that PTA and ISS were not considered. Due to the restricted sample size for individuals who were employed, group membership was defined as being employed (employment at the same level as before injury or employment at a reduced level) or unemployed.

Three stepwise discriminant function analyses were conducted in the STBI study, and all of the analyses showed that the *MMPI-2* WRK score did not contribute to the discriminating power of the function, but that the ISS score and the Digit Symbol age score from the WAIS-R did contribute to the discriminating power. Even though the ISS and the Digit Symbol score were the only statistically significant predictors retained by the discriminant functions, at least the results on most of the other variables were in the anticipated direction. However, this was not the case for the *MMPI-2* WRK scale because the mean score for the *MMPI-2* WRK score was in the opposite direction, with individuals who returned to work obtaining a higher *MMPI-2* WRK mean.

With respect to the ISS score, the results are logical in that those individuals who suffered a brain injury and had less severe physical injuries would likely have better employment productivity. Dikmen et al. (1994) also considered the impact of other physical injuries on return to work and found that injuries to other bodily systems had a

negative impact on return-to-work rates. As well, other researchers have also reported that injuries to other body systems can contribute to unemployment and impact upon return to work (i.e., Dacey et al., 1991; MacKenzie et al., 1987).

In the stroke study it was not possible to run the first discriminant function analyses using age, education, and the *MMPI-2* WRK score because none of the variables were kept in the function. This finding was not surprising given that the literature review suggested that education and premorbid employment may not be the most significant factors in predicting return to work and that work stability may be the more critical factor (i.e., Bergmann et al., 1991; Howard et al., 1985; Hsieh and Lee, 1997; Saeki et al., 1993; Smolkin & Cohen, 1974). As well, the findings from the literature review on age were mixed, suggesting that it is not just the young who return to work and that there may be other factors to consider (i.e., Adunsky et al., 1992; Black-Schaffer & Osberg, 1990; Brooks et al., 1987; Coughlan & Humphrey, 1982; Howard et al., 1985; Saeki et al., 1993).

In the stroke study it was not possible to conduct the second analysis with a subsample of the first group that had data from the Digit Symbol subtest from the WAIS-R, The Booklet Category Test, the Trailmaking Test B, and the Logical Memory Immediate subtest from the WMS-R due to the small sample size. There were only 6 individuals who returned to work and 40 who did not. The group who returned to work was not sufficient to conduct the analysis based on Norman and Streiner's (1999) recommendations that sample size should be approximately 5 to 10 times the number of variables selected for analysis.

Therefore, the discriminant analyses that were conducted with the STBI study produced the only findings. The results reveal that, of the neuropsychological test scores, only the Digit Symbol score contributed to the functions. This finding is in keeping with the literature pertaining to STBI, because the Digit Symbol score is consistently sensitive to the effects of brain injury and is associated with return to work (Lezak, 1995). Thus, those individuals who obtained better scores on this measure were more likely to have adequate speeded information processing skills that would put them in a better position to returning to work at some level.

When only the means for the different variables are considered from the STBI study, all of them are in the expected direction except the *MMPI-2* WRK score. The findings for PTA were commensurate with the literature in that individuals who had a longer period of PTA did not return to work (Asikainen et al., 1998; Cifu et al., 1997). Moreover, when the specific days of PTA are considered, the mean for individuals who returned to work was 20 days (*SD* =20.01); and for those who did not return to work, the mean was 32.25 days (*SD* = 33.57). The mean for years of education for individuals with STBI who returned to work (*M* = 13.26, *SD* = 3.03) was only slightly higher than that of those who did not return to work (*M* = 12.92, *SD* = 2.78), suggesting that education was not a particularly important variable in discriminating between the two groups. This finding is commensurate with those in the literature in that educational achievement results were mixed. For example, some literature suggested that individuals who had higher premorbid vocational achievement experienced greater success with employment after STBI (Dikmen et al., 1994; Girard et al., 1996; Gollaher et al., 1998; Stambrook et al., 1990), whereas other literature (i.e., Asikainen et al., 1996; Fraser et al., 1988)

suggested that individuals with higher education levels were unemployed and that some with lower education levels were employed. Taken together, this indicates that educational achievement and later vocational outcome are likely interrelated with many factors.

Overall, the findings from the different analyses in the STBI study suggest that the clinical utility of the *MMPI-2* WRK scale was questionable given that the *MMPI-2* WRK means were not in the anticipated directions and that the *MMPI-2* WRK score did not contribute to the discriminant function power. Therefore, there seems to be little point in considering the information provided by the *MMPI-2* WRK scale in neuropsychological assessments of individuals who have sustained STBI, given that it does not appear to be functioning as it was intended, unless subsequent and stronger research finds to the contrary.

Hypothesis 7: Hypothesis 7 predicted that the *MMPI-2* WRK scale scores would add to the vocational predictive validity of the traditional *MMPI-2* clinical scales. The average of the clinical scales (1-4 and 6-9) would serve as an indicator of overall emotional distress. A discriminant function analysis was conducted with the clinical scales (1-4 and 6-9) and the *MMPI-2* WRK scale. Because the *MMPI-2* WRK Scale was specifically designed to evaluate work attitudes, it was thought that it should add to the utility of scales designed to assess other issues in terms of predicting work status after STBI and stroke.

The results from the first analysis conducted with the STBI sample indicate that, when the average of the clinical scales was entered into the discriminant function, it classified participants into either employed or unemployed groups essentially no better

than chance. The clinical scales mean of the employed group (59.24) and that of the unemployed group (59.21) were almost identical. This is perhaps not surprising given that these scales were not designed to predict employment status, although one might surmise that it is difficult to maintain employment when faced with severe emotional problems (e.g., Butcher et al. [1990] indicated that "many of the psychiatric sample had never held active jobs" [p. 90]). More surprisingly, the *MMPI-2* WRK scores for the two groups were not significantly different and were in the wrong direction. For the individuals who were unemployed, the *MMPI-2* WRK mean was slightly but not significantly lower (55.71) than that obtained for those who were employed (58.55). When the original findings from Butcher et al. are considered in relation to the current findings, it appears that the *MMPI-2* WRK score is not working in the anticipated way and that it cannot be relied upon in terms of predicting employment as concurrently measured.

In regard to the average of the clinical scales, another analysis was considered necessary because simply averaging the scores of the clinical scales may not have allowed the detection of the importance of specific scale elevations. Therefore, a stepwise discriminant function analysis was conducted with the *MMPI-2* scales 1-4 and 6-9, and the *MMPI-2* WRK scale. Approaching the analysis in this manner improved the classification from 50.3% to 65.7% and resulted in a statistically significant finding. However, the *MMPI-2* WRK scale score did not enter into the solution, but scales 7, 1, 2, and 6 did enter into the solution.

When the findings from Hypothesis 7 are considered in relation to the literature, it appears that the clinical scales average cannot be used to predict vocational status after

STBI and that the *MMPI-2* WRK scale score was not helpful in classifying individuals into their respective vocational groups. However, when the clinical scales were entered into a stepwise solution, a statistically significant function comprised of scales 7, 1, 2, and 6 correctly classified 32 out of 49 participants who returned to work and 79 out of 120 who did not return to work. Thus, it appears that difficulties with emotional and personality function do have a bearing on whether an individual who has sustained STBI will be successful in returning to work, depending upon how it is measured. On the other hand, the *MMPI-2* WRK scale did not enter into the function.

When the specific *MMPI-2* scales in the stepwise solution are considered, Scale 7 purports to measure anxiety, worry, compulsions, and self-criticalness; Scale 1 measures excessive concern about health and bodily function; Scale 2 measures depressive symptoms and contains items that identify pessimism, guilt, mood, irritability, discouragement, hopelessness, and sadness; and Scale 6 measures interpersonal sensitivity and misinterpretation of others' actions or beliefs. The issues identified by the study participants are consistent with the literature pertaining to STBI, in which the participants reported difficulty with anger, irritability, anxiety, depression, and denial, and decreased self-esteem (Brooks et al., 1987; Crépeau & Scherzer, 1993; Hinkeldey & Corrigan, 1990; Lezak, 1987; Lubusko et al., 1994; Ponsford et al., 1995; Tyerman & Humphrey, 1984; Weddell et al., 1980). When the means of the two groups are compared, individuals who did not return to work obtained higher scores, indicative of greater problems on scales 1 ($M = 63.16$, $SD = 13.13$) and 2 ($M = 63.31$, $SD = 13.83$). On the other hand, individuals who returned to work obtained higher scores on scales 6 ($M = 57.53$, $SD = 11.53$) and 7 ($M = 62.14$, $SD = 12.67$). This was unexpected given that

one would not expect individuals who returned to work to be more paranoid and anxious. Although the means for neither group were at or greater than a *T* score of 65 (i.e., a score considered as indicative of psychological distress on a particular scale), a series of independent *t* tests were conducted to detect significant differences. Given the number of analyses, the significance level was changed to .01. The results indicate that there were no statistically significant differences between the two groups on the basis of their individual *MMPI-2* scores.

The results from the first analysis conducted with the average of the clinical scales in the stroke study reveal that it classified the participants into the two groups essentially no better than chance. The clinical scales means of the employed group (59.40) and the individuals who did not return to work (58.63) were very similar. This is not surprising given that the scales were not designed to predict employment status. Nonetheless, one would think that individuals with a higher degree of emotional distress might find it more difficult to maintain employment. When the *MMPI-2* WRK score was considered, it was in the correct direction, with the employed group having a lower score (52.81) than the unemployed group (56.23). However, the findings were not significant, and the discriminant function analysis with the *MMPI-2* clinical average and the *MMPI-2* WRK score was essentially no better than chance at predicting the vocational outcome of the participants.

Another discriminant function analysis was conducted with the sample of 82 stroke participants. This time each of the *MMPI-2* clinical scales 1-4 and 6-9, and the WRK scale were entered into the analysis separately. This change was felt necessary because the *MMPI-2* clinical scales average did not allow extreme scores to be

considered in the analysis. However, none of the *MMPI-2* clinical scales or the WRK scale was useful in predicting the two vocational outcome groups. Given that difficulties with depression are commonly identified as problematic after stroke (i.e., Angeleri et al., 1993; Coughlan & Humphrey, 1982; Fisher & Bogousslavsky, 1996) and that there is an association between depression and employment (i.e., Feibel & Springer, 1982), it was unexpected that scale 2 did not enter into the analysis and that essentially none of the MMPI-2 clinical scales entered into the discriminant function analysis. When the stroke sample findings are considered from Hypothesis 7, they suggest that the WRK scale and scales 1-4 and 6-9 were not useful in the discriminant function. Moreover, when the STBI Hypothesis 7 findings are considered, none of the scores for the two vocational groups differed (i.e., $p < .01$). This suggests that it is likely that the STBI finding were not robust or particularly reliable.

Hypothesis 8: Hypothesis 8 stated that there would be a relationship between the *MMPI-2* WRK score and the premorbid Blishen score (i.e., socioeconomic status) for individuals with STBI and stroke at Assessments 1 and 2 (Analysis 1). It was also anticipated that the correlation between the premorbid Blishen score and *MMPI-2* WRK at Assessment 1 would be stronger than that at Assessment 2 (Analysis 2). As indicated previously, the Blishen score served as a measure of premorbid work status (Blishen & McRoberts, 1976; Paniak, 1990).

The rationale for this hypothesis was based on the work of MacMillan et al. (1999), who proposed that preinjury characteristics might have a bearing on later outcome and that work attitudes may be enduring qualities that remain stable even after STBI. Thus, those individuals with poor job stability premorbidly may tend to have

poorer vocational outcome and work attitudes after STBI or stroke (e.g., Dikmen et al., 1994; MacMillan et al., 1999). As well, those individuals with good attitudes about work premorbidly may still continue to hold the same beliefs about work across assessments. On the other hand, it is also possible that over time (i.e., Assessment 2), a change in work attitudes may occur when the individual develops greater insight into his/her difficulties. In addition, the longer it is postinjury, the less an individual's premorbid vocational status (i.e., Blishen) may be related to WRK scores.

Essentially, the STBI findings from Hypothesis 8 stated that there was not a statistically significant correlation between the *MMPI-2* WRK score and the premorbid Blishen score (i.e., socioeconomic status) for individuals with STBI at Assessments 1 and 2 regardless of the sample size. As well, the findings reveal that there was not a stronger correlation between the premorbid Blishen score and the WRK score at Assessment 1 than at Assessment 2 for the STBI sample in Analysis 2 ($n = 35$ at both assessments).

In regard to the stroke samples, in the first analysis (i.e., total stroke sample for Assessment 1 and subsample for Assessment 2) there was a statistically significant correlation detected between the premorbid Blishen score and the WRK score at Assessment 1 but not at Assessment 2. When the second analysis was conducted with a subsample of individuals at Assessments 1 and 2 ($n = 26$), there was not a statistically significant correlation detected between the premorbid Blishen score and the WRK score. As well, there was no difference between the strength of the correlation between the first assessment and the second assessment in the second analysis.

Overall, the Hypothesis 8 findings for both the STBI and stroke studies were largely not supportive of Hypothesis 8. In particular, the findings from the first analysis

with the STBI sample reveal that there was not a statistically significant correlation between the premorbid Blishen score and the *MMPI-2* WRK scale at Assessment 1 or 2. However, a statistically significant correlation was detected between the premorbid Blishen score and the WRK score at the first assessment for the total stroke sample ($N = 82$). Although it was anticipated that the correlation between the premorbid Blishen score and the *MMPI-2* WRK score at Assessment 1 would be stronger than the premorbid Blishen score and the MMPI WRK score at Assessment 2 because at the latter time the participants would be longer postinjury and the WRK score's relationship to premorbid work status would be weaker, this was not demonstrated. Specifically, there was not a stronger correlation detected between the premorbid Blishen score and the WRK scale at Assessment 1 than at Assessment 2 for the STBI or the stroke sample.

Given the mixed findings, a post hoc analysis was conducted to determine whether there was a concurrent association between the *MMPI-2* WRK score and the Blishen score at Assessment 1 and at Assessment 2 for the STBI and the stroke samples. The Blishen score at the time of each assessment was used rather than the premorbid Blishen score. For the first assessment the total STBI sample ($N = 173$) was used for analysis. The mean of the Blishen score at Assessment 1 was 14.14 ($SD = 6.62$). The *MMPI-2* WRK mean at assessment one was 56.32 ($SD = 12.79$). For Assessment 2 the STBI sample was comprised of 35 participants. The mean of the Blishen score at Assessment 2 was 16.21 ($SD = 17.31$). The WRK mean at Assessment 2 was 53.37 ($SD = 13.56$). The results reveal that there was not a significant relationship between the *MMPI-2* WRK Scale and the Blishen Score at Assessment 1, $r(172) = .13$, $p > .05$, or at Assessment 2, $r(34) = -.14$, $p > .05$, for the STBI sample.

For the stroke sample, at Assessment 1 the sample ($N = 82$) was used for analysis. The mean of the Blishen score at first assessment was 13.99 ($SD = 18.42$), and the mean of the WRK score at Assessment 1 was 55.56 ($SD = 11.94$). For Assessment 2 the sample was comprised of 26 participants. The mean of the Blishen score at second assessment was 9.68 ($SD = 11.94$), and the mean of the WRK score at Assessment 2 was 57.96 ($SD = 13.04$). The results reveal that there was not a significant relationship between the *MMPI-2* WRK scale and the Blishen score at either Assessment 1, $r(81) = -.15$, $p > .05$, or Assessment 2, $r(25) = .16$, $p > .05$.

Perhaps these findings result because the *MMPI-2* WRK is simply not reliably related to the Blishen score (i.e., vocational status) at any time and/or there were simply not enough people who changed work status between assessments to affect the WRK correlation with the Blishen score. Therefore, the analyses lend support to the findings from the other hypotheses suggesting that the WRK score is weakly, if at all, related to vocational functioning after STBI or stroke. Moreover, when the results from Hypothesis 8 are viewed collectively, the results provide very little support for the ability of the WRK scale to predict concurrent social economic status (i.e., Blishen score) or to be reflective of premorbid socioeconomic status (i.e., Blishen score). As suggested previously, perhaps the problem lies with the *MMPI-2* WRK scale itself given that the majority of the items do not directly relate to employment or address variables found by other researchers to be predictive of employment (e.g., motivation, work eagerness, working alliance, or premorbid work ethic).

Implications of the Research for Professional Practice

The current dissertation contributes new research to the meagre literature available on the *MMPI-2* WRK scale. Moreover, the aforementioned archival research is possibly the first to explore the utility of the *MMPI-2* WRK content scale with Canadians who sustained STBI or stroke. Given that the *MMPI-2* remains one of the most extensively used measures in clinical practice and clinicians rely on this measure in day-to-day work, it was critical that the current research be conducted.

The implications for the use of the *MMPI-2* WRK scale in clinical practice are discouraging when the findings from the current dissertation are considered. Specifically, the WRK scale did not appear to be working in the direction expected because the scores obtained by individuals who were employed or unemployed were not significantly different. Although the *MMPI-2* WRK scale appeared to be a reliable measure because the WRK scores did not change from one assessment to another when the participant's work status remained unchanged, this is no evidence for the scale's clinical utility. Although the *MMPI-2* WRK scale developers purported that the ability to function effectively in employment environments varies in different groups and demonstrated that the WRK scales could differentiate between different groups in their original validation study, the findings of the current research were not commensurate with their findings.

The current findings demonstrate that there was no association between the WRK scale scores and concurrent employment. Moreover, the results reveal that the *MMPI-2* WRK scale did not contribute to the power of the discriminant function in any of the analyses conducted. On the other hand, the ISS and the Digit Symbol scores contributed to the power of the discriminant function. The latter findings are consistent with those in

the literature and suggest that these two measures are indeed helpful to clinicians in decision making. Although the test developers purported that high WRK scores are suggestive of poor work attitudes and behaviours that lead to poor performance in employment, this was not borne out in the current research because the WRK score was not correlated concurrently with employment status or predictive of employment status. Thus, if one is to incorporate the WRK scale into assessment batteries and ultimately rely on it in clinical practice, it is important that it provide clinicians with useful and valid information. If useful information can be obtained from other measures, or even if not, then the use of the WRK scale still does not seem necessary or warranted. Moreover, use of the WRK scale may pose a potential disservice to clients if clinicians use the scale in an uncritical fashion without firsthand knowledge of the potential problems detected in the current research and, ultimately, base their decisions on the findings.

The findings from the current dissertation also raise other issues for clinicians who assess work attitudes in day-to-day practice or researchers who develop measures to assess work attitudes. With clinicians, time is always a factor. If the information obtained from the *MMPI-2* WRK scales cannot be counted upon to produce useful findings, then it is not a good expenditure of resources to have participants spend the additional time to complete the *MMPI-2* just to obtain the WRK scale information. (This does not imply that time is wasted in administering the entire *MMPI-2*, because valuable information can indeed be obtained from the other scales, although not much information about work status can be gleaned from the WRK scale.) For clinicians or researchers attempting to develop questionnaires to assess work attitudes, it is important to be mindful of some of the concerns raised about the development of the *MMPI-2* WRK scale. Namely, the

MMPI-2 WRK scale was developed post hoc, and the majority of the items did not directly mention employment or address variables found by other researchers to be predictive of employment (e.g., motivation, work eagerness, working alliance, or premorbid work ethic). Thus, ensuring that future measures contain content empirically related to employment status and that the measure has been properly validated for the population in question is critical.

Limitations of the Research

Although every effort was made to plan and conduct the research with as few problems as possible, there are several limitations in the current research that must be acknowledged. These limitations are discussed in relation to the following categories: design issues, and generalizability and external validity.

Design Issues

The archival design of the study imposed some limitations in the current dissertation. First, the study findings would likely have been improved if the stroke sample had been larger. Given the smaller stroke sample size, it simply was not possible to examine some of the proposed hypotheses. Second, the fact that not all of the stroke and STBI participants were administered the same measures also imposed limitations upon the number of participants included in analyses. Third, information pertaining to seeking or receiving financial compensation was not recorded in the participants' medical or psychological records and, unfortunately, could not be considered as a variable. Given that other researchers (i.e., Binder & Rohling, 1996; Klonoff et al., 1998) reported that this is a variable that can certainly impact on participants' motivation, work eagerness, and vocational status, this would have been worthwhile to examine.

Generalizability and External Validity

It was not possible to obtain random samples for the current dissertation. Therefore, convenience samples were selected in which all of the participants had suffered either STBI or stroke and undergone neuropsychological assessment in a rehabilitation hospital. A potential limitation with this type of sample is the lack of representativeness to a population. To deal with this problem, both the STBI and the stroke samples were described as thoroughly as possible. For both samples, information was obtained about age, gender, education, marital status, socioeconomic status, and injury type. Based on the information obtained, the literature reviewed, and the inclusion criteria required, the samples did appear to be representative of the target populations of interest (i.e., age, gender, types of injuries, severity of injuries, sequelae).

When conducting research in which random sampling is not feasible, the generalizability of the findings can be enhanced by carefully describing the characteristics of the study samples in question so that other researchers can judge for themselves how or to whom the findings might be applied. As indicated previously, this was addressed in the current dissertation. Nonetheless, it must be acknowledged that the findings from the current study may not apply to those individuals who suffered STBI or stroke and did not obtain services from a rehabilitation facility.

The generalizability of a study can also be improved by replication. In particular, the researcher or another researcher can repeat the study with different samples or conduct the research in different environments. To some degree, the external validity of the current dissertation has been enhanced by Fox and Lees-Haley's (2001) research, in which they examined the relationship of the *MMPI-2* WRK scale with employment status

in a sample that differed from that of the current research. Specifically, their sample was comprised of 292 individuals who were involved in litigation (i.e., personal injury or workers' compensation) with alleged claims of psychological injury. Moreover, the environment in which the study was conducted and its purpose also varied (i.e., private psychological practice vs. hospital clinic, forensic focus vs. rehabilitation). Given that their findings were similar to those of the current research, this suggests that the current findings can indeed be generalized to other samples. Nonetheless, it is acknowledged that the generalizability of the current findings can further be advanced by replication studies with other samples and in other contexts.

Suggestions for Further Research

Given that the findings from the current research do not support the use of the WRK scale with STBI and stroke samples, the assessment of work attitudes remains a critical problem for those clinicians who continue to assist such individuals in rehabilitation and return-to-work endeavours. It appears that future research could address the following: (a) investigation of the WRK scale with other samples and (b) examination of other measures that might be more appropriate.

Given that the current findings show that the *MMPI-2* WRK scale was not particularly useful with STBI or stroke samples and that Fox and Lees-Haley (2001) also reported similar findings when the scale was tested with individuals who might possibly have sustained a TBI, it is important that additional research be conducted with other samples. Thus, it remains to be seen in further research with the *MMPI-2* WRK scale whether it has any clinical utility with other populations.

Regarding the second problem, a review of the literature pertaining to work attitude measurement in individuals with STBI and stroke was conducted. Unfortunately, the review revealed that there were no measures that specifically purported to measure work attitudes after STBI or stroke. When the search was expanded to encompass a wider range of disabilities, it was determined that the following three might be useful: the Menninger Scale, the Personal Capacity Scale, and the Work Attitude Scale. As well, Klonoff et al.'s (1998) questions pertaining to work eagerness and work readiness were considered. To help familiarize the reader with these measures and the feasibility of their use, a brief review is provided.

The Menninger Scale

The Menninger Scale was developed by Hester, Decelles, and Gaddis (1986) to assist in determining which people have the greatest likelihood of returning to work without rehabilitation assistance and which individuals are not likely to return to work even when support services are provided. They obtained detailed information from an insurance carrier about 600 individuals with long term disability claims who had either returned or not returned to work. There were enough cases to divide the participants into five respective disability groups: those with cardiovascular problems, pulmonary problems, gastrointestinal problems, musculoskeletal problems, and neurologic problems. Neurological problems included cerebrovascular accidents and individuals with brain concussions. (Hester et al. did not report how a brain concussion was defined in their research.) They determined that 10 items seemed to discriminate between those who returned to work and those who did not return to work: type of disability, age, sex, education, marital status, type of occupation, area of residence, type of employer, type of

disability support received, and amount of wage replacement. They combined these 10 items to form the Menninger Return to Work Scale to assist in determining the likelihood of an injured or ill person returning to work without rehabilitation services.

Based on their research, Hester et al. (1986) reported that younger individuals returned to work more than did those who were older. Sixty percent of the women who had long term disability policies returned to work, compared to 47% of the men. Single workers were more likely to return to work than were those who were married, divorced, or separated. More individuals who were disabled as a result of cardiovascular problems returned to work than did those with neurological problems. However, Hester et al. indicated that their sample selection might have had some bearing on the findings with respect to this variable. The mean education average of individuals who returned to work (i.e., $M = 13.7$, $SD = 3.64$) was higher than the mean education average of those who did not return to work (i.e., $M = 11.3$, $SD = 4.23$). In regard to specific employment roles, more individuals who were employed as managers or professionals returned to work than those individuals in service occupations. Moreover, more individuals who were employed in public agencies returned to work than those who were employed by a company or corporation or were in fact self-employed. Examination of the place of residence also indicated that a larger percentage of individuals in rural areas with limited rehabilitation services or public transportation did not return to work. The type of disability support that was received also was related to returning or not returning to work. Specifically, those participants who were receiving only long-term disability benefits were very likely to return to work. With respect to wage replacement, Hester et al. reported that when the wage replacement exceeds 75% of the individual's former wage, then there is less

likelihood of returning to employment. Based on their findings, they concluded that the scale had excellent ability to differentiate those who would return to work from those who would not return to work.

The Personal Capacity Scale

The Personal Capacity Scale (PCQ) is a self-report questionnaire that provides information about adaptive behaviour, motor functioning, cognition, physical condition, communication, vision, and vocational qualifications. It contains 30 items that provide information about how the individual perceives his/her overall abilities and strength/weaknesses. Each of the 30 questions is broken down into four response levels: 0 (*no impairment*), 1 (*mild impairment*), 2 (*moderate impairment*), and 3 (*severe impairment*). The PCQ is actually an "item by item translation of the Functional Assessment Instrument (FAI) into first person terms and simpler language so that it may be completed by the patient" (Biggan. 1996, p. 25). It was felt that the PCQ might be a useful measure to consider given that it was designed to provide information about how the individual perceives his/her abilities. Unfortunately, there is little research available about the validity and reliability of the PCQ.

The PCQ was one of the measures that Biggan (1996) used in her doctoral dissertation, where she examined vocational outcome in a sample of 44 participants who had suffered a traumatic brain injury. Her sample included 24 participants with a severe injury, 12 with a moderate injury, and 8 with a mild injury. Biggan examined the validity of selected neuropsychological, emotional, and functional assessment measures in predicting vocational outcome. Besides the PCQ, she used the Logical Memory (LM) subtest of the Wechsler Memory Scale–Revised, the Paced Auditory Serial Addition Test

(PASAT), the Beck Depression Inventory (BDI), the Functional Assessment Inventory (FAI), and the Behavior Checklist (BC). For the purposes of the current research, only the findings from the PCQ are emphasized.

Biggan (1996) used the FAI and the PCQ to obtain information about the perception of vocational strengths and weaknesses and the level of awareness about deficits. She examined the FAI functional limitations score (FAI-FL), the PCQ functional limitations score (PCQ-FL), the FAI strength score (FAI-S), and the PCQ strength score (PCQ-S). Rehabilitation professionals completed the FAI, and individual participants completed the PCQ. A significant difference was detected between the two measures, with professionals identifying a greater number of deficits than did patients, and patients identifying a greater number of strengths than did professionals. Biggan also conducted a post hoc regression analysis to determine which demographic and test variables were correlated with return to work. She included the FAI-FL, PCQ-FL, PCQ-S, age, and injury severity in the analysis. The results revealed that only the PCQ-FL score was significant and accounted for 10% of the variance. When the PCQ was readministered approximately six months after the initial assessment, the patient rating reflected greater endorsement of cognitive problems and a decreasing focus on physical impairments. As well, Biggan found that the participants' PCQ-FL score was the best overall predictor of earned income six months post injury. She concluded that the PCQ is a useful instrument for evaluating differences between patients' and clinicians' perceptions of deficit awareness. As well, she was of the opinion that the PCQ-FL could be used to predict income levels after the first year of injury.

The Work Attitude Scale

Duvdevany and Rimmerman (1996) investigated internal or external locus of control, attitudes toward employment, and cooperation with a rehabilitation counsellor in a sample of 200 Israelis who were deemed to have work-related disabilities. Greater than 50% of the sample had physical disabilities, and approximately one third had mental disabilities. They based their research on the premises that locus of control is related to adjustment to disability and individuals who have an internal locus of control generally make greater progress in rehabilitation. As well, Duvdevany and Rimmerman drew upon Neff's (1977) work personality theory, in which "a person's tendency to work and derive satisfaction from it is reflected in the vocational part of his/her personality" (p. 31). Specifically, a positive work personality was described as having good motivation, being willing to conform to social norms, having a good ability to meet work demands, having satisfactory relationships with co-workers, being flexible on the job, and having adequate skills to perform the job. Aspects of work personality and attitudes towards work were measured with the Work Attitude Scale, which was based on a model that encompassed satisfaction/dissatisfaction, internal/external locus of control, and specific motives such as material, activity, esteem by others, and creativity. Through this model Duvdevany and Rimmerman uncovered information about whether a person actually wanted to work, what specific needs motivated him/her, and how work satisfaction was derived for that particular individual. Their findings demonstrate that individuals with an internal locus of control had better attitudes towards employment. Moreover, they determined that locus of control was able to predict positive work personality and overall attitude toward work. These researchers proposed that identifying an individual's locus of control and work

personality might be helpful in determining suitable rehabilitation programs. Unfortunately, the Work Attitude Scale is an unpublished questionnaire, and further information about it is not readily available.

Klonoff et al.'s Work Eagerness and Work Readiness Outcome Measures

Klonoff et al. (1998) examined several attitudinal outcome variables in their study on outcome assessment after milieu-oriented rehabilitation with a sample of patients with TBI, cerebrovascular accidents, and other brain injuries. They developed a series of 13 questions that focussed on process variables that rehabilitation staff could use to help determine a patient's level of outcome after discharge from the rehabilitation program. As indicated in the earlier literature review, these process variables encompassed work alliance, work eagerness, and work readiness. (Refer to Appendix E for the specific questions.) Klonoff et al. concluded that the incorporation of process variables greatly enhanced their knowledge of rehabilitation outcomes. They acknowledged that the process variables and particularly the staff ratings had not been subjected to detailed psychometric testing because of limited sample size and the fact that their research was exploratory and heuristic. Nonetheless, they were hopeful that their findings would stimulate other researchers to develop measures that incorporate these variables into their design.

Concluding Summary and Comments

The current study demonstrated that the *MMPI-2* WRK scale was not correlated concurrently or predictively with work status. Although the test developers purported that the scale would be helpful in evaluating the ability of participants to function in work environments and would be indicative of behaviours or attitudes likely to contribute to

poor work performance, this was not borne out in the current dissertation. In particular, the *MMPI-2* WRK scale was not helpful in differentiating between participants who were employed and unemployed. In contrast, other variables (i.e., PTA, chronicity) were found to be helpful in this regard. Specifically, the findings reveal that employed participants who had sustained STBI had a statistically significant shorter period of PTA and were longer postinjury.

The *MMPI-2* WRK scale did not contribute to the power of the discriminant function in any of the analyses conducted. On the other hand, the ISS and the WAIS-R Digit Symbol Subtest scores did contribute to the power of the discriminant function. These findings are logical given that the literature review revealed that participants who obtained more severe physical injuries and STBI were more likely to be unemployed. With respect to the WAIS-R Digit Symbol findings, participants who obtained a better score were able to process information more quickly. This strength likely put them in a better position to function more effectively on the job.

The current dissertation findings do not bode well for the use of *MMPI-2* WRK scale in assessment batteries of participants who have sustained STBI or stroke, and raise questions about the actual validity of the scale. Likewise, Fox and Lees-Haley (2001) also suggested that the *MMPI-2* WRK scale was not associated with current employment status. As indicated previously, perhaps the lack of association between employment status and the *MMPI-2* WRK scale is a direct result of the *MMPI-2* WRK scale content and its post hoc development. The fact that the scale was simply derived from the original MMPI items and does not refer to employment in the majority of the items is of concern. On the other hand, the work of Klonoff et al. (1998) on outcome measurement is

promising and revealed that work eagerness or motivation is a key factor in determining those who will be successful in employment even after they have sustained a severe brain injury. Their suggestion that process-oriented questions pertaining to work eagerness, working alliance, and work readiness be considered is noteworthy. It would also be interesting to see whether such questions could be written to allow "objective" and quantifiable scoring as with the *MMPI-2* WRK scale.

Overall, the findings from the current research suggest that the *MMPI-2* WRK scale does not have clinical utility with participants who have sustained STBI or stroke. As such, the *MMPI-2* WRK scale is not helpful in evaluating the ability of the aforementioned participants to function in work environments and does not provide useful information about the behaviours or attitudes likely to contribute to poor work performance. Unfortunately, the literature review revealed that there are not many measures that may be suitable for the aforementioned purpose. Thus, a serious dilemma exists in that a measure to address these problems has yet to be developed. Based on the current findings, the development of such a measure should include information about injury severity, speed of information processing, and work eagerness or motivation, and should include direct reference to employment. As well, the measure should be able to differentiate changes in work status and be concurrently and predictively related to work status. Given that assisting individuals who have sustained STBI or stroke in increasing their productivity and ultimately returning to work is paramount to the participants themselves and to rehabilitation professionals, it is hoped that future researchers will take on the challenge of developing a suitable assessment measure.

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APPENDIX A

GLASGOW COMA SCALE

Test	Response	Score
Eye opening	Spontaneous	4
	Opens eyes to verbal stimulus	3
	Opens eyes to painful stimulus	2
	No response to any stimulus	1
Verbalization (verbal response)	Fully alert and oriented	5
	Confused	4
	Inappropriate	3
	Incomprehensible	2
	None	1
Motor response of nonparalyzed side	Normal (obedience to command)	6
	Localizes painful stimulus	5
	Withdrawal response to pain	4
	Flexion response to pain	3
	Extension response to pain	2
	None	1

APPENDIX B

POSTTRAUMATIC AMNESIA SEVERITY LEVEL

Slight concussion:	transient disturbance of consciousness; PTA under 1 hour
Moderate concussion:	as above, but PTA 1 to 24 hours
Severe concussion:	recovery of consciousness delayed; PTA 1-7 days
Very severe concussion:	prolonged coma or stupor; PTA over 7 days

APPENDIX C

BARTHEL INDEX

Function	Score	Description	
Feeding	10	Independent, able to apply any necessary device, eats in reasonable time	
	5	Needs help (e.g., cutting)	____
Wheelchair or bed transfers	15	Independent, including placing locks of wheelchair and lifting footrests	
	10	Minimal assistance or supervision	
	5	Able to sit but needs maximal assistance to transfer	____
Personal toilet (grooming)	5	Washes face, combs hair, brushes teeth, shaves (manages plug if using electric razor)	____
Toilet transfers	10	Independent with toilet or bedpan, handles clothes, wipes, flushes, or cleans pan	
	5	Needs help for balance, handling clothes or toilet paper	____
Bathing self	5	Able to use bathtub or shower or take complete sponge bath without assistance	____
Walking	15	Independent for 50 yd., may use assistive devices, except for rolling walker	
	10	Walks with help for 50 yd.	
	5	Independent with wheelchair for 50 yd. only if unable to walk	____
Stairs, ascending and descending	10	Independent, may use assistive devices	
	5	Needs help or supervision	____
Dressing and undressing	10	Independent, ties shoes, fastens fasteners, applies braces	
	5	Needs help, but does at least half of task within reasonable time	____
Bowel control	10	No accidents, able to care for collecting device if used	
	5	Occasional accidents or needs help with enema or suppository	____
Bladder control	10	No accidents, able to care for collecting device if used	
	5	Occasional accidents or needs help with device	
		Total score	____

The Barthel scale scores 10 functions on a scale from fully dependent to independent. If performance of the patient is inferior to that described, the score is 0; full credit is not given for an activity if the patient needs minimal help or supervision (Mahoney & Barthel, 1965).

Definition and Discussion of Barthel Index Scoring

Feeding

10 Independent. The patient can feed self a meal from a tray or table when someone puts food within reach. Patient must put on an Assistive device (if needed), cut up food, use salt and pepper, spread butter, etc. Patient must accomplish this in a reasonable time.

5 Some help is necessary (e.g., cutting food), as listed above.

Moving from Wheelchair to Bed and Return

15 Independent in all phases of this activity. Patient can safely approach bed in wheelchair, lock brakes, lift footrests move safely to bed, lie down, come to a sitting position on the side of the bed, change position of the wheelchair (if necessary to transfer back into it safely), and return to wheelchair.

10 Some minimal help is needed in some steps of this activity or patient needs to be reminded or supervised for safety of one or more parts of this activity.

5 Patient can come to sitting position without help of second person but needs to be lifted out of bed or needs a great deal of help to transfer.

Doing Personal Toilet

5 Patient can wash hands and face, comb hair, clean teeth, and shave. Patient may use any kind of razor but must put in blade or plug in razor without help and take razor from drawer or cabinet. Female patients must put on own makeup, if used, but need not braid or style hair.

Getting on and off Toilet

10 Patient is able to get on and off toilet, fasten and unfasten clothes, prevent soiling of clothes, and use toilet paper without help. Patient may use wall bar or other stable object for support if needed. If necessary to use bedpan instead of toilet, patient must be able to place bedpan on a chair, empty bedpan and clean it.

5 Patient needs help because of imbalance or needs help handling clothes or in using toilet paper.

Bathing Self

5 Patient may use bathtub or shower or take complete sponge bath. Patient must be able to do all steps involved in whichever method is used without another person present.

Walking on a Level Surface

15 Patient can walk at least 50 yd. without help or supervision. Patient may wear braces or prostheses and use crutches, canes, or walkerette but not rolling walker. Patient must be able to lock and unlock braces if used, assume standing position and sit down, place necessary mechanical aids into position for use, and dispose of them when sitting. (Putting on and taking off braces is scored under "dressing.")

10 Patient needs help or supervision in any of the above but can walk at least 50 yd. with little help.

Propelling a Wheelchair

5 Patient cannot ambulate but can propel a wheelchair independently. Patient must be able to go around corners, turn around, maneuver the chair to a table, bed, toilet, etc. Patient must be able to push a chair at least 50 yd. (Do not score this item if patient receives score for walking.)

Ascending and Descending Stairs

10 Patient is able to go up and down a flight of stairs safely without help or supervision. Patient may (and should) use handrails, canes, or crutches when needed. Patient must be able to carry canes or crutches to ascend or descend stairs.

5 Patient needs help with or supervision of any of above items.

Dressing and Undressing

10 Patient is able to put on, remove, and fasten all clothing and shoelaces (unless necessary to use adaptations). Activity includes putting on, removing, and fastening corset or braces when these are prescribed. Special clothing such as suspenders, loafer shoes, or dresses that open in front may be used when necessary.

5 Patient needs help in putting on, removing, or fastening any clothing. Patient must do at least half the work. Patient must accomplish this in a reasonable time. (Women need not be scored on use of brassiere or girdle unless these are prescribed garments.)

Continence of Bowels

10 Patient is able to control bowels and has no accidents. Patient can use suppository or take enema when necessary (as for patients with spinal cord injury who have had bowel training).

5 Patient needs help in using suppository or taking enema or has occasional accidents.

Controlling Bladder

10 Patient is able to control bladder day and night. Patients with spinal cord injury who wear external device and leg bag must put them on independently, clean and empty the bag, and stay dry day and night.

5 Patient has occasional accidents or cannot wait for bedpan or get to the toilet in time or needs help with external device.

A score of 0 is given in all of the above activities when the patient cannot meet the criteria as defined above.

APPENDIX D

THE WRK SCALE ITEMS

10. (F) I am about as able to work as I ever was.

15. (T) I work under a great deal of tension.

17. (T) I am sure I get a raw deal in life.

31. (T) I find it hard to keep my mind on a task or job.

54. (T) My family does not like the work I have chosen or the work I intend to choose for my lifework.

73. (T) I am certainly lacking in self-confidence.

98. (T) Some people are so bossy that I feel like doing the opposite of what they request, even though I know they are right.

108. (F) Anyone who is able and willing to work hard has a good chance of succeeding.

135. (T) I have often lost out on things because I couldn't make up my mind soon enough.

233. (T) I have difficulty starting to do things.

243. (T) When in a group of people I have trouble thinking of the right things to talk about.

299. (T) I cannot keep my mind on one thing.

302. (T) I easily become impatient with others.

318. (F) I usually expect to succeed in things in do.

339. (T) I have sometimes felt that difficulties were piling up so high that I could not overcome them.

364. (T) I feel like giving up quickly when things go wrong.

368. (T) I shrink from facing a crisis or difficulty.

394. (T) My plans have frequently seemed so full of difficulties that I have had to give them up.

409. (T) It bothers me to have someone watch me at work even though I know I can do it well.

428. (T) I have several times had a change of heart about my lifework.

445. (T) I have frequently worked under people who seem to have things arranged so that they get credit for good work but are able to pass off mistakes onto those under them.

464. (T) I feel tired most of the time.

491. (T) I feel helpless when I have to make important decisions.

505. (T) I am so sick of what I have to do every day that I just want to get out of it all.

509. (T) Having to make important decisions makes me nervous.

517. (T) I find it difficult to hold down a job.

521. (F) I like making decisions and assigning jobs to others.

525. (T) Everything is going on too fast for me.

545. (T) I always have too little time to get things done.

554. (T) When my life gets difficult it makes me want to give up.

559. (T) The people I work with are not sympathetic to my problems.

561. (F) I usually have enough energy to do my work.

566. (T) When I am sad and blue, it is my work that suffers.

APPENDIX E

CRITERIA FOR WORK READINESS AND WORK EAGERNESS RATINGS

Work Readiness

(to return to full 100% pre-injury work level or hold a basic minimum wage job)
Is the patient ready from a neuropsychological standpoint (e.g., Cognitive Retraining, neuropsychological testing)?
Is the patient ready from a physical standpoint (e.g., Motor Group, Upper Extremity Group, Individual OT, Individual PT)?
Is the patient ready from an interpersonal standpoint?

Individual Psychotherapy	Group Psychotherapy
Unstructured observation	Communication Group
Community Outings	

What is the patient's level of insight/awareness of limitations relative to objective data (medical records, test findings)?
What is the patient's receptivity to staff feedback and suggestions for compensations in the program and at work?

Work Eagerness

Prior to starting work, what was the patient's voiced attitude about it?
Overall, how was follow-through on Work/School Trial (e.g., time lag in completing preparation assignments)?
What was the patient's voiced attitude about work *after starting*?
How was the patient's *initiative* in adding hours or job duties?
How *flexible* was the patient about job duties/hours (e.g., all or nothing approach)?
How strongly does the patient consider their symptoms likely to interfere with the return to work?
Does the patient actively initiate compensations for work?

(Klonoff et al., 1998, p. 690)