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TRAUMATIC BRAIN INJURY & RETURN TO WORK: A REVIEW OF FACTORS THAT HAVE NEGATIVE, POSITIVE, AND NO RELATIONSHIP TO VOCATIONAL OUTCOME IN BRAIN INJURED INDIVIDUALS

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Traumatic Brain Injury and Return to Work: A Review of Factors that have Negative, Positive, and No Relationship to Vocational Outcome in Brain Injured Individuals

Issue:	Identifying factors that may be used to predict ability to return-to-work for traumatic brain injured patients.
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Context: Return-to-work (RTW) is an important endpoint in terms of measuring the effectiveness of rehabilitation among traumatic brain injured (TBI) patients. The ability to predict outcomes following injury influences decisions regarding diagnoses, prognoses, and treatment; as such, the ability to predict RTW rates following TBI is an integral part of understanding and improving rehabilitation of these patients.

Objective: To identify from the literature, factors that influence RTW for TBI patients, in order to understand and improve rehabilitation.

Design: A review of a wide body of literature was conducted to identify those factors reported to have either a negative, positive or no relationship to RTW for TBI patients. The factors are categorized as demographic, psychosocial, cognitive and neuropsychological deficits, workplace, and injury related.

Results: As all factors identified in the literature are classified as either having a negative, positive or no relationship, findings contradict each other in several incidents. A discussion of the limitations of the literature suggests that the contradicting findings may be the result of methodological variations. The absence of consistent operational definitions of successful employment is also identified as a major limitation of the research.

The study makes 19 practice recommendations for rehabilitation programming and future research directions regarding RTW for TBI patients. Some examples of the recommendations made are: Early post-injury intervention, multi-faceted rehabilitation, stabilizing neurological and/or psychiatric conditions prior to intervention and rehabilitation, individually tailoring rehabilitation to address specific patients' needs, and taking into account individual patients' pre-morbid characteristics.

Conclusion: It is suggested that RTW should not be the primary measure of social recovery. Other measures such as quality of personal relationships and leisure activities may be of primary importance to the TBI patient and may indirectly influence RTW for the patients. The summary also suggests that further research into the influence of workplace characteristics should also be considered. It is noted that some variables that may be useful for predicting RTW are not useful for predicting which patients will not return to work, suggesting that predictors should be examined separately for both successful and unsuccessful RTW.

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Traumatic Brain Injury & Return to Work: A Review of Factors that Have Negative, Positive, and No Relationship to Vocational Outcome in Brain Injured Individuals

PROJECT REPORT

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Traumatic Brain Injury & Return to Work:
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No Relationship to Vocational Outcome in
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EXECUTIVE SUMMARY:

The Importance of Examining Return to Work Rates
Among Traumatically Brain Injured Patients

1. According to North American estimates, traumatic brain injuries (TBIs) result in 200-300 hospital admissions per 100,000 population per annum (Annoni et al., 1992).

2. The majority of TBIs are classified as mild or moderate, as defined by a Glasgow Coma Scale (GCS) score greater than 8 at admission (Annoni et al., 1992). The incidence of severe TBI is estimated at 14 per 100,000 per annum, with severe TBI being a significant cause of persistent disability (i.e., the overall prevalence rate of disabled persons is 150 per 100,000; Annoni et al., 1992).

3. Workplace injuries and motor vehicle accidents (MVAs) are the primary causes of TBIs (Bennett & Raymond, 1997).

4. Over the past several decades, increases in the numbers of head injuries have occurred concurrently with decreases in the numbers of deaths from TBIs; thus, many more TBI patients are surviving than before (see McMordie et al., 1990). Even severely impaired patients have only a 5-year life expectancy reduction over the 20 years post-TBI, compared to the general non-injured population (Stambrook et al., 1990).

5. Return to work (RTW) is an important endpoint in terms of measuring the effectiveness of rehabilitation among TBI patients (Cifu et al., 1997). TBI patients are most often young to middle-aged adults, and consequently have many potentially employable years remaining; thus the financial costs to society are high. Furthermore, as being unemployed can be conceptualized as a negative life event that has detrimental effects upon an individual's well-being (see Lubusko et al., 1994), the emotional costs to both TBI patients and their families are great.

6. Rates of RTW following TBI range from 10% to 70% (see Cifu et al., 1997). For example, among severe head injury patients, a significant majority have been found to be working pre-injury (85%), but post-injury a significant majority (71%) are not working (Brooks et al., 1987).

7. The degree of RTW attained following TBI appears to be bimodally distributed, with RTW being quite complete (i.e., paralleling pre-morbid work abilities) or not at all attained (see

Girard et al., 1996). The highest rates of RTW following TBI have been found to occur in the first 6 months post-injury (Dikmen et al., 1994).

8. RTW following TBI is determined by a variety of factors, including the following: patient demographics; injury severity; type of rehabilitation and work assistance provided; operational definitions of work status; and, modes of verifying work status (see Cifu et al., 1997).

9. The ability to predict outcome following injury influences decisions regarding diagnoses, prognoses, and treatment (Rao et al., 1988); as such, the ability to predict RTW rates following TBI is an integral part of understanding and improving rehabilitation of these patients.

I. DEMOGRAPHIC FACTORS

A. Negative Relation with Return to Work Outcome

Very Young Age (<7 years): Severe TBI suffered at a very young age (i.e., 7 years of age or younger) significantly impacts later educational and occupational outcome, with children in this age group who are severely injured demonstrating significant post-injury learning and vocational difficulties (Asikainen et al., 1996).

Older Age: Older age (i.e., typically greater than 40 years) at time of TBI has been found to be negatively correlated with likelihood of returning to work post-injury (Gogstad & Kjellman, 1976; Johnson, 1987; McMordie et al., 1990; Ponsford et al., 1995; Ruff et al., 1993; Schalen et al., 1994; Vilkki et al., 1994). Asikainen et al. (1996) found that of individuals with severe brain injury who were 26 years of age or older at time of insult, 46% were incapable of work at follow-up. For patients who were over 40 years of age at time of injury, 80% of those with severe TBI were unable to RTW (Asikainen et al., 1998). Other findings report RTW rates to drop to 12% in those aged over 45 years (Brooks et al., 1987). Dikmen et al. (1994) report that only 46% of patients over 50 years at the time of TBI returned to work 2 years post-injury, whereas almost 75% of patients under the age of 50 returned to work (Dikmen et al., 1994).

Older age at time of TBI has also been found to result in poor outcome as indexed by lower scores on the Independent Living Scale (assessing daily living and functional abilities) and the Center for Neuro-Skills Scale (assessing cognition, withdrawal, agitation/aggression, physical and occupational therapy, speech, language, education, and vocation; Ashley et al., 1997). It has been postulated that lower RTW rates in older patients may partially be accounted for by the tendency for older patients to have reduced adaptability, hence rendering employers less likely to accept them (Schalen et al., 1994).

Marital Status: Subjects who are married or common-law have been found to have lower RTW/school (RTW/S) rates in comparison to those who are single (Ip et al., 1995).

Race/Ethnicity: At a 15-year follow-up of Vietnam veterans who suffered a TBI, blacks were found to be less likely to work than whites, suggesting that programming should address specific rehabilitation needs of culturally diverse patients (Kraft et al., 1993).

Pre-injury Educational Status: Pre-injury educational status that is less than high school level has been found to be associated with poorer prognosis for RTW rates 1-year post-TBI (Greenspan et al., 1996). In a 2-year post-TBI follow-up, a 46% RTW rate was found among patients with less than high school education; this is in contrast to a 76% RTW rate among those with high school education, 71% rate among those with vocational training, and an 87% rate among patients with a Bachelor's degree or higher educational level (Dikmen et al., 1994).

Somewhat counter-intuitively, Asikainen et al. (1996) found that severe TBI patients with the *highest* educational status pre-injury were found to have the highest rates of inability to work following injury, with 58% being unable to work post-injury. A confounding variable that may account for these findings is that the most highly educated patients were also older at the time of injury (and, older age has been found to be a negative prognostic indicator for RTW);

alternatively, the most highly educated individuals would be returning to more demanding jobs which would require a high level of cognitive capacity post-injury, hence resulting in deflated RTW rates (see e.g., Stambrook et al., 1990).

Pre-Injury Occupation: Rappaport et al. (1989) found that at up to a 10-year follow-up, none of the severe TBI patients who previously held professional positions were able to return to them, and none of the individuals in lower status positions were able to attain professional positions post-TBI. Stambrook et al. (1990) found that severe and moderately injured TBI patients were unable to return to positions that had equivalent vocational status in comparison to their pre-injury status. Confounding-variable explanations that have been offered above for findings that higher educational status is negatively correlated with RTW may similarly be applicable to findings on occupational status (i.e., see Stambrook et al., 1990).

B. No Relation with Return to Work Outcome

Age: Cifu et al. (1997) found that patients who were and were not employed 1-year post-TBI did not differ in terms of age; however, the age range of these researchers' sample was restricted, which may potentially be a confounding variable. Others have also found age to be unrelated to RTW rates among TBI patients (Girard et al., 1996; Lubusko et al., 1994; Ruffolo et al., 1999; Weddell et al., 1980)

Marital Status: Marital status has been to not be related to RTW rates among TBI patients (Cifu et al., 1997; Girard et al., 1996), including mild TBI patients (Ruffolo et al., 1999).

Race/Ethnicity: Race/ethnicity of TBI patients has been found to be unrelated to post-injury work status (Cifu et al., 1997; Girard et al., 1996).

Pre-Injury Educational Status: Cifu et al. (1997) found that TBI patients who were and were not employed 1-year post-TBI did not differ in terms of their education level. Others have also found educational level to be uncorrelated with RTW rates among mild TBI patients (Ruffolo et al., 1999) and severe TBI patients (Fabiano & Crewe, 1995). Years of education have been found to not be related to employment post-injury (Lubusko et al., 1994; Ponsford et al., 1995).

Pre-Injury Occupation: Uzzell et al. (1987) found that patients who did RTW (mild, moderate, and severe TBI patients) were able to resume their respective pre-morbid occupational levels. Johnson (1987) found that class of employment at the time of TBI did not differentiate between patients who did or did not RTW. Others have also found pre-morbid occupational status (Fabiano & Crewe, 1995; Girard et al., 1996; Lubusko et al., 1994) and class of employment (Ponsford et al., 1995) to be unrelated to post-TBI employment.

Sex: Sex of the TBI patient has been found to not impact employment status 1-year (Cifu et al., 1997; Gollaher et al., 1998; see also Ip et al., 1995), 2-years (Ponsford et al., 1995), or 3-years post-injury (Girard et al., 1996). Sex is not correlated with RTW rates among mild TBI patients specifically (Ruffolo et al., 1999).

Social Class: Weddell et al. (1980) found that TBI patients who were or were not employed 2-years post-injury did not differ in terms of their social class.

C. Positive Relation with Return to Work Outcome

Younger Age: Younger age at time of TBI is positively correlated with scores on the Occupational Status Scale, which assess educational/vocational status (Ashley et al., 1997). Specifically, individuals aged 17-25 at the time of injury have been found to have the best occupational outcome in relation to younger or older individuals (Asikainen et al., 1996). Brooks et al. (1987) report that age below 45 is a positive prognostic indicator of post-TBI employment outcome insofar as higher rates of RTW are evidenced below that age. Others also support younger age (i.e., typically below 40 years) to be a positive prognostic factor for both RTW and return to school (Ip et al., 1995; Rao et al., 1990).

Marital Status: Individuals who are married at time of follow-up (1-year post-TBI) have been found to be more likely to be employed (69%) in comparison to those who are unmarried (58%; Greenspan et al., 1996).

Pre-injury Educational Status: The highest rates of good recovery, and lowest rates of severe disability (as indexed by the Glasgow Outcome Scale [GOS]) in severe TBI patients are found among individuals who have a pre-injury educational level of "vocational school", "technical college", or "university" (Asikainen et al., 1996). The authors account for this finding by postulating that skills that are learned in praxis (i.e., in professional training or through work experience) are retained better than other skills, and are more easily applied post-injury. Others have also found higher pre-injury educational level to be associated with higher chances of vocational success post-TBI (Gollaher et al., 1998; Kraft et al., 1993).

Pre-injury Occupation: Brooks et al.'s (1987) findings showed a non-significant (but clinically significant) trend for RTW rates in severe TBI patients to rise from 21% in unskilled workers to 33% among skilled manual jobs, and to 50% in managerial (or similar level) workers. Ruffolo et al. (1999) found that mild TBI patients were more likely to RTW if their pre-injury occupation was in a more independent/greater decision-making latitude category (e.g., student, homemaker, professional/semi-professional, or management) versus being in a less independent category (e.g., clerical, sales/service, or manual labor).

Sex: Groswasser et al. (1998) found that functional outcome, as assessed by RTW or school, was better for females than for males, with 47.2% of females returning to the previous level of work/school capacity, compared to only 30.2% of males. Brooks et al. (1987) found some evidence that females were more likely to be able to RTW following a severe TBI, but due to a small number of cases in their sample, statistical significance was not achieved. McMordie et al. (1990) obtained similar findings, although they postulate that the males may have sustained more severe TBIs (although this was not discernable in their study).

II. PSYCHOSOCIAL FACTORS

A. Negative Relation with Return to Work Outcome

Pre-Injury Personality Factors: TBI patients who are unemployed 2-years post-injury demonstrate higher incidences of general personality disturbances (Weddell et al., 1980). Severe TBI patients who have been rated by relatives as pre-morbidly being nervous and suspicious demonstrate delayed RTW rates (Oddy & Humphrey, 1980). Brooks et al. (1987) found that lower RTW rates were predicted by the presence of changeable/depressed mood (see also Mazaux et al., 1997), and by difficulties in controlling anger. Severe TBI patients who have achieved a post-injury employment status that is worse than their pre-injury status report lower levels of Internal Locus of Control, higher levels of Powerful Others Locus of Control, and higher feelings of hopelessness (although the direction of causation between the negative cognitions and employment status cannot be determined; Lubusko et al., 1994). Finally, self-reported violent behavior has been found to be negatively correlated with RTW rates among Vietnam combat victims with TBI (Schwab et al., 1993).

Social/Family Factors: TBI patients who are unemployed 2-years post-injury are more dependent on their families, are more frequently bored, and have fewer reported leisure activities (Weddell et al., 1980). Sander et al. (1997) found that unemployed TBI patients were more likely than their employed counterparts to report boredom, frustration, and impatience. In a similar vein, self-reported social isolation among Vietnam TBI patients has been found to be negatively correlated with RTW rates (Schwab et al., 1993). Emotional withdrawal has also been found to be negatively correlated with RTW rates (Mazaux et al., 1997). It is important to note, however, that correlation does not imply causation; hence the direction of these effects is not discernible (e.g., lack of employment may contribute to social isolation and boredom).

Substance Abuse History: TBI patients with a history of any substance abuse (alcohol or illicit drug) are less likely to be working or in school at 1-year post-rehabilitation admission, with 71.4% of patients with a history of substance abuse being unemployed or not in school, versus only 38.9% of those without a substance abuse history being unemployed or not at school (Corrigan et al., 1997). Ip et al. (1995) also report a inverse relationship between history of alcohol abuse and RTW/S rates.

Adaptive Deficits: Severe TBI patients who fail to RTW demonstrate deficits in self-care behaviors (as reported to relatives); specifically, deficits in personal hygiene and in being able to take responsibility for the household have been found to be strong predictors of post-injury work status (i.e., unemployment; Brooks et al., 1987).

Communication Deficits: Deficits in being able to carry on and understand a conversation post-severe TBI (as assessed by relatives' self-reports) are significant predictors of RTW rates, with presence of the deficit being a good predictor of failure to RTW (although the absence of the deficit was not sensitive in predicting whether a patient would RTW; Brooks et al., 1987).

Sleep Complaints: TBI patients who continue to report sleep complaints 2-3 years post-injury demonstrate lower rates of employment compared to those without sleep complaints (Cohen et al., 1992).

Compensation Status: Among patients with minor head injury, duration of absence from work was significantly longer for patients who had ongoing claims for compensation (88 days) compared to those with no such claims (24 days; Cook, 1972).

B. No Relation with Return to Work Outcome

Pre-Injury Personality Factors: Girard et al. (1996) found that pre-morbid psychiatric history was not a significant predictor of RTW/S outcome among TBI patients who were assessed, on average, 3-years post-injury.

Social/Family Factors: Family status (i.e., living alone or living with family) has been found to not impact rates of RTW 18-24 months post-TBI (Gogstad & Kjellman, 1976). Others have also found living arrangement to be uncorrelated with RTW rates among mild TBI patients (Ruffolo et al., 1999).

Chronic Pain: Patients with concurrent TBI and Chronic Pain Syndrome (CPS) can achieve comparable employment rates post-injury (i.e., 75% employment rate) at follow-up (which ranged from 0 to 36 months); however, patients with CPS and TBI require additional, more specialized treatment to address difficulties related to both the TBI and CPS (Andary et al., 1997) as treatment failure in TBI/CPS patients is high if treatment does not specifically address the sequelae of both these syndromes (Anderson et al., 1990). Chronic pain serves to compound the cognitive deficits and functional capacity in TBI patients; for example, attention or memory deficits may be worsened, thus pointing to the need for appropriate treatment of chronic pain (Lahz & Bryant, 1996). Given the high frequency of chronic pain difficulties in mild TBI patients, it is important that attentional deficits or psychological symptomatology are not mislabeled as being attributable to only the TBI, and not the chronic pain (Uomoto & Esselman, 1993).

C. Positive Relation with Return to Work Outcome

Pre-Injury Personality Factors: Individuals who successfully RTW post-severe TBI are rated by relatives as being more energetic pre-injury, as compared to ratings for individuals who did not RTW (Brooks et al., 1987). Severe TBI patients who are rated by relatives as pre-morbidly being verbally expansive/brash also have speedier RTW rates (Oddy & Humphrey, 1980). Severe TBI patients who were classified as having an undefined "stable personality or family background" had higher RTW rates (42.6%) in comparison to patients with an "unstable personality or family background" (27.8%; Gilchrist & Wilkinson, 1979).

Social/Family Factors: Mild TBI patients who RTW display higher levels of social interaction at follow-up than those who do not RTW (Ruffolo et al, 1999). The positive impact

of good family relationships is demonstrated by findings that TBI patients who are in families who report satisfactory to excellent pre-injury relationships have been found to be more likely to RTW/S (Kaplan, 1988).

Substance Abuse History: A negative history of substance abuse is correlated with a more positive RTW/S outcomes post-TBI (Girard et al., 1996).

Pre-Injury Work History: Pre-injury productivity (i.e., defined as employment and/or being a student at the time of injury) is correlated with likelihood of returning to work at 1-year follow-up (Gollaher et al., 1998). A significant majority (i.e., 80%) of TBI patients who have a stable pre-injury work history (i.e., defined as employment for a minimum of 6 months immediately prior to injury) RTW at 2 years post-injury, compared to only 60% of patients who have an unstable pre-injury work history (Dikmen et al., 1994).

Self-Awareness: Accurate self-awareness of functioning post-TBI (e.g., as assessed by patients' agreement with family/significant others or clinician's assessments) has been found to be positively correlated with return to compensated work post-injury (Ezrachi et al., 1991; Sherer et al., 1998).

Time Lapse to Rehabilitation: The time length prior to rehabilitation impacts RTW rates assessed 18-24 months post-injury, with individuals whose period of inactivity prior to rehabilitation is 1-year or less being more likely to be working at follow-up (in comparison to those whose period of inactivity is greater than 1-year; Gogstad & Kjellman, 1976). Others have also found that TBI patients who entered rehabilitation programming less than 1-year following their injury had a higher frequency of work placements in comparison to those who entered the program more than 1-year post-injury (Malec et al., 1993).

III. COGNITIVE & NEUROPSYCHOLOGICAL DEFICITS

A. Negative Relation with Return to Work Outcome

Memory Deficits: TBI patients who are unemployed up to 2-years post-injury demonstrate higher rates of general memory disturbances (Mazaux et al., 1997; Weddell et al., 1980). Among severe TBI patients, those who fail to RTW obtain lower scores on tests of verbal memory (e.g., Logical Memory test; Brooks et al., 1987; Cifu et al., 1997; Girard et al., 1996; Schwab et al., 1993). Lower scores on short-term visual memory tests (as assessed by the Visual Memory Index) have also been found among those who fail to RTW/S (Ip et al, 1995). Others have also found visual recognition memory losses to be associated with decreased rates of RTW at 15-year follow-up post-TBI (Schwab et al., 1993).

Intelligence/Cognitive Status: Lower Wechsler Adult Intelligence Scale – Revised (WAIS-R) Vocabulary scores have been found among TBI patients who do not RTW (Ruff et al., 1993). Lower Performance IQ scores have also been found to be related to lower rates of RTW/S post-TBI (Ip et al., 1995). Cognitive deficits (as assessed by scores on cognition scales on the Disability Rating Scale, PECS, and Levels of Cognitive Functioning Scale) have been found to be related to failure to RTW up to 2 years post-TBI (Rao & Kilgore, 1992). Others have also found decreased IQ post-TBI to be related to difficulties in returning to previous work (Kunishio et al., 1993).

Attention Deficits: Individuals with lower scores on a measure of attention (i.e., Paced Auditory Serial Addition Test) were less likely to RTW post-severe TBI (Brooks et al., 1987). Asikainen et al. (1999) and Leahy and Lam (1998) also found poor performance on the Stroop Test (which assesses divided attention and processing speed) to be associated with inability to be employed post-injury. Deficits in higher-level attentional skills have also been found by others to be related with poorer RTW or school outcome (Girard et al., 1996; see also Mazaux et al., 1997). A lower score on a Selective Attention Speed index was a significant predictor of individuals who did not RTW (Ruff et al., 1993).

Executive Functions: Poor performance on the Tinker Toy Test (which assesses executive functions) has prognostic value in terms of predicting vocational outcome, with failure on the test being observed almost exclusively among head injured patients who are unable to RTW two years or more post-TBI (although it is important to note that intact performance has limited prognostic value, as almost half of the work disabled TBI patients performed normally on the test; Bayless et al., 1989). Others have also found executive function deficits to be related with poorer RTW or school outcome (Girard et al., 1996). Similarly, reasoning loss has been found to be associated with decreased rates of RTW at 15-year follow-up (Schwab et al., 1993).

Anosmia: The presence of posttraumatic anosmia, which is utilized as an indicator of orbital frontal damage, is related to negative vocational prognosis, with total and partial anosmics being less likely to RTW 2-years post-injury, even after receiving medical clearance to be able to RTW (Varney, 1988).

Dysphasia: Persistent dysphasia negatively impacts likelihood of RTW post-severe TBI (Bruckner et al., 1972).

Visual Impairments: Bilateral visual field defects are associated with poorer outcome, as assessed by actual work placement (Groswasser et al., 1990).

Hemiplegia: Persistent hemiplegia adversely affects likelihood of RTW post-severe TBI (Bruckner et al., 1972).

Speech Impairments: Return to work rates for severe TBI patients with a speech disorder demonstrate a trend to be lower (33.3%) than rates for patients with normal speech (48.1%; Gilchrist & Wilkinson, 1979).

Speed of Information Processing: Speed of information processing deficits are related to poorer RTW and school outcome (Girard et al., 1996).

Other Neuropsychological Impairments: Performance on the Purdue Pegboard Test (which is sensitive to brain damage) significantly differentiated TBI patients who are capable of subsidized and/or independent employment post-injury from those unable to work, with poor performance on this tests being associated with inability to be employed (Asikainen et al., 1999). Impairments in eye-hand coordination and finger dexterity, as measured by the Grooved Pegboard test also are negative prognostic indicators for RTW/S. Poor performance on the Trail Making Test is correlated with lower rates of RTW/S (Ip et al., 1995). Mazaux et al. (1997) found RTW rates to be negatively correlated with the following neuropsychological impairments: motor slowing; difficulty in mental flexibility; conceptual disorganization; difficulty planning; mental fatigability; decreased initiative/motivation.

B. No Relation with Return to Work Outcome

Memory Deficits: TBI patients who were or were not employed have been found to not differ in terms of Wecshler Memory Scale – Revised (WMS-R) variables (Leahy & Lam, 1998).

Intelligence/Cognitive Status: Girard et al. (1996) found that pre-morbid learning difficulties were not significant predictors of RTW or school outcome (assessed, on average, 3 years post-injury). Fabiano and Crewe (1995) found that among their sample of severe TBI patients, pre-morbid predicted IQ, were not significant predictors of employment status 6 years post-injury. Leahy and Lam (1998) found that TBI patients who were or were not employed did not differ on WAIS-R variables. Patients who are and are not employed 1 year post-TBI do not differ in terms of cognitive status as assessed by the Neurobehavioral Rating Scale (NRS) Meta-cognition scale, Cognition scale (Cifu et al., 1997). These findings may partially be explained by Cifu et al.'s (1997) postulation that patients must be at a minimum threshold of functioning to even complete neuropsychological testing, hence resulting in a "basement effect" that screens out the most severely cognitively impaired.

Attention Deficits: Mild TBI patients who do or do not RTW do not differ on tests of information processing (Paced Auditory Serial Addition Test – Revised; Ruffolo et al, 1999).

Anosmia: Complete anosmia has been found to not impact RTW rates among severe TBI patients (Bruckner et al., 1972).

Aphasia/Dysphasia: The presence of aphasia in severe TBI patients does not impact vocational outcome, in comparison to non-aphasic severe TBI patients (Gil et al., 1996).Return to work rates at 18-24 months follow-up are not impacted by the presence of massive/moderate versus light/none dysphasia (Gogstad & Kjellman, 1976).

Visual Impairments: Return to work rates for severe TBI patients with visual impairments (44.4%) do not significantly differ from rates for those without visual impairments (37%; Gilchrist & Wilkinson, 1979). Others have similarly found that defects of vision (massive/moderate versus light/none) do not impact RTW rates in brain injured patients (Gogstad & Kjellman, 1976).

Speed of Information Processing: Mild TBI patients who do or do not RTW do not differ on tests of information processing (Paced Auditory Serial Addition Test – Revised), or speed of information processing (reaction time testing; Ruffolo et al, 1999).

Other Neuropsychological Impairments: Patients who are and are not employed 1 year post-TBI do not differ in terms of Purdue Pegboard, or Trails A and B (Cifu et al., 1997). Visual and auditory reaction times have been found to not be effective in differentiating patients with moderate or severe TBI who do and do not RTW (Asikainen et al., 1999).

C. Positive Relation with Return to Work Outcome

Intelligence/Cognitive Status: Individuals who have excellent cognitive abilities at 1-month post-TBI (as indexed by a Halstead Impairment Index less than or equal to 0.2) have the highest rates of RTW at one year post-injury (i.e., 96%); these individuals are likely those who also incur mild TBIs and who have good pre-morbid functioning (Dikmen et al., 1994). Fabiano and Crewe (1995) found that among their sample of severe TBI patients whose employment status was assessed up to 6 years post-injury, those who were employed full-time had higher WAIS-R Full Scale IQs ($\underline{M}$ = 99.1) in comparison to those in sheltered or supported employment ($\underline{M}$ = 79.3), those employed part-time ($\underline{M}$ = 87.2), and those unemployed ($\underline{M}$ = 87). In this same sample, individuals with higher Full Scale IQs were also more likely to RTW within 2-years post-injury (whereas those with lower Full Scale IQs returned to work more than 3-years post-injury; Fabiano et al., 1995). Individuals who were employed full-time also had higher Digit Symbol subtest scores ($\underline{M}$ = 7.8) in comparison to those in sheltered/supported employment ($\underline{M}$ = 4.2) or unemployed ($\underline{M}$ = 6.0). At follow-up, patients who were employed full-time or successfully enrolled in college demonstrated less disparity between their post-injury IQ and estimated pre-morbid IQ in comparison to all other groups (supported/sheltered employment; part-time employment; unemployed).

Speed of Information Processing: Girard et al. (1996) found that the best single predictor of RTW or school outcome at initial neuropsychological testing was the written subtest of the Symbol Digit Modalities Test (assessing speed of information processing), with better performance being associated with more favorable outcome.

IV. WORKPLACE FACTORS

A. Negative Relation with Return to Work Outcome

Employer/Position Characteristics: Severe TBI patients who begin working with a new employer post-injury demonstrate a trend towards being less likely to remain successfully employed at follow-up (which averaged 6 years post-injury in Fabiano et al.'s 1995 sample). Additionally, changing *both* employer and the nature of the employment is a hindrance toward successful RTW (Johnson, 1987).

Activity Setting: Increased environmental demands appear to be negatively correlated with success following TBI, given Girard et al.'s (1996) findings that it was easiest for patients to become productive at home, somewhat more difficult to return to school, and most difficult to return to employment.

Return to Work Time Lapse: Johnson (1987) found that among his sample, all patients who were unemployed 2-years post-injury were unsuccessful in returning to work over the subsequent year (or longer). Similar findings were obtained by Oddy et al. (1985), who found that at a mean follow-up of 7-years post-severe TBI, all individuals who had been unemployed at 2-years post-injury remained unemployed. In fact, findings indicate that most severe TBI patients who RTW do so in the first year post-TBI (Oddy & Humphrey, 1980). Olver et al. (1996) conducted 2- and 5-year follow-ups of moderate to severe TBI patients, and found that there was a decline between 2 and 5 years in terms of the number of individuals who were employed; they attribute this partially to economic conditions of Australia at that time, but also suggest that proactive follow-up of individuals in employment is required (e.g., employers were not able to tolerate lower productivity, interpersonal difficulties, or inability to be retrained).

B. No Relation with Return to Work Outcome

Return to Work Time Lapse: Length of time post-injury has been found to not correlate with TBI patients' likelihood of returning to work/school, although trends in data demonstrate that individuals who do not RTW/S in their first year post-injury are actually less likely to RTW/S at a later point (Ip et al., 1995). Months post-injury did not differ between severe TBI patients who were or were not at the same/improved post-injury employment status (as compared to their pre-injury status; Lubusko et al., 1994).

C. Positive Relation with Return to Work Outcome

Employer/Position Characteristics: Severe TBI patients who return to their pre-injury job have greater success than those attempting to learn a new job (Asikainen et al., 1996). Severe TBI patients who are re-hired by the same employer also demonstrate a trend towards being more likely to remain successfully employed (Fabiano et al., 1995). Return to the same pre-injury position, provision of special work conditions (e.g., easier work; support of a

colleague or personnel officer) at post-injury employment, and a lengthy period during which special conditions are maintained are factors that are more likely to contribute to a TBI patient successfully returning to work post-TBI (Johnson, 1987).

Activity Setting (i.e., Supported Employment): Supported employment has been demonstrated to improve the vocational achievements of severe TBI patients, and return patients to levels and stability of employment that they had attained pre-injury (e.g., see Wehman et al., 1989, 1990, 1993; West, 1995). In fact, Wehman et al. (1990) found that prior to supported employment, their severe TBI patients had worked only 15% of the total months during which they could have worked; during the implementation of supported employment, this increased to 75%. Access to a supported employment specialist appears to be a key factor in promoting job retention in supported employment settings (Wehman et al., 1989). Participation in a vocational rehabilitation job development and placement program has been found to result in a 68% placement rate in paid employment (versus 34% and 39% for comparison groups), with a retention rate of about 70% at 3-year follow-up (Haffey & Abrams, 1991).

Return to Work Time Lapse: Severe TBI patients who RTW within 24 months are more likely to be employed at follow-up (which averaged 6 years post-injury) than patients who took longer than 36 months to RTW (Fabiano et al., 1995). Others find that as time lapse increases (e.g., 2 years post-TBI), patients still continue to make improvements in areas such as RTW (Sbordone et al., 1995).

Early Employment Success: Early improvement in employment has been found to predict maintenance of later employment; specifically, employment status at 6-months post-injury has been found to be a significant predictor of employment status at 12-months post-injury (Brown et al., 1992).

V. INJURY FACTORS

A. Negative Relation with Return to Work Outcome

Brain Injury Characteristics (e.g., severity): Ability to RTW is strongly related to the severity of the head injury, with severe TBI patients being less likely to RTW than moderate TBI patients, and moderate TBI patients being less likely to RTW in comparison to minor TBI patients (e.g., Dacey et al., 1991; Dikmen et al., 1993, 1994; Vogenthaler et al., 1989). These findings are particularly applicable to TBIs at the extreme end of severity; to illustrate, patients with Glasgow Outcome Scale (GOS) scores equal to grade 4 (vegetative state) are so severely disabled that post-injury re-employment or post-injury educational attainment are permanently disabled (Asikainen et al., 1996).

Reider-Groswasser et al. (1993) found that the width of the third ventricle (as seen on a computerized tomography [CT] scan) was related to vocational outcome one year post-TBI, with a greater width being found among those who did not RTW.

Length of Hospital Stay: TBI patients who do not RTW 1-year post-injury differ from their employed counterparts in that their length of stay in acute care settings is longer (30 days for unemployed patients; 18 days for employed), as is their length of stay in rehabilitation settings (48 days for unemployed; 26 days for employed; Cifu et al., 1997). Others have also found that severe TBI patients who are at a worse post-injury employment status, in comparison to their pre-injury status, have longer hospital stays (Lubukso et al., 1994). McMordie et al.'s (1990) findings quality the above findings somewhat, in that these latter researchers found that length of hospital stay was negatively related to RTW rates only in the upper extremes (i.e., if the hospital stay exceeded 6 months).

Loss of Consciousness: Among severe TBI patients who were unconscious for 8 weeks or longer, only 11.1% were found to have attained RTW status at follow-up, which ranged from between 9 months and 15 years (Gilchrist & Wilkinson, 1979). RTW rates gradually decrease as loss of consciousness (LOC); specifically, RTW rates are 81.8% if LOC is 1-7 days; 46.9% if LOC is 2-4 weeks; and, 18.2% if LOC is 5-7 weeks long (Gilchrist & Wilkinson, 1979). McMordie et al. (1990) found that less than 2% of TBI patients with LOC greater than one month were able to RTW (75% of TBI patients who returned to work had a LOC of 2 weeks or less).

Coma Length: TBI patients who are unemployed 1-year post-injury remain in coma longer than those are employed (Cifu et al., 1997). Longer coma length (Annoni et al., 1992; Ezrachi et al., 1991; Kaplan, 1988; Ruff et al., 1993; Sander et al., 1997) among those who fail to RTW are also found by other researchers. Among severe TBI patients, lengthened time to follow commands (which serves as an index of coma length) results in a decreased likelihood of returning to work at 2-years post-injury (Dikmen et al., 1994). Longer periods of coma are found among TBI patients who are involved in sheltered or supported employment up to 6-years post-severe TBI, in comparison to those who are employed full-time or attending college (Fabiano & Crewe, 1995). Length of post-comatose unawareness has been found to be

negatively correlated with likelihood of returning to work up to 1-year post-injury (Sazbon & Groswasser, 1991).

Post-Traumatic Amnesia Length: TBI patients who are unemployed 1-year post-injury have longer post-traumatic amnesia (PTA) lengths (Cifu et al., 1997). Longer PTA lengths (Annoni et al., 1992; Johnson, 1987; Kaplan, 1988; Lubusko et al., 1994; Oddy & Humphrey, 1980; van Zomeren & van den Burg, 1985; van der Nallt et al., 1999; Vilkki et al., 1994) among those who fail to RTW are also found by other researchers.

Neurological Deficits: The extent of neurological lesion (as indexed by the number of neurological defects present on admission) is a prognostic indicator for RTW; specifically, the RTW rate for severe TBI patients with 4 or more defects is 23.5% (versus approximately 50% for patients with 3 or less defects; Gilchrist & Wilkinson, 1979). Schwab et al. (1993) found that among TBI patients who had been injured in combat in Vietnam, work status 15-years post-TBI was negatively correlated with the presence of the following 3 impairments in conjunction with each other: epilepsy, paresis, and visual field loss.

Intoxication at Injury: Individuals who are intoxicated at the time of TBI (i.e., from either alcohol or illicit drugs) are less likely to be working or at school at 1-year follow-up (Corrigan et al., 1997).

Communicating Hydrocephalus: The presence of communicating hydrocephalus is associated with poor outcome as indexed by work placement post-TBI (Groswasser et al., 1990).

Behavioral Status: Patients who are unemployed 1-year post-TBI display lower levels of behaviors both at rehabilitation admission and discharge, as assessed by the Neurobehavioral Rating Scale (NRS; Cifu et al., 1997).

Functional Status: Functional status at rehabilitation admission, as assessed by the Functional Independence Measure (FIM; which consists of a comprehensive list of activities essential for survival, e.g., eating, grooming, dressing, bladder management, social interaction, etc.; see Cook et al., 1994) was lower for patients unemployed 1-year post-TBI (in comparison to TBI patients who were employed; Cifu et al., 1997; Greenspan et al., 1996).

Injury to Other Body Systems: Among minor TBI patients, those with other systems injuries (e.g., orthopedic injuries) have been found to be less likely to RTW/S 1-month post-injury, in comparison to individuals with minor TBI but no associated other-systems injuries (Dikmen et al., 1986). TBI patients not working 2-years post-injury demonstrate higher degrees of physical impairment, as assessed by Bond's Neurophysical Scale (Weddell et al., 1980). Others have also found that those with severe other-systems injuries have low rates of RTW at 2 years post-injury; however, these individuals also have the most severe brain injuries, hence rendering conclusive statements about the influence of other-systems injuries tenuous (Dikmen et al., 1994). Physical problems such as moving slowly, fatigue, and trouble lifting heavy objects are more commonly reported by TBI patients who fail to return to work (Sander et al., 1997).

Injuries to body systems other than the head or brain, as assessed by the Injury Severity Score (ISS), have been found to impact upon TBI patients' *ability* to RTW (as assessed by the

GOS); specifically, individuals with more severe other-systems injuries obtain more unfavorable scores on the GOS, which has been interpreted as a negative prognostic indicator for RTW ability (Dacey et al., 1991).

B. No Relation with Return to Work Outcome

Coma Length: Ip et al. (1995) found that RTW/S did not relate to injury severity as indexed by GCS score, coma length, or CT results. Other researchers (see Ip et al., 1995) have also found that GCS and coma length are more valid indicators of early evaluation of outcome (e.g., to determine mortality), but are not reliable indicators of educational or vocational status. Others have similarly found that GCS and length of coma did not differ between those with same/improved versus worse post-injury employment status (Lubusko et al., 1994).

Neurological Deficits: The presence of neurological deficits (i.e., paralysis, ataxia, contractures, visual or auditory impairments, and speech deficits) has been found to be uncorrelated with RTW/S outcome (Ip et al., 1995).

Intoxication at Injury: Level of blood alcohol at time of TBI has been found to be unrelated to outcome measures relating at RTW/S 1-year follow-up (Corrigan et al., 1997).

Functional Status: Functional status as assessed by the Functional Independence Measure (FIM) at rehabilitation discharge has been found to not differentiate between TBI patients who are and are not employed 1-year post-injury (Cifu et al., 1997). Scores on the Communication and Social/Recreation/Vocational subscales of the Patient Evaluation and Conference System (PECS; which assess patients' abilities in community re-integration, independent living, vocational participation, and communication skills) have been found to be unrelated to vocational status post-TBI (Rao et al., 1990). However, as these are skills which likely continue to improve following discharge from inpatient hospitalization, it would intuitively be expected that scores on these respective subscales would not be related to vocational status (see Rao et al., 1990 for a discussion).

Injury to Other Body Systems: Physical deficits (e.g., sensory or motor disturbances; gait disturbances; cranial nerve deficits, etc.) as assessed by the Bond Neurophysical Scale have been found to not be significant predictors of RTW rates among severe TBI patients, suggesting that psychosocial difficulties are more important predictors of disability than are physical difficulties (Brooks et al., 1987). Cifu et al. (1997) similarly found that medical data (i.e., relating to associated physical injuries, cranial operations, cranial/non-cranial complications, intracranial hematomas) did not differentiate between TBI patients who were or were not employed 1-year post-injury. Moderate other-systems injuries do not differentiate between patients who do or do not RTW at 6 months post-injury (Dikmen et al., 1994). Presence of fractured limbs had no relation to work status 2 years post-TBI (Ponsford et al., 1995). Impairments as assessed by the Patient Evaluation and Conference System (PECS) in the areas of medical and neurological deficits (i.e., motor loss, sensory deficiency, involuntary movement, autonomic disturbance, associated medical problems, joint limitations, and postural deviations) were found to be unrelated to vocational outcome up to 2-years post-injury (Rao & Kilgore,

1992). However, to qualify the above, it may be that in more severe TBIs, the devastating effects of the TBI overshadow the impact of the other-systems injuries (Dacey et al., 1991).

Ataxia: Return to work rates for severe TBI patients with cerebrallar ataxia (39.1%) do not differ from rates for those without ataxia (38.5%; Gilchrist & Wilkinson, 1979).

C. Positive Relation with Return to Work Outcome

Brain Injury Characteristics (e.g., severity): Almost all (95%) of mild TBI patients have been found to have returned to work 3-months post-injury, even despite them continuing to report some post-TBI symptomatology (Powell et al., 1996).

Patients with non-vascular injuries are more likely to RTW at 18-24 month follow-up (Gogstad & Kjellman, 1976)

Coma Length: Shorter coma length is a positive indicator of RTW status post-TBI (Rao et al., 1990). For example, shorter periods of coma among severe TBI patients are found among those who RTW within 2-years post-injury (versus those who take longer than 3 years to RTW; Fabiano et al., 1995). A coma duration of less than 1 *week* (which coincided with a Glasgow Outcome Scale score of 1 or 2) was found to be correlated with an increased likelihood of independent employment post-injury for patients aged 8-40 years at time of injury; in patients younger or older than this duration, a coma duration of 1 *day* or less coincided with a Glasgow Outcome Scale score of 1 or 2, and hence was associate with increased likelihood of independent employment (Asikainen et al., 1998).

Post-traumatic Amnesia Length: For patients aged 8-40, a PTA that lasted 4 weeks or less (and coincided with a Glasgow Outcome Scale score of 1 or 2) was positively correlated with independent work post-injury; however, the average PTA length that correlated with positive outcome was shorter for both younger patients (2 weeks or less) and older patients (1 week or less; Asikainen et al., 1998).

Functional Status: TBI patients who are employed 1-year post-TBI have been found to be functioning at a higher level than those unemployed at both rehabilitation admission and discharge, as assessed by the Disability Rating Scale (DRS; Cifu et al., 1997; Gollaher et al., 1998). In their multivariate prediction study, Ponsford et al. (1995) found functional status at rehabilitation start (as assessed by the DRS) to be the best predictor of employment status 2-years post-injury. Higher PECS discharge scores, reflecting greater independence (on medical/nursing, physical/occupational therapy, and psychology/neuropsychology subscales), are found among individuals who successfully RTW (Ponsford et al., 1995).

VI. LIMITATIONS IN THE RESEARCH

Prediction of vocational outcome following TBI is important for both clinical and research purposes – for example, an understanding of predictors is of utility in directing clinicians toward differential vocational planning tailored to individuals' needs (see Dikmen et al., 1994). Employment strongly impacts quality of life (perhaps through increased self-fulfillment and increased opportunities), thus the quest to increase employment is important for several reasons from patients' perspectives as well (Webb et al, 1995). However, in order to ensure that an accurate understanding of predictors is achieved, it is important that the above summary of findings on predictors of RTW rates among TBI patients be qualified with an understanding of the limitations of this type of research. In this section, some of the primary limitations that exist within the body of literature on TBI/RTW will be highlighted, and suggestions for future research will be offered.

To begin with, it is evident that there is considerable variance in findings across studies, with certain researchers finding a particular variable to be a positive indicator of RTW post-TBI, and others finding the variable to be unrelated, or even negatively related, to RTW outcome. Fraser and Wehman (1995) suggest that variable outcomes reported in the vocational rehabilitation literature are attributable to methodological variations across studies (e.g., lack of uniformity in severity ratings of TBI; lack of consistent operational definitions of outcome; see also Brooks et al., 1987; Crepeau & Scherzer, 1993; Humphrey & Oddy, 1980). In order to overcome this problem of variability, Fraser and Wehman (1995) suggest that a standardized protocol is needed to assess vocational outcome. Findings on the proportions of TBI patients who RTW also vary due to methodological limitations relating to variations in the follow-up time period (Brooks et al., 1987; Humphrey & Oddy, 1980). Corrigan et al. (1997) report a systematic bias in longitudinal studies of individuals with TBI, in that patients who were intoxicated at the time of their injury and those who had a history of substance abuse were more likely to be lost at follow-up. Given that RTW rates are significantly lower for those who have histories of intoxication at injury or substance abuse history, population estimates for RTW following TBI may thus be overestimated (Corrigan et al., 1997).

The absence of a consistent operational definition of *successful employment* is a glaring limitation in the research, as studies often lump together categories of student, volunteer, part-time, and full-time employment activities together (Cifu et al., 1997). Not infrequently, researchers have relied on subjective ratings of employability without examining factors such as length of work retention – a further, and serious limitation in the research (see Cifu et al., 1997). The problems associated with subjective ratings are underscored by findings that reports of patient functioning from third-parties (e.g., relatives) are not necessarily concordant with those of patients; specifically, caregivers have been found to rate recoveries made by TBI patients as better than how patients perceive themselves to have recovered (Brown et al., 1992). Finally, employment status at a discrete follow-up period is a static measure that may not offer much information, and it has been suggested that stability of employment be used as a dependent variable (e.g., employment status over several points in time; Gollaher et al., 1998).

Directions for Future Research

Return to work has been adopted as the primary measure of social recovery in the literature, yet other outcome measures such as quality of personal relationships and leisure activities may be of primary importance to the TBI patient (Humphrey & Oddy, 1980), and may in fact indirectly be related to RTW successes and failures. Thus, a more detailed understanding of other, non-RTW dependent variables may serve to enhance our understanding of TBI patients' recovery from a more holistic perspective, which may lead to an improved understanding of RTW predictors.

Pre-injury variables such as personality, alcoholism, and psychiatric history have not been systematically studied, nor are there consistent findings as to the influence of these variables on RTW rates in TBI patients (Brooks et al., 1987; Humphrey & Oddy, 1989). Psychosocial variables such as negative societal attitudes toward disability, and their impact on RTW rates, warrant investigation (Brooks et al., 1987). There is also a need to validate established predictors among different ethnic groups, particularly among the groups that have relatively large representations in Canada (e.g., Chinese, East Indian).

Research studies examining RTW correlates among TBI patients have frequently ignored characteristics of the workplace (West, 1995). However, the ability for a job to satisfy both the financial needs and expectations is a contributor to long-term commitment to one's employment (see West, 1995). As such, a more detailed and qualitative analysis of the impact of workplace factors is also warranted (e.g., the precise nature of patients' work; worker satisfaction with employment; stability of employment; Ponsford et al., 1995). Other workplace factors which need to be studied are variables such as level of support, job placement strategies and employer attitudes (Fabiano & Crewe, 1995).

As a final point, Ip et al. (1995) found that the variables which are good at classifying patients who *do* RTW/S are not necessarily good in predicting those who *do not* RTW/S (and vice versa) – a point that should be well heeded in research in this area. Specifically, Ip et al. (1995) found that alcohol abuse, marital status, and Trail A scores were best at classifying those who did RTW/S, whereas for those who did not return, Performance IQ, Visual Memory Index, and Trail B test results were the best predictors. Research on TBI and RTW should thus aim to examine predictors separately for both successful RTW *and* unsuccessful RTW, as the predictors for these two outcomes may be quite different.

VII. PRACTICE RECOMMENDATIONS

1. Crepeau & Scherzer (1993) conducted a meta-analytic review of the predictors and indicators of work status post-TBI and found that, overall, most predictors/indicators are only weakly or moderately correlated with work status. Among the predictors that are related to work status, the authors report that correlations of those variables with work outcome occur, for the most part, only in certain restricted cases (e.g., PTA is a strong predictor of RTW only when the PTA length is relatively short; age, sex, and coma length have prognostic value only in certain cases; see Crepeau & Scherzer, 1993, for a more detailed discussion). These meta-analytic findings indicate that caution needs to be taken when interpreting findings on RTW following TBI, and that the value of the predictors should not be taken as being infallible.

2. The outcome and findings of prediction research are heavily dependent upon the specific predictors that are examined; however, very few researchers comprehensively examine the impact of a variety of factors. Examination of the individual predictive power of demographic, physiological, or neuropsychological variables by itself rarely predicts greater than 25% of the variance, hence supporting the utility of multivariate prediction studies (Ponsford et al., 1995; see Crepeau & Scherzer, 1993 for a general discussion) in examining the predictors of RTW among TBI patients.

3. TBI recovery continues over a period of at least 2 years post-TBI; thus, assessment of employment outcome should, at minimum, continue over this period of time (Ponsford et al., 1995).

4. Brooks et al. (1987) found low rates of provision of vocational rehabilitation programming services to TBI patients. This is problematic given the low rates of RTW among severe TBI patient populations, and underscores the importance of ensuring that appropriate rehabilitation services are offered to TBI patients.

5. Early post-injury intervention is beneficial given Malec et al.'s (1993) findings that increased employment rates were observed among those who entered rehabilitation programming less than one year post-TBI.

6. Brain injury rehabilitation should be multi-faceted, as cognitive variables alone only account for a modest amount of the variance (e.g., see Girard et al., 1996). Emotional and functional disabilities represent greater barriers to adjustment post-TBI than do neuropsychological impairments on their own (see Malec et al., 1993; McLean et al., 1993). Given the above, factors such as emotional (e.g., family support, financial stress) and functional difficulties thoroughly assessed and addressed in treatment.

7. Stabilizing neurological and/or psychiatric conditions prior to intervention and rehabilitation of TBI patients is recommended, as it may enhance patients' readiness and ability to respond to the vocational-oriented treatments (Shaw et al., 1985).

8. Diagnoses of affective (e.g., depression), anxiety, and substance abuse disorders are relatively common occurrences post-TBI; given the impact of these disorders upon impairment measures and cognitive functioning (Fann et al., 1995), concurrent mental health diagnoses warrant assessment and appropriate intervention. It is particularly important that substance abuse issues are addressed in post-TBI rehabilitation, when appropriate (Girard et al., 1996).

9. Symptoms of TBI and Chronic Pain Syndrome (CPS) often overlap, and the symptoms of one syndrome may overshadow the symptoms of the other. However, as treatment failure is high if treatment is not tailored to meet the patients need for both TBI and CPS treatment (Anderson et al., 1990), it is important that detailed assessments be conducted of TBI in CPS patients, and vice versa.

10. The importance of taking into account individual patients' pre-morbid characteristics should be recognized. To illustrate, particularly with respect to intellectual outcome, it is important to investigate how an individual patient functions with respect to their pre-injury status, as the higher the pre-injury IQ, the greater the IQ point loss post-injury (Mayes et al., 1989). Individuals with higher pre-morbid IQs thus may potentially suffer greater intellectual damage in comparison to patients whose pre-morbid IQs are lower, necessitating a greater level of adjustment and coping for both patient and family (Mayes et al., 1989). Likelihood of attaining pre-injury vocational level may thus be more difficult for patients from higher educational levels.

11. It is imperative that vocational rehabilitation professionals remain cognizant of the viscous cycle between unemployment and social isolation, as much of an individual's social supports and contacts often come from work (see Stambrook et al., 1990).

12. Psychological or other tests used on TBI patients may not be sensitive in detecting subtle cognitive-communication deficits (e.g., in verbal reasoning, decision-making) that may lead an individual to fail to meet demands or work, school or social situations (MacDonald & Johnson, 1996).

13. Rehabilitation programming needs to be individually tailored to address specific patients' needs; for example, some may need more emphasis on alcohol abuse rehabilitation, whereas others would need neuropsychological training.

14. Even given the predictors summarized above, the amount of total variance accounted for is typically well below 50%, leaving a substantial amount of variance unexplained; thus, interventions with TBI patients focused upon improving RTW rates should be multi-disciplinary, broad, and addressing a variety of areas in patients' lives. Overall, the contribution of cognitive abilities in predicting RTW or school outcome is modest, with cognitive abilities overall accounting for less than 30% of the variance in outcome – suggesting that other variables are also important (Girard et al., 1996)

15. Severity of TBI is not necessarily linearly related to impairment or disability, as demonstrated by McMordie et al.'s (1990) findings that 50% of individuals who never lost

consciousness during the TBI were unable to RTW. Similarly, RTW rates are not linearly related to apparent levels of disability (Johnson, 1987).

16. Among non-injured individuals, jobs are more often lost to poor social/interpersonal skills (as opposed to inability to perform) – this may place TBI patients at higher risk for vocational failure (Skord & Miranti, 1994), and hence should be addressed in rehabilitation programming.

17. Functional outcome scales focus on physical ability to be able to complete daily life activities, at the neglect of psychosocial/behavioral adjustment and satisfaction scales, the latter which need to be included (Olver, 1995). Treatment needs to be broad-based and address not only cognitive and vocational retraining (e.g., of skills and compensatory strategies), but also needs to more broadly assess the impact of environmental variables such as family coping (Olver, 1995).

18. Severe TBI patients' improvements in functional status (as indexed by productive activity, i.e., paid or unpaid work, educational activities, or non-competitive employment) at 1-year following rehabilitation programming has been found to remain stable or improve at 3-year follow-up, although reports of loneliness and depression over this time period increased (Harrick et al., 1994). This suggests that improvements in functional status do not necessarily represent improved emotional status, hence the latter requires address in rehabilitation (Harrick et al., 1994).

19. Uzzell et al. (1987) found that although all their mild TBI patients were classified as being "good recoveries" according to the Glasgow Outcome Scale, over 50% had not returned to work 16 months post-TBI, thus shedding doubt on the sensitivity and value of this measure as being a significant predictor of outcome. Caution should be taken to avoid over-reliance on any one indicator of post-TBI outcome; rather, assessments and predictions should be based upon multiple, converging sources of data.

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Traumatic Brain Injury & Return to Work Project:
WEBSITES

NAME:	LOCATION:
Brain Injury Association of Nipissing	http://dawn.thot.net/brain/history.htm
Brain Injury Associations, Support, Survivor, and Family Links	http://www.neuro.pmr.vcu.edu/LINKS/support.htm
Brain Injury Information Links	http://www.idir.net/~irvcohen/brain.html
Canadian Brain Injury Coalition	http://www.cbic.ca/english/
Center for Outcome Measurement in Brain Injury	http://www.tbims.org/combi/
Disability Resources Monthly	http://www3.geocities.com/CapitolHill/1703/EMPLOYMENT.html
GF Strong Website	www.vanhosp.bc.ca/rehab
Mild Traumatic Brain Injury;	http://www.neuroskills.com/tbi/mtbi.html
National Institute of Disability Management and Research	www.nidmar.ca/calendar
Neuroscience Center	http://www.neuroscience.cnter.com/
*Ontario Brain Injury Association – home page	www.obia.on.ca/default
*Ontario Brain Injury Association – resources & links; resources & links to databases, search engines, etc.	www.obia.on.ca/links
Perspectives Network	http://www.tbi.org/
Rehadat Canada (information system of vocational rehabilitation)	www.nidmar.ca/rehadat
Stout University	rtc.uwstout.edu
Taconic Resources for Independence, Inc.	http://www.idsi.net/tri/vr.htm
Technical Assistance on Transition and the	http://www.pacer.org/tatra/ttatra.htm

Rehabilitation Act (TATRA)	
Traumatic Brain Injury Model Systems	http://www.tbims.org/
Traumatic Brain Injury Resources	http://curry.edschool.virginia.edu/go/cise/ose/categories/tbi.html
Traumatic Brain Injury Support Groups	http://www.bookwurms.com/trauma/sprt.html
Virginia Commonwealth University – Department of Physical Medicine and Rehabilitation	http://www.pmr.vcu.edu/

Traumatic Brain Injury & Return to Work Project:
ACADEMIC DATABASES LIST

NAME:	DESCRIPTION:	LOCATION:
PsycInfo	Psychology Journal Database	Accessible through University library services (e.g., SFU, UBC)
Medline	Medical Journal Database	Accessible through University library services (e.g., SFU, UBC)
EBSCO	Academic Database with full-text journal articles in the areas of social sciences, humanities, education, etc.	Accessible through SFU library services [SFU library --> internet texts --> journals --> EBSCO host collection of 3500+ --> EBSCO host 3.0 --> academic search full text elite --> click off peer reviewed/full text/ search within full text]

Traumatic Brain Injury & Return to Work Project:
ACADEMIC JOURNALS LIST

- AAOHN: Official Journal of the American Association of Occupational Health Nurses
- Academic Therapy
- Acta Neurochirurgica: Supplementum.
- American Journal of Occupational Therapy
- American Journal of Physical Medicine
- American Journal of Physical Medicine & Rehabilitation
- American Journal on Addictions
- American Occupational Therapy Journal
- Annals of the New York Academy of Sciences
- Archives of Emergency Medicine
- Archives of Neurology
- Archives of Physical Medicine and Rehabilitation.
- Australian and New Zealand Journal of Psychiatry
- Australian Occupational Therapy Journal
- Behavioral Residential Treatment
- Brain Injury
- British Journal of Hospital Medicine
- British Journal of Neurosurgery
- British Journal of Occupational Therapy
- British Journal of Psychiatry
- British Medical Journal
- Bulletin of Clinical Neurosciences
- Canadian Journal of Rehabilitation
- Canadian Journal of Sport Sciences
- Canadian Occupational Therapy Journal
- Clinical Neuropsychology
- Clinical Psychology Review
- Clinical Rehabilitation
- Cognitive Rehabilitation
- Community Alternatives: International Journal of Family Care
- Comprehensive Mental Health Care
- Cortex
- Counselling Psychology Quarterly
- Emergency Medicine Clinics of North America
- General Hospital Psychiatry

- Headlines (BC Brain Injury Association journal)
- International Disability Studies
- International Journal of Clinical Neuropsychology
- International Journal of Psychiatry in Medicine
- International Journal of Rehabilitation Research
- International Journal of Technology Assessment in Health Care
- International Review of Applied Psychology
- Iowa Medicine
- Italian Journal of Neurological Sciences
- Journal of Applied Behavior Analysis
- Journal of Applied Rehabilitation Counseling
- Journal of Clinical and Experimental Neuropsychology
- Journal of Clinical Epidemiology
- Journal of Clinical Psychology
- Journal of Community Health Nursing
- Journal of Consulting and Clinical Psychology
- Journal of Counseling and Development
- Journal of Head Trauma Rehabilitation
- Journal of Learning Disabilities
- Journal of Nervous and Mental Disease
- Journal of Neurologic Rehabilitation
- Journal of Neurology, Neurosurgery, and Psychiatry
- Journal of Neuroscience Nursing
- Journal of Neurosurgery
- Journal of Neurotrauma
- Journal of the National Medical Association
- Journal of Work
- Maryland Medical Journal
- Medical Care Review
- Neurologic Clinics
- Neuropsychiatry, Neuropsychology, and Behavioral Neurology
- Neuropsychological Rehabilitation
- Neuropsychology
- Neuropsychology Review
- Neurosurgical Review
- Nursing Clinics of North America
- OBIA Review (Publication of the Ontario Brain Injury Association; found at www.obia.on.ca)
- Ontario Psychologist

- Pain
- Perceptual and Motor Skills
- Physical Therapy
- Professional Psychology Research and Practice
- Progress in Behavior Modification
- Psychiatric Journal of the University of Ottawa
- Psychological Medicine
- Psychosomatics
- Psychotherapy in Private Practice
- Recovery (Insurance Corporation of BC's journal)
- Rehabilitation Counseling Bulletin
- Rehabilitation Psychology
- Scandinavian Journal of Rehabilitation Medicine
- Social Science and Medicine
- Soviet Psychology
- Surgical Neurology
- The Australian and New Zealand Journal of Surgery
- The Journal of Trauma
- The Otolaryngologic Clinics of North America.
- Topics in Language Disorders
- Vocational Evaluation and Work Adjustment Bulletin
- World Journal of Surgery