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Effects of postsecondary education on employment outcomes and earnings of young adults with traumatic brain injuries

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Abstract.
BACKGROUND: Gainful employment has many psychological, social, and financial benefits. Helping young adults with traumatic brain injury (TBI) who have academic potential to attend college will increase their chances of finding a good job with benefits that can pave the way for a great career and a middle-class life.
OBJECTIVE: The purpose of the present study was to evaluate the effectiveness of college and university training on employment outcomes and earnings of young adults with TBI.
METHODS: We conducted a non-experimental causal comparative study using propensity score matching to create a treatment ($n = 278$) and a comparison group ($n = 278$) using the RSA-911 data.
RESULTS: Results demonstrated that young adults with TBI who received college or university training have better employment and earning outcomes than young adults without college or university training.
CONCLUSIONS: Implications for state vocational rehabilitation counsellors are discussed.

Keywords: Traumatic brain injury, training, employment

1. Introduction

Paid employment is essential for the physiological survival and psychological well-being of working-age adults. It allows individuals to provide for themselves, raise a family, live with dignity, connect with people, and contribute as productive members of society (Fryers, 2006). However, the employment-to-population ratio of 30.6% for working-age adults with disabilities is strikingly low, comparing unfavourably to the 74.8% ratio for individuals without disabilities (U. S. Department of Labor, 2020). Unemployment prevents a large number of individuals with disabilities from community participation; stalls upward mobility; and greatly affects their physical health, mental health, and overall quality of life (Murali & Oyebode, 2004; U.S. Senate Committee on Health, Education, Labor and Pensions, 2012).

College and university training has a significant impact on employment and lifetime earnings

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(Julian & Kominski, 2011; U.S. Department of Labor [USDOL], 2014). Research indicates that men with college degrees earn $900,000 more in median lifetime earnings than male high school graduates (Tamborini et al., 2015). Women with college degrees earn $630,000 more than female high school graduates (Tamborini et al., 2015). It is true that the unemployment rates for people with some college, associate's degree or bachelor's degree and higher are significantly lower than high school graduates (no college) and people with less than a high school diploma (Federal Reserve Bank of St. Louis, n.d.). Moreover, education is a fundamental social determinant of physical and mental health (Cutler & Lleras-Muney, 2014; Hahn & Truman, 2015; Winkleby et al., 1992; Zimmerman & Woolf, 2014). For people with disabilities, higher levels of education significantly increase their job prospects and earnings (Jones et al., 2006; O'Neill et al., 2015; Kidd et al., 2000). O'Neill et al. (2015) conducted a propensity score matching study using the U.S. Department of Education's Rehabilitation Services Administration Case Report (RSA-911) data to evaluate the effect of college or university training on earnings among people with disabilities closed as successfully rehabilitated by state VR agencies. They reported significant differences in weekly earnings between clients who received college training and those who did not receive such training. They also found that rehabilitation counselors in state VR agencies are more likely to provide college and university training as an employment intervention for transition-age youth with disabilities and for people with sensory or physical disabilities but are less likely to provide such services for people with intellectual disabilities, developmental disabilities, and psychiatric disabilities. These individuals may be underserved due to cognitive barriers they experience that may interfere with navigating their training and their academic performance (O'Neill et al., 2015).

1.1. Adults with traumatic brain injuries

In the United States, about 1.7 million Americans sustain traumatic brain injuries (TBI) each year, with approximately two-thirds of these injuries affecting people between the ages of 15 and 24 years (Centers for Disease Control and Prevention [CDC], 2016; MacLennan & MacLennan, 2008). Employment outcomes for individuals with TBI lag far behind those of the general population. Specific to young adults with TBI, they may face a variety of complications, including cognitive impairments, behavioral concerns, and social difficulties, which can negatively impact their educational and vocational pursuits (Strauser et al., in press; Todis et al., 2011; Wehman et al., 2014). Cuthbert et al. (2015) analysed patient data from the Traumatic Brain Injury Model Systems National Data and Statistical Center (TBIMS-NDSC) to estimate the prevalence of unemployment and part-time employment in the United States for working-age individuals with TBI who received services from TBIMS between 2001 and 2010. The results indicated that the prevalence of unemployment at two-year post-injury (2003–2012) for adults with TBI was 60.4%, whereas the average unemployment rate for the U. S. population during the same period was 9.0%. In another study, young adults with TBI were found to be 2.3 times less likely to obtain a college degree and were 1.7 times more likely to be unemployed or have an unskilled career compared to the general population (Anderson et al., 2009). There is emerging research evidence to support college and university training as an effective employment intervention for young adults with disabilities (O'Neill et al., 2015). For students with TBI who have academic potential, attending and graduating from college could improve their likelihood of finding gainful employment by helping them cope with their physical, emotional, and cognitive symptoms (Strauser et al., in press), thereby paving the way for a meaningful career leading to a middle-class life.

1.2. Purpose of the study

Although the positive effect of college and university training on employment outcomes and lifetime earnings is well documented in the business and labor economics literature, there is a paucity of research studies investigating the effectiveness of education as an employment intervention for young adults with TBI. Accordingly, the purpose of this study was to examine the effect of college and university training on employment outcomes in a sample of young adults with TBI who were served by state VR agencies. The RSA-911 dataset provides a rich source of demographic, VR-service, and employment outcome information about people with disabilities served by state VR agencies (Ditchman et al., 2013). Using this dataset, we conducted a matched case-control study using propensity score matching to adjust for non-random assignment to evaluate the effect of college and university training on employment outcomes and earnings among young adults with TBI served

by state VR agencies. Specifically, this study was designed to answer two key research questions:

1. Is college and university training an effective intervention for increasing the rate of competitive, integrated employment among young adults with TBI who receive services from the state-federal VR program?
2. Is college and university training an effective intervention for improving the quality of employment outcomes for young adults with TBI who are employed in competitive, integrated settings at the time of VR case closure?

2. Method

2.1. Study cohort

Data for this study were extracted from the RSA-911 data base, which contains detailed information about demographics, disability, types of services, and employment outcomes for all clients receiving state VR services in the United States. The data are furnished annually to RSA by state VR agencies. Data from the RSA-911 for fiscal year 2014 were used for the present analyses because that year represents a more typical economy than the full employment era preceding COVID-19 and the economic crisis that has accompanied the pandemic in 2020 (Smialek & Collins, 2019). The inclusion criteria for the present study were: (a) young adults between the ages of 18 and 35, (b) a primary diagnosis of TBI, and (c) a high school diploma or less education at intake.

Participants in this study included 1,574 young adults with TBI who met the inclusion criteria and whose cases were closed in fiscal year 2014. The sample included 1162 (73.8%) males and 412 (26.2%) females. Racial and ethnic backgrounds were dominated primarily by European Americans ($n = 1080$, 68.6%), followed by African Americans ($n = 252$, 16.0%), Hispanics/Latinos ($n = 173$, 11.0%), Native Americans ($n = 37$, 2.4%), Asian Americans ($n = 29$, 1.8%), and Native Hawaiians and/or other Pacific Islander Americans ($n = 3$, 0.2%). The mean age of the participants at intake was 24.17 years ($SD = 5.34$). Seven hundred eighty-eight participants (50.1%) were Social Security beneficiaries receiving Supplemental Security Income (SSI) or Social Security Disability Insurance (SSDI). Six hundred eighty-two participants (43.1%) were Medicaid recipients.

2.2. Variables

Four demographic variables (i.e., age, gender, race, receipt of Medicaid insurance) and one VR service variable (i.e., receipt of assessment services) were used for the propensity score matching analysis. These covariates were used to adjust the selection bias between the treatment and control groups. The outcome variables included employment outcome (employed vs not employed in a competitive, integrated setting), average number of hours worked per week, and average weekly earnings at VR case closure.

2.3. Statistical analysis

Propensity score matching methods for non-experimental causal comparative studies (Austin, 2011) were used to create a matched group of young adults with TBI who did not receive college and university training as part of their VR services (the control group) that was compatible with the group of young adults with TBI who received college and university training (the treatment group). Next, the matched group (no college or university training) and the treatment group (received college or university training) were compared to examine the effect of college and university training on employment outcomes. Chi-square analysis and *t*-tests for independent sample analysis were used to analyze the differences between the treatment and control groups on employment outcomes.

3. Results

3.1. Descriptive statistics

To maximize the sample size for the treatment group, participants with a high school education or less at application and some college, associate's degree, or bachelor's degree and higher at closure were classified as the college and university training group (treatment group). Participants with a high school education or less at application and also at closure were defined as the no college and university training group (control group). Five prominent covariates (age, gender, race, receipt/non-receipt of Medicaid, and receipt/non-receipt of assessment services were used for the propensity score matching analysis. Assessment services were used as a proxy for lower levels of TBI severity. Prior to propensity

score matching, there were 278 participants in the treatment group and 1,296 participants in the control group. Information regarding the demographic characteristics of the treatment and control groups, the *t*-test results, and the chi-square results is presented in Table 1.

As can be observed in Table 1, young adults with TBI in the treatment group were younger than participants in the control group, $t(1574) = -4.971$, $p < 0.0001$. The percentage of European American participants was higher in the treatment group than in the control group, $\chi^2(1, N = 1574) = 14.112$ $p < 0.0001$. There were proportionally more participants who received Medicaid in the control group than in the treatment group, $\chi^2(1, N = 1574) = 38.395$, $p < 0.0001$. There were fewer participants receiving assessment services in the control group than in the treatment group, $\chi^2(1, N = 1574) = 5.991$, $p < 0.05$. These results show that the treatment and control groups differed significantly on four of the five prominent covariates.

3.2. Propensity score matching analysis

Propensity score matching using logistic regression analysis and the nearest neighbour method was conducted to equalize the treatment and control groups on the five prominent covariates. As can be observed from Table 1, propensity score matching using the five prominent covariates was able to identify 278 young adults with TBI from the control group that match the prominent characteristics of the 278 participants in the treatment group. Chi-square and *t*-test results indicated that there were no statistically significant differences between the

Table 1
Comparison of the No College and College Groups before and after Matching

Before Matching ($N = 1574$)			
Demographic Variables	No Postsecondary Education Group ($n = 1296$)	Postsecondary Education Group ($n = 278$)	*p* Level
Age	$M = 24.479$	$M = 22.737$	$t(1572) = -4.971$
	$SD = 5.363$	$SD = 5.002$	$p < 0.0001$
Gender			
Male	969 (74.8%)	193 (69.4%)	$X^2(1, N = 1574) = 3.383$
Female	327 (25.2%)	85 (30.6%)	$p = 0.066$, *n.s.*
Race/Ethnicity			
White	1019 (78.6%)	246 (88.5%)	$X^2(1, N = 1574) = 14.112$
Non-White	277 (21.4%)	32 (11.5%)	$p < 0.0001$
Medicaid			
Yes	688 (53.1%)	74 (26.6%)	$X^2(1, N = 1574) = 38.395$
No	608 (46.9%)	204 (73.4%)	$p < 0.0001$
Assessment			
Yes	414 (31.9%)	110 (39.6%)	$X^2(1, N = 1574) = 5.991$
No	882 (68.1%)	168 (60.4%)	$p < 0.05$
After Matching ($N = 556$)			
Demographic Variables	No Postsecondary Education Group ($n = 278$)	Postsecondary Education Group ($n = 278$)	*p* Level
Age	$M = 23.31$	$M = 22.74$	$t(554) = -1.31$
	$SD = 5.14$	$SD = 5.00$	$p = 0.19$, *n.s.*
Gender			
Male	203 (73.0%)	193 (69.4%)	$X^2(1, N = 556) = 0.88$
Female	75 (27.0%)	85 (30.6%)	$p = 0.35$, *n.s.*
Race/Ethnicity			
White	240 (86.3%)	246 (88.5%)	$X^2(1, N = 556) = 0.59$
Non-White	38 (13.7%)	32 (11.5%)	$p = 0.44$, *n.s.*
Medicaid			
Yes	99 (35.6%)	74 (26.6%)	$X^2(1, N = 556) = 5.25$
No	179 (64.4%)	204 (73.4%)	$p < 0.05$
Assessment			
Yes	98 (35.3%)	110 (39.6%)	$X^2(1, N = 556) = 1.11$
No	180 (64.7%)	168 (60.4%)	$p = 0.29$, *n.s.*

treatment and control groups on four of the five prominent covariates. However, the percentage of participants who were Medicaid recipients in the treatment group was lower than in the control group, $\chi^2(1, N = 556) = 5.25$, $p < .05$.

3.3. Employment-related outcome analysis

We conducted one chi-square test of independence and two *t*-tests for independent samples to evaluate the effects of college and university training on employment outcomes, hours work per week, and weekly earnings.

3.3.1. Employment outcome

A chi-square test of independence was performed to examine the relationship between college and university training and employment outcomes. The relationship between these two variables was significant, $\chi^2(1, N = 556) = 18.00$, $p < .001$. Young adults with TBI in the treatment group had a higher employment rate (60.4%) at the time of case closure than did the control group (42.4%).

3.3.2. Weekly earnings

For clients with successful employment outcomes, an independent-samples *t*-test was conducted to compare weekly earnings across the college training and no college training conditions. There was a significant difference in weekly earnings for the treatment group ($M = \$381.00$, $SD = \$209.12$) and the control group ($M = \$261.21$, $SD = \$169.53$) conditions; $t(281) = 5.131$, $p < 0.0001$. Young adults with TBI with college and university training earned significantly more than those in the control group.

3.3.3. Average hours worked per week

An independent-samples *t*-test was conducted to compare average hours worked per week in the treatment and control groups. There was a significant difference in hours worked per week for the treatment ($M = 32.58$ hours, $SD = 9.87$) and control ($M = 27.32$, $SD = 9.61$) conditions; $t(281) = 4.475$, $p < 0.0001$. Young adults with TBI in the treatment group worked significantly more hours per week than participants in the control group.

4. Discussion

The purpose of this study was to examine the effect of college and university training on employment outcomes of young adults with TBI receiving services from state VR agencies. Results indicated that individuals who received college or university training had more successful employment outcomes, worked more hours per week, and had higher weekly earnings than those who did not receive college or university training. Previous research has also demonstrated the important role of college or university training on employment outcomes in people with TBI (Catalano et al., 2006; Gamble & Moore, 2003; Tucker & Degeneffe, 2017). For instance, in one study, people with TBI who received college or university training had an employment rate of 70% compared to those without training who had an employment rate of 57% (Catalano et al., 2006). In another study, compared to people with TBI who did not receive college or university training, those receiving college or university training were 5.21 times more likely to obtain competitive employment and had higher weekly earnings (Gamble & Moore, 2003). These previous findings, coupled with the superior employment outcomes reported by the treatment group in this study, corroborate Hendricks et al.'s (2015) assertion that support for postsecondary education is the single most cost-effective intervention for people with TBIs in the state-federal VR program.

4.1. Clinical implications

Gainful employment has many benefits. Work is a large part of people's personal identity; it grants social legitimacy to people's lives, helps people to live with dignity, and enables them to view themselves as productive members of society (Freyers, 2006). This is particularly relevant to youth with TBI, because the condition can lead to individuals experiencing a loss of personal sense of identity, contracted view of self and the future, and lower quality of life (Muenchberger et al., 2008). College and university training increases the probability that an individual will find a meaningful job that can lead to a successful career. In the present study, we demonstrated the effectiveness of college and university training on improving the employment outcomes and earning capacity of young adults with TBI who received services from state VR agencies. Tucker and Degeneffe (2017) also highlighted the importance of VR supports including college or university training and personal adjustment counseling because youth with TBI may encounter many disability-related and psychoso-

cial challenges as they transition to employment. In state VR agencies, rehabilitation counselors play an important role in helping persons with disabilities achieve their independent living and employment goals. For example, when working with clients with TBI, rehabilitation counselors can promote their adjustment to TBI and improve access to resources and services (Dillahunt-Aspillaga et al., 2014). Rehabilitation counselors can provide tuition support for young adults with TBI to attend college and pre-employment transition services (e.g., self-advocacy training, social skills training, and job interviewing and job seeking skills training) to help students develop character strengths and emotional efficacy to cope with the demands and challenges of college life and prepare for finding employment. These VR services can augment services (e.g., study skills training, time management training, and accommodation services) provided by disability service providers to maximize the probability that students with TBI will persist with their career goals, graduate from college, and find gainful employment. However, currently, there is a gap among neuro-rehabilitation providers, VR counselors, and disability service providers in college settings. Neuro-rehabilitation and health professionals need to become familiar with state VR agencies in their geographic area and develop a working relationship with rehabilitation counselors in order to refer their clients with TBI deemed to have academic potential to state VR agencies for employment related services. This can be done by professionals taking a more proactive approach in familiarizing themselves with the resources offered in the community, and personally connecting with rehabilitation counselors in these communities to network and develop alliances. Findings of the present study also indicate that college and university training for youth with TBI is a good investment. However, according to the Bureau of Labor Statistics (2015), people with disabilities are less likely to complete a bachelor's degree in comparison to people without disabilities. College students with TBI may have difficulty navigating the academic rigors of their training (owing largely to cognitive impairments in addition to physical, societal, and systemic barriers; Rumrill et al., 2016). It can also be difficult for students with TBI to self-advocate and seek appropriate services; therefore, rehabilitation counselors need to work closely with neuro-rehabilitation providers and disability service providers as a team to develop treatment plans and provide evidence-based disability and rehabilitation services that will improve college life adjustment, goal persistence, and career self-efficacy and outcome expectancy of students with TBI.

4.2. Limitations

This study has several limitations. First, we used observational data to create treatment and control groups instead of using a randomized controlled trial design, and we cannot make conclusive statements about causality. Additionally, this study was limited by only demographic and vocational rehabilitation service variables available in the RSA-911 database. It is possible that a comprehensive set of demographic variables could provide more accurate propensity scores for matching youth with TBI who received college or university training with those who did not receive such services as a VR intervention. These factors limit the generalizability of findings of the current study. To increase the sample size, we used a loosely described definition of college or university training as youth with TBI who completed some college, associate's degree, or bachelor's degree and higher. It may be better to combine multiple years of RSA-911 data and retrieve participants who have a college degree or higher at closure.

5. Conclusion

It is well documented in the labor and economics literature that people with a college degree do better than people with a high school diploma (no college) or less. Findings of the present study support the positive effect of college and university training on employment outcomes in a sample of young adults with TBI. State vocational rehabilitation counselors should consider postsecondary education as a viable option for young adults with disabilities regardless of their race/ethnicity, gender, and socioeconomic status.

Conflict of interest

The authors declare that they have no conflict of interest.

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