

Results

Given the large number of predictors and indicators of successful employment following traumatic brain injury, the variables were grouped to better organize the information. Variables were grouped in a pre-injury and demographic category and a post-injury category. Pre-injury variables included all relevant available information covering the pre-injury period, including ethnicity, age, gender, occupational status, and location. Post-injury variables included all relevant available information covering the post-injury period, including injury severity and involvement in vocational rehabilitation.

Pre-Injury and Demographic Predictors/Indicators

Ethnicity. The effect of ethnicity has been investigated as a potential predictor of employment status following a traumatic brain injury. The authors of five studies have examined the relationship between ethnicity and employment in individuals with TBI from 2002 to 2012. Overall, the authors of these studies found that ethnicity was a predictor of returning to work after a TBI. For example, after controlling for other pre-injury variables, Sherer et al. (2003) analyzed TBI Model Systems data and found that African-Americans and other racial minorities were approximately twice as likely to be unemployed as Caucasians. Using a logistic regression analysis of the Rehabilitation Services Administration's RSA-911 database, Da Silva Cordoso et al. (2007) analyzed 5,831 participants and found that Caucasians were 1.27 times more likely to obtain employment than were Hispanics. In a recent study, Arango-Lasprilla et al. (2009) concluded that ethnicity had a significant impact on employment status one year post injury. Minorities (African-Americans, Hispanic, Asian, and Native American) were 3.58 times more likely to be unemployed than their Caucasian counterparts. In their

study comparing work outcomes between the English speaking culture in Melbourne, Australia, and those with culturally and linguistically diverse (CALD) backgrounds, Saltapidas and Ponsford (2007) found significantly fewer CALD participants returned to work following their traumatic brain injury. In contrast to the majority of researchers, Johnstone et al. (2003a) found no significant difference between the number of successfully employed African-Americans and Caucasians over a two year period following state vocational rehabilitation services. The researchers hypothesized that there was no difference in employment outcomes due to the number of African-American participants receiving vocational rehabilitation services more heavily related to environmental factors. For example, Johnstone et al. (2003a) noted that 63% of African-American participants received transportation services, which significantly increased the likelihood of returning to work. The researchers called for more focus on the impact of environmental factors on employment outcomes to support their findings. In review, the researchers of 4 of 5 articles demonstrated that minorities experience poorer return to work rates following TBI than Caucasians.

Age. The impact of age on returning to work following TBI has been examined in the literature. Older adults were found to experience less favorable return to work rates than younger adults. After analyzing secondary of 55 participants with TBI admitted to a brain injury unit, Felmingham et al. (2001) found that age at the time of injury was the most significant predictor of returning to work two years post TBI. In their four year follow-up study of 538 TBI Model Systems patients, Keyser-Marcus et al. (2002) reported that age at injury appeared to be the most reliable predictor of whether an individual would return to work, with younger individuals being more likely to return to

work. In addition, Keyser-Marcus et al. (2002) found that individuals in the age group 40 and older were significantly less likely to return to work at one to five years post injury. In their comparison study of 112 people with TBI and 112 healthy controls, Senathi-Raja et al. (2009) found that older individuals (age 38 and above) with traumatic brain injury were less likely to return to the workforce. Two hundred and twenty four participants were recruited from a database of patients with TBI receiving rehabilitation from 1984-2002 at Epworth Hospital in Melbourne, Australia. Senathi-Raji et al. (2009) used The Sydney Psychosocial Reintegration Scale (SPRS) to measure changes of independent living skills, including employment.

Contrary to other researchers, Skeel, et al. (2003) found no age-related differences in return to work rates in their retrospective analysis of the Missouri Division of Vocational Rehabilitation using RSA-911 data. The researchers reported that the contrasting results may have been due to the population from which the sample was drawn. Skeel et al. (2003) noted that individuals in their study likely had sufficient initiative, motivation, and basic skills to be considered legitimate candidates for employment as they were in the final phases of the vocational rehabilitation process. This may have been in contrast to other participant samples that were gathered from acute and rehabilitation hospitals. Overall, 4 of 5 researchers determined that age at the time of traumatic brain injury was a predictor of return to work.

Gender. The authors of three studies have examined the relationship between gender and employment in individuals with TBI between 2002 and 2012. In their prospective study of 78 participants with TBI who received services from a state vocational rehabilitation division, Bounds et al. (2003) evaluated the differences in injury

severity, demographics, neuropsychological abilities, and vocational and financial outcomes. Bounds et al. (2003) found that after completing state vocational rehabilitation (case closure), only 4.4% of women with traumatic brain injury were successfully employed compared to 23.6% of men. Bounds et al. (2003) added that 73.9% of women had vocational rehabilitation services terminated after being accepted but before services were initiated, compared to 56.4% of men, despite having similar injury severity, neuropsychological, and other demographic characteristics. In their meta-analysis of eight studies prior to 1998, Farace and Alves (2000) found that outcomes were worse in women than in men for 85% of measured variables, including return to work. Farace and Alves (2000) noted that this conclusion was limited by the fact that only a small percentage of the total published reports before January 1998 were on TBI outcomes separately for each sex.

Using data obtained from a previous National Institute of Health study (Valporate Prophylaxis of Posttraumatic Seizures Study), Fraser et al. (2006) found that according to U.S. Department of Labor Ratings, women were more likely able to obtain and maintain employment post traumatic brain injury. The researchers followed 140 workers at the time of injury and examined return to work over a 3-5 year period. Conversely, in an examination of secondary data of 306 patients followed up to 24 years post injury, Devitt et al. (2006) found that males achieved worse return to work rates. Devitt et al. (2006) noted that these results may have been impacted by the ratio of male to female participants, with nearly 2.5 times more males participants included in the study.

Pre-Injury Occupational Status

Pre-injury occupational status and returning to work following TBI have been examined in the literature. In a study by Walker et al. (2006), participants whose pre-morbid occupations were managerial or professional were 3 times more likely and skilled workers were 1.5 more likely to return to work than manual laborers. Walker et al. (2006) analyzed data for 1,341 participants who received services at 17 different TBI Model Systems centers. For those participants who did successfully return to work, Walker et al. (2006) found that most did so within the same occupational category. Similarly, Lilley et al. (2012) found that blue collar workers with TBI were less likely to return to work. Lilley et al. (2012) analyzed secondary data for 2,626 participants three months following hospitalization. Work tasks, typical to blue collar jobs, involving painful/tiring body positions or standing increased the likelihood of not returning to work. Keyser-Marcus et al. (2002) found that individuals who were employed prior to their traumatic brain injury were three to five times more likely to return to work five years post injury in their four year follow-up study of 538 TBI Model Systems patients. The main explanation for these findings was that individuals with traumatic brain injury with prior stable work experience and qualifications faced fewer difficulties with employment reintegration than individuals without these pre-existing assets.

Rural vs. Urban Environment. Rehabilitation professionals at comprehensive vocational rehabilitation centers typically have required the client to travel to receive services. In rural or remote areas, individuals often have been far removed from the treatment facility. Three studies were found that the authors examined the relationship between return to work and rural location. Johnstone et al. (2003b) reported that 24% of

clients receiving state vocational rehabilitation services in an urban environment obtained successful employment compared to only 7% of clients living in rural areas. Johnstone et al. (2003b) examined 78 individuals who requested services from the Missouri Department of Vocational Rehabilitation over a two year period. Vocational outcome was evaluated based on being successfully versus unsuccessfully employed at the time of follow-up. Similarly, Beach (2009) reported negative employment outcome in rural areas for clients receiving state vocational rehabilitation services due to transportation and job placement availability. Beach (2009) analyzed data from 1998-1999 and 2003-2004 and found similar negative employment results for clients from rural areas in both years. In contrast to other researchers, Harradine et al. (2004) reported no significant group differences in return to work outcomes at follow-up in their longitudinal study in New South Wales. Harradine et al. (2004) analyzed retrospective data of 198 patients two years following a brain injury rehabilitation program. Harradine et al. (2004) noted that these results were limited because of the population of their study. Compared to other studies analyzed for this review, participants in the study completed by Harradine et al. (2004) were more severely injured and represented disproportionate sample sizes of rural and urban participants.

Post-Injury Predictors/Indicators

Severity of injury. Injury severity has been examined extensively in the literature. The relationship between injury severity and return to work varies depending on the type of measure used. The authors of the studies reviewed typically used measures such as Glasgow Coma Scale score and the duration of posttraumatic amnesia.

Glasgow coma scale. The Glasgow coma scale (GCS) was first developed in 1974 in an effort to assess different groups of patients with altered levels of consciousness and to improve communication between health care personnel caring for patients with impaired consciousness (Zuercher, Ummenhofer, Baltussen, & Walder, 2009). The Glasgow coma scale was developed purely as a physiologic measure of injury severity (Foreman et al., 2007). When the Glasgow coma scale has been applied, the final score has been determined by adding the values of the eye-opening score (1-4), verbal response score (1-5), and motor response score (1-6). Individuals who had a better response received a better score. A score of 13 to 15 represented mild brain injury, 9 to 12 indicated moderate brain injury, and 3 to 8 represented severe brain injury (Smith, 2001). In their study of 113 patients with TBI discharged from trauma centers in the Netherlands, Grauwmeijer et al. (2012) found that higher scores on the motor response component of the Glasgow coma scale had a higher predictive value for returning to work. Avesani et al. (2005) also reported that severe motor disability and poor motor response scores were primary indicators of successful return to work in their retrospective study of 353 TBI patients from 1991 to 1999. The researchers reported that patients with lower motor response scores faced lower prospects of vocational reintegration.

On the other hand, evidence of the GCS as a non-predictor of returning to work was also found. In their retrospective study of 171 participants from the TBI Model Systems Database, Nakase-Richardson et al. (2011) found no significant correlation between GCS scores and re-employment outcomes. In addition, Guerin et al. (2006) found that length of hospital stay was a better predictor of returning to work than Glasgow coma scale scores, which had so significant impact on successful return to

work. However, the researchers reported that no participants scored below 13, which indicated that all participants had only mild traumatic brain injury. For this reason, the results of this study should be viewed with caution.

Posttraumatic amnesia. Posttraumatic amnesia has been defined as the time after a period of unconsciousness when the injured person appeared to be conscious and awake, but had no continuous memory of day-to-day events (King et al., 1997). The period of posttraumatic amnesia has been defined as the time between receiving a head injury and the resumption of normal continuous memory (Nakase-Richardson et al., 2011). In most studies, the duration of posttraumatic amnesia was obtained retrospectively at follow-up interviews (McMillan, Jongen, & Greenwood, 1996). In their study of 248 military veterans with non-penetrating traumatic brain injury, Eastvold et al. (2012) found that length of post traumatic amnesia was the strongest predictor of returning to work or school. Sherer et al. (2002) analyzed secondary data from six inpatient brain injury rehabilitation programs and found that duration of post traumatic amnesia significantly contributed to the prediction of work status at one year follow-up.

Involvement in vocational rehabilitation. Vocational rehabilitation services (VRS) have been viewed as an integral part of the TBI rehabilitation process (Da Silva Cardosa, et al., 2007). Several vocational rehabilitation programs or services to enhance successful employment for people with traumatic brain injury have been suggested in the literature including vocational guidance and counseling, on-the-job training, and job search and placement assistance.

Vocational guidance and counseling. Vocational guidance and counseling are services provided for an individual to achieve success employment outcomes (i.e., return

to work). Rehabilitation professionals delivering vocational guidance and counseling may have provided personal adjustment counseling and counseling to address medical, family, or social challenges such as achieving employment. Vocational guidance and counseling has been distinct from the general counseling and guidance that occurs between a counselor and the individual during the entire rehabilitation process (Dutta, Gervy, Chan, Chou, & Ditchman, 2008). Johnstone et al. (2003a) concluded that vocational guidance and counseling and on-the-job training predicted return to work for clients with TBI. The researchers' sample included 78 individuals with TBI who received services from the Missouri Department of Vocational Rehabilitation between 1999 and 2001. The researchers found that participants who completed vocational rehabilitation were primarily white, male, and single. Johnstone et al. (2003a) noted that without helping individuals set realistic vocational goals and identify appropriate vocations based on interests and skills (vocational guidance and counseling), individuals might be unable to find a job that maximizes return to work rates.

On-the-job training. On-the-job training has been defined as training in specific jobs skills by a prospective employer. On-the-job training has included apprenticeship training programs conducted or sponsored by an employer, a group of employers, or a joint apprenticeship committee representing both employers and a union (Dutta et al., 2008). In their study of 7,366 person with TBI whose cases were closed by state vocational rehabilitation agencies as employed or not employed in 2004, Catalano et al. (2006) highlighted the essential role of on-the-job training in predicting successful return to work.

Job search and placement assistance. Job search assistance has been referred to as activities to support and assist a client in searching for an appropriate job. These services have included help in preparing resumes, identifying appropriate job opportunities, and developing interviewing skills (Dutta et al., 2008). Job placement has included a referral to a specific job resulting in an interview, whether or not a client obtains a job. Schonbrun et al. (2007) analyzed 6,460 cases using the RSA-911 database to examine the relationship between specific services and return work in RSA consumers with TBI. Schonbrun et al. (2007) found that job placement and job search were positively correlated with successful return to work and higher weekly earnings at the closure of state vocational rehabilitation services. Using a similar methodology, Gamble and Moore (2003a) also found that job placement services were positive predictors of successful employment in their study of 1,073 vocational rehabilitation clients. Gamble and Moore (2003a) concluded that job placement should receive greater emphasis in vocational training and education. Similarly, Bolton et al. (2002) analyzed 4,000 vocational rehabilitation clients with TBI and concluded that job placement assistance was the single most important predictor of successful employment. Bolton et al. (2002) noted that the provision of job placement services was an activity that was under the professional control of the counselor, and may have been an important factor in explaining why it was such a contributor to successful work outcomes. Only 34% of the participants who were sampled received job placement assistance.