

# Effects of postsecondary education on employment outcomes of youth with specific learning disabilities: A propensity score matching approach

Jian Li<sup>a,\*</sup>, Phillip D. Rumrill, Jr.<sup>b</sup>, Kanako Iwanaga<sup>c</sup>, Han Zhang<sup>d</sup>, Fong Chan<sup>e</sup>  
and David G. Strauser<sup>f</sup>

<sup>a</sup>*Kent State University, Kent, OH, USA*

<sup>b</sup>*University of Kentucky, Lexington, KY, USA*

<sup>c</sup>*Virginia Commonwealth University, Richmond, VI, USA*

<sup>d</sup>*University of Wisconsin – Parkside, Kenosha, WI, USA*

<sup>e</sup>*University of Wisconsin-Madison, Madison, WI, USA*

<sup>f</sup>*University of Illinois – Urbana-Champaign, Champaign, IL, USA*

Received 1 October 2021

Revised 28 May 2022

Accepted 17 November 2022

Pre-press 1 February 2023

Published 17 March 2023

## Abstract.

**BACKGROUND:** Helping young adults with specific learning disabilities (SLD) attend college increases their chances of joining the workforce, which helps protect them from the negative effects of unemployment.

**OBJECTIVE:** This study examined whether receiving vocational rehabilitation (VR) services of four-year college or university training would lead to improved employment outcomes for young adults with SLD.

**METHODS:** Using the Rehabilitation Services Administration (RSA)-911 database, a propensity score matching technique was employed to create a comparison group of young adults with SLD who did not receive college or university training for a treatment group of those who did. The quasi-experimental design investigated differences in the employment outcomes between the two groups.

**RESULTS:** Findings revealed that the group who received college or university training was more likely to obtain competitive employment upon exit from the VR program than the matched comparison group who did not receive the training; youth with SLD who received college or university training and had secured competitive employment at the time of exit also had significantly higher hourly wages and weekly working hours than their counterparts in the comparison group.

**CONCLUSION:** College and university training is positively related to employment outcomes for young people with SLD. Implications for state VR counselors are also discussed.

Keywords: Specific learning disabilities, competitive employment, vocational rehabilitation, postsecondary education, propensity score matching

---

\*Address for correspondence: Jian Li, Kent State University, 316J White Hall, P.O. Box 5190, Kent, OH, USA. E-mail: jli42@kent.edu.

## 1. Introduction

Specific learning disability (SLD) was first recognized and defined by the U.S. federal government in 1968 (Kirk, 1968), and it remains the largest category of individuals receiving federally legislated support through special education over the past fifty years (National Center for Education Statistics, 2013, 2019). According to the established definition provided by the Individuals with Disabilities Education Act (IDEA) in the mid-1970s, SLD is “a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, that may manifest itself in the imperfect ability to listen, think, speak, read, write, spell, or to do mathematical calculations, including conditions such as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia [U.S. Department of Education, 2004, Sec. 300.8 (c) (10)].” One noteworthy feature of SLD is that it includes a heterogeneous set of learning difficulties (Grigorenko et al., 2020). SLD also frequently co-occurs with other mental health and behavioral disorders (Cederlöf et al., 2017).

According to the National Center for Learning Disabilities (NCLD, 2014), students with SLD have the highest dropout rates among all students with disabilities. Approximately 68% of individuals with SLD receive a high school diploma, yet only 54% have a goal of attending two- or four-year college. One in two students with SLD experiences a disciplinary removal, such as suspension or expulsion. One in two young adults with SLD report having some type of involvement with the criminal justice system within eight years of leaving high school; one in three have been arrested.

When seeking independence and autonomy, young adults with SLD often find themselves in vulnerable positions in the workforce (Rubin et al., 2016). In one study, only approximately 46% of youth with SLD held regular paid employment within two years of leaving high school (Cameto et al., 2003). Working-age adults with SLD are twice as likely to be unemployed compared to those without disabilities (Cortiella & Horowitz, 2014; National Center for Learning Disabilities, 2017). Those with SLD who are employed frequently hold jobs whose requirements fall below their skills and qualifications, also known as underemployment (Wehman, 2013). The National Center for Learning Disabilities (2017) indicated that 92 percent of individuals with SLD had annual incomes of under \$50,000 within eight years

of leaving high school, and most earned \$25,000 or less.

Existing research suggests that youth with SLD mainly experience challenges at work in five areas: inefficiency due to the slow pace of work, lack of accuracy associated with a high error rate on reading tasks and/or written correspondence, difficulty in the sequencing of tasks because of problems following instructions or completing projects with multiple steps, time management and difficulty with planning, and ineffective social skills. Moreover, many people with SLD struggle with soft skills; self-determination (Pryce et al., 2003); and difficulties in comprehension, sensory processing, communication, and social functioning. There is no doubt that young adults with SLD need interventions and support services to prepare them to find and retain employment (Strauser, 2021).

To achieve this goal, college or university training may function as an effective intervention for people with SLD because it has a significant impact on employment and lifetime earnings (Julian & Kominiski, 2011; U.S. Department of Labor [USDOL], 2014a). In the general population, the unemployment rates for people with some college, associate's degree, or bachelor's degree and higher are significantly lower than rates of unemployment among high school graduates (no college) and people with less than a high school diploma (Federal Reserve Bank of St. Louis, 2019). Education is also an important social determinant of physical and mental health (Cutler & Lleras-Muney, 2014; Hahn & Truman, 2015; Winkleby et al., 1992; Zimmerman & Woolf, 2014). Indeed, previous studies have reported that educational attainment is more strongly associated with employment for people with disabilities than for people without disabilities, which suggests that post-secondary educational training can be used as a means to increase employment opportunities, income, and self-sufficiency in community living for people with disabilities (Jones et al., 2006; Kidd et al., 2000; McDonough & Revell, 2010).

State and federal agencies have been promoting competitive integrated employment for people with disabilities for many years. The state-federal vocational rehabilitation (VR) program is the nation's largest provider of employment supports to Americans with disabilities (Ditchman et al., 2013; Dutta et al., 2008). Available to people with SLD and other disabling conditions in all 50 states and United States territories (Rubin et al., 2016), this program provides a wide range of services designed to lead to successful

employment, including assessment, counseling and guidance, training, job search assistance, job placement, on-the-job support, and assistive technology (Ditchman et al., 2013). Any individual with a disability who can benefit from these services and who requires assistance to prepare for, enter, engage in, or retain gainful employment is eligible to participate in the VR program (Ditchman et al., 2013). The Workforce Innovation and Opportunity Act (WIOA) of 2014 requires VR services to be provided to students with disabilities who may be eligible for VR services, including individuals with SLD, starting by the age of 16 (U.S. Department of Labor, 2014b). Among the many VR services that are available to Americans with disabilities free of charge, one is to provide four-year college or university training.

Although the positive effects of college or 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 SLD. Accordingly, the purpose of this study was to examine the effect of college or university training on employment outcomes in a sample of young adults with SLD who were served by state VR agencies. The U.S. Department of Education Rehabilitation Services Administration-911 (RSA-911) database was used in this study because it 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).

This study adopted the propensity score matching (PSM) procedure to identify matched samples of state VR consumers who received college or university training (the treatment group) and did not receive such training (the comparison group; Dahabreh et al., 2012; Rosenbaum & Rubin, 1983). In the last two decades, propensity score matching has gained popularity in the examination of causal relationships as it has the capability to adjust for selection bias resulting from non-random assignment when observational data are used. This study was guided by two research questions:

1. Is college or university training an effective intervention for increasing the rate of competitive integrated employment among young adults with SLD 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 SLD who achieved competitive integrated employment at the time of VR case closure?

## 2. Method

### 2.1. Data source

Data collected through the U.S. Department of Education, Rehabilitation Services Administration Case Service Report (RSA-911) database in Program Year 2018 for the state VR services programs were used in this study. The data elements of RSA-911 include participants' demographic information at application, eligibility, order of selection, disability, trial work experience, individual plan for employment, pre-employment transition services, VR services, training services, career services, other services, measurable skill gain, employment, exit, and post-exit outcomes (U.S. Department of Education, Office of Special Education and Rehabilitative Services, Rehabilitation Services Administration, 2017). Rehabilitation Services Administration uses these data to assess, support, and evaluate the effectiveness of state VR agencies' performance.

### 2.2. Participants

Several filter criteria were applied to select the study sample. These filter criteria resulted in participants who: (a) were eligible VR applicants with an assigned individualized plan for employment (IPE), (b) were aged between 18 and 35 years old, (c) had a primary diagnosis of specific learning disability, (d) had a high school diploma or less education at intake, (e) had an hourly wage at exit of \$300 or less as the evaluation of data quality in this study indicated that values greater than \$300 on the hourly wage variable would be either extreme outliers or a case of mis-coding, and (f) had provided complete data on all the variables used in this study. The selection procedure resulted in a sample of 28,270 young adults with SLD out of the 833,150 records in the Program Year 2018 data file, 392 of whom had received four-year college or university training.

Demographic information regarding the study sample is presented in Table 1. About 60% of the sample were male ( $n = 16,885$ ) whereas some 40% ( $n = 11,385$ ) were female. In descending order, the three largest race/ethnicity groups in the sample were Caucasians ( $n = 13,059$ ; 46.2%), Hispanics ( $n = 7,329$ ;

Table 1  
Demographic statistics of study sample ( $N = 28,270$ )

Variable	Category	<i>N</i>	%	Mean ( <i>SD</i> )
Gender	Female	11,385	40.3	
	Male	16,885	59.7	
Race	Caucasian	13,059	46.2	
	Hispanic	7,329	25.9	
	African American	6,585	23.3	
	Asian American	402	1.4	
	American Indian	263	0.9	
	Hawaiian	74	0.3	
	Multi-racial	558	2.0	
Medicaid	No medicaid	17,888	63.3	
	Medicaid	10,382	36.7	
Low income	No	14,784	52.3	
	Yes	13,486	47.7	
Long-term unemployment	No	20,038	70.9	
	Yes	8,232	29.1	
Age	—	28,270	—	20.03 (3.66)

25.9%), and African Americans ( $n = 6,585$ ; 23.3%). Multi-racial groups ( $n = 558$ ; 2%), Asian Americans ( $n = 402$ ; 1.4%), American Indians ( $n = 263$ ; 0.9%), and Native Hawaiians and Pacific Islanders ( $n = 74$ ; 0.3%) occupied smaller proportions of the study sample (4.6% total). Slightly less than two-thirds of the sample ( $n = 17,888$ ; 63.3%) were not receiving Medicaid at the time of enrollment in the VR program. Less than a third of the sample ( $n = 8,232$ ; 29.1%) reported being long-term unemployed, and almost half ( $n = 13,486$ ; 47.7%) were classified as having low income. The average age of the sample was 20 years old, with a standard deviation of 3.66 years.

### 2.3. Variables and measures

There were three dependent variables in this study, all having to do with participants' employment status at the time they exited the VR program: competitive employment, hourly wage, and weekly working hours. Competitive employment was a dichotomous variable indicating whether a participant exited the program in competitive integrated or supported employment or not (i.e., 0 = no; 1 = yes). Hourly wage and weekly working hours were both coded as continuous variables. The independent or grouping variable was a dichotomous variable representing whether participants received four-year college or university training or not (i.e., 0 = no; 1 = yes). Participants who received college or university training formed the treatment group, whereas those who did not receive college or university training formed the comparison group.

Five covariates were also used in this study. These included age at application, gender (i.e., 0 = female; 1 = male), race (i.e., 0 = Caucasian; 1 = non-Caucasian), Medicaid (i.e., 0 = without Medicaid, 1 = with Medicaid), and assessment at intake (i.e., 0 = not receiving assessments at intake; 1 = receiving assessments at intake). Age at application was a continuous variable and the others were dichotomous variables. Among the covariates, Medicaid served to represent participants' economic status and assessment at intake gauged participants' potential to pursue postsecondary education.

### 2.4. Data analysis

Because young adults with SLD who received four-year college or university training (recipients) and those who did not (non-recipients) may differ with regard to both their employment outcomes and other relevant characteristics, the findings from a simple, direct comparison between the two groups using the observational data that are available in the RSA-911 database could be misleading. To examine in a more controlled way the relationship between receipt of four-year college or university training and employment outcomes, we utilized propensity score matching (PSM) to create a group of non-recipients that is equivalent and comparable on the important demographic and background covariates to the group of recipients. PSM has been commonly used as an alternative method or a quasi-experimental technique to estimate causal effects in observational studies where potential selection biases need to be corrected by balancing or equating the groups based

on the matching covariates (Rajeev & Sadek, 2002; Rosenbaum & Rubin, 1983). In this study, the PSM technique identified a sub-set of non-recipients in the sample whose estimated propensities obtained from the matching covariates were statistically equivalent to the recipients’.

All the analyses were conducted using the statistical package STATA 12 (StataCorp, 2011). Before selecting the matching non-recipients (i.e., the comparison group), the balance of the two groups of young adults with SLD in the database was assessed. In other words, the two groups (recipients or the treatment group and non-recipients or the comparison group) were compared on the identified matching covariates of age at application, gender, race, Medicaid, and assessment at intake. Next, the PSMATCH2 module was used to conduct 1-to-1 nearest neighbor matching without a replacement conditioned on the common support (Leuven & Sianesi, 2003). A propensity score, the probability of being in the four-year college or university training group, was estimated for each individual in the sample through a probit regression model based on the matching covariates. The estimated propensity scores were used to match each recipient with one non-recipient. After the matching procedure, the PSTEST module was utilized to assess the quality of matching. The group means or expected frequencies of matching covariates between the recipient group (i.e., the treatment group) and the identified matching non-recipient group (i.e., the comparison group) were compared through *t*-tests or chi-square tests. If the matching non-recipient group was equivalent to the recipient group on the matching covariates, the *t*-tests and the chi-square tests showed non-significant results.

To examine the effects of receiving four-year college or university training on the employment outcomes of the two groups of young adults with SLD, a chi-square test was first performed to investigate if receiving the college or university training was associated with the chance of participating in competitive integrated employment at the time of exit from the VR program. Next, only those young adults with SLD in both the treatment and the comparison groups who obtained competitive integrated employment at the exit were retained in the analysis and independent sample *t*-tests were conducted to compare if there were significant group differences in their hourly wages and weekly working hours. For all the independent sample *t*-tests performed in this study, the assumption of equal variance was always tested first. Whenever a violated assumption was identified, the Welch’s *t*-test was used instead to address the bias caused by the unequal variances. The alpha significance level for the hypothesis tests was set at 0.05.

### 3. Results

#### 3.1. Preliminary analyses

Before the matching procedure, we examined the comparability between the four-year college or university training recipients and the non-recipients on the matching covariates. The results indicated that the two groups were significantly different in their composition (see Table 2). Relatively, there were significantly more female ( $\chi^2 = 9.76, df = 1, p < 0.05$ ) and Caucasian ( $\chi^2 = 49.44, df = 1, p < 0.001$ ) participants in the recipient group than in the non-recipient group; the recipient group had a significantly higher

Table 2  
Comparability between training recipients and non-recipients on matching covariates before the matching procedure ( $N = 28,270$ )

Variable	Category	Recipients ( $n = 392$ )	Non-recipients ( $n = 27,878$ )	$\chi^2$ (df)	<i>p</i>
Gender	Female	188 (47.96%)	11,197 (40.16%)	9.76 (1)	0.002**
	Male	204 (52.04%)	16,681 (59.84%)		
Race	Caucasian	250 (63.78%)	12,809 (45.95%)	49.44 (1)	0.000***
	Non-Caucasian	142 (36.22%)	15,069 (54.05%)		
Medicaid	No medicaid	309 (78.83%)	17,579 (63.06%)	41.37 (1)	0.000***
	With medicaid	83 (21.17%)	10,299 (36.94%)		
Vocational assessment	No	254 (64.8%)	23,848 (85.54%)	132.39 (1)	0.000***
	Yes	138 (35.2%)	4,030 (14.46%)		
		<i>Mean (SD)</i>		<i>t</i> (df)	<i>p</i>
Age		19.18 (2.71)	20.04 (3.67)	-6.25 (411.47) <sup>a</sup>	0.000**

Note. \*\* $p < 0.01$ . \*\*\* $p < 0.001$ . <sup>a</sup>Welch’s *t*-test.

Table 3  
Comparability between training recipients and non-recipients on matching covariates after the matching procedure ( $N=784$ )

Variable	Category	Recipients ( $n=392$ )	Non-recipients ( $n=392$ )	$\chi^2$ ( $df$ )	$p$
Gender	Female	188 (47.96%)	188 (47.96%)	0.00 (1)	1.00
	Male	204 (52.04%)	204 (52.04%)		
Race	Caucasian	250 (63.78%)	250 (63.78%)	0.00 (1)	1.00
	Non-Caucasian	142 (36.22%)	142 (36.22%)		
Medicaid	No medicaid	309 (78.83%)	309 (78.83%)	0.00(1)	1.00
	With medicaid	83 (21.17%)	83 (21.17%)		
Vocational assessment	No	254 (64.8%)	254 (64.8%)	0.00 (1)	1.00
	Yes	138 (35.2%)	138 (35.2%)		
<i>Mean (SD)</i>				<i>t</i> ( $df$ )	<i>p</i>
Age		19.18 (2.71)	19.18 (2.71)	0.00 (782)	1.00

Table 4

Comparison between training recipients and non-recipients on competitive employment at exit after the matching procedure ( $N=784$ )

Variable	Category	Recipients ( $n=392$ )	Non-recipients ( $n=392$ )	$\chi^2$ ( $df$ )	$p$	Cramer's $V$
Competitive employment at exit	No	83 (21.17%)	139 (35.46%)	19.71 (1)	0.000***	0.16
	Yes	309 (78.83%)	253 (64.54%)			

Note. \*\*\* $p < 0.001$ .

percentage of participants who did not have Medicaid insurance ( $\chi^2 = 41.37$ ,  $df = 1$ ,  $p < 0.001$ ) and completed assessments at the intake ( $\chi^2 = 132.39$ ,  $df = 1$ ,  $p < 0.001$ ). In addition, the independent sample Welch's  $t$ -test showed that the training recipients were significantly younger than their non-recipient peers at the time of application ( $t = -6.25$ ,  $df = 411.47$ ,  $p < 0.001$ ). These test results called for a matching procedure that would make the two groups more equivalent. Leaving the pre-existing group differences unaddressed would lead to biased and misleading results.

### 3.2. Propensity score matching procedure

Based on the five matching covariates, a 1-to-1 PSM procedure was performed and a subset of 392 young adults with SLD from the original non-recipient group was matched with the 392 recipients of college or university training. The matching quality was assessed to ensure that the balance on covariates had truly been achieved through the matching procedure. Specifically, chi-square tests and a  $t$ -test were conducted to examine if the recipient (treatment) group and the matched non-recipient (comparison) group exhibited differences in their status on the covariates. As is displayed in Table 3, all matching covariates that were significantly different between the two groups prior to matching were no longer significantly different between the group of 392

four-year college or university training recipients and the matching comparison group of 392 non-recipients.

### 3.3. Matched group comparisons

To answer the research questions, a chi-square test of independence based on the matched data was first performed to investigate the relationship between the outcome variable of competitive integrated employment at exit and group membership. The chi-square test result indicated that obtaining competitive integrated employment at exit was positively associated with receipt of four-year college or university training ( $\chi^2 = 19.71$ ,  $df = 1$ ,  $p < .001$ , see Table 4). Young adults with SLD who received four-year college or university training were more likely to secure competitive integrated employment (78.8%) than their peers in the comparison group who did not receive college or university training (64.5%). The effect size of the association (Cramer's  $V = 0.16$ ) was small by Cohen's definition (1988; i.e., 0.1 = small, 0.3 = moderate, and 0.5 = large).

Next, only participants who obtained competitive integrated employment were retained in the analysis to answer the second research question. Independent sample  $t$ -tests were conducted to compare group means on the two continuous outcomes, namely, hourly wages and weekly working hours. Table 5 displays the test results, and the group means on the

Table 5  
Comparison between training recipients and non-recipients in hourly wage and weekly working hours after the matching procedure  
( $N=562$ )

Variable	Recipients ( $n=309$ )		Non-recipients ( $n=253$ )		$t(df)$	$p$	Cohen's $d$
	Mean	SD	Mean	SD			
Hourly wage	14.83	6.10	11.20	3.91	8.55 ( $531.01$ ) <sup>a</sup>	0.000***	0.69
Weekly working hours	34.43	8.85	30.49	9.52	5.07 ( $560$ )	0.000***	0.43

Note. \*\* $p < 0.001$ . <sup>a</sup>Welch's  $t$ -test.

two continuous outcome variables. The two groups (treatment and comparison) differed significantly in their hourly wages (\$14.83 vs. \$11.20; Welch's  $t=8.55$ ,  $df=531.01$ ,  $p < .001$ ) and weekly working hours (34.43 vs. 30.49;  $t=5.07$ ,  $df=560$ ,  $p < 0.001$ ). On average, hourly wages of those competitively employed participants who received college or university training were \$3.63 higher than that of their peers in the comparison group. Young adults with SLD who received college or university training also worked approximately 4 hours ( $M_{diff}=3.94$ ) more per week than their peers in the comparison group. Effect sizes as measured by Cohen's  $d$  were calculated for the two tests. According to Cohen's (1988) conventions (i.e., 0.2 = small, 0.5 = medium, and 0.8 = large), the effect size of the difference in hourly wage was medium ( $d=0.69$ ) and the effect size of the difference in weekly working hours approached medium ( $d=0.43$ ).

#### 4. Discussion

The aim of this study was to examine the effects of college or university training on employment outcomes of young adults with SLD 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 did the matched comparison group who did not receive college or university training. The results of this PSM approach, which effectively isolated the impact of college or university training on the treatment group's employment situation at VR case closure, corroborates previous research that has highlighted the important career preparatory role that college or university training plays in VR participants' lives. For instance, in one study, VR consumers with traumatic brain injuries 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 VR consumers 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). It is not surprising that Hendricks et al. (2015) asserted that support for postsecondary education is the single most cost-effective intervention for people with learning and other neurological disabilities in the state-federal VR program.

##### 4.1. Clinical implications

The benefits of competitive integrated employment for people with and without disabilities are so many and varied that they almost go without saying. Work is a large part of people's personal identity; it confers social legitimacy upon 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 SLD, because they have historically been marginalized in their pursuit of educational and employment success, underserved by state VR agencies, underemployed, and subjected to high levels of discrimination in the workplace (Rubin et al., 2016). College or 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 or university training in improving the employment outcomes and earning capacities of young adults with SLD who received services from state VR agencies.

Tucker and Degeneffe (2017) underscored the need for college or university training for young people with disabilities to be accompanied by personal adjustment counseling because these youth may encounter many disability-related and psychosocial challenges as they transition first to higher education and subsequently 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 customers with SLD and other disabilities, rehabilitation counselors can help them identify and utilize community resources, including healthcare and mental health providers, that can support their postsecondary educational pursuits (Dillahunt-Aspillaga et al., 2014). Rehabilitation counselors can provide tuition support for young adults with SLD to attend college and pre-employment transition services to help students develop character strengths and emotional efficacy to cope with the demands and challenges of college life and prepare for the world of work after graduation. These VR services can augment services (e.g., study skills training, time management training, and accommodation services) provided by disability service offices on campus to maximize the probability that students with SLD will persist with their career goals, graduate from college, and find gainful employment.

VR counselors may also provide support for customers with SLD prior to enrolling in college or university training. The WIOA mandates Pre-Employment Transition Services (Pre-ETS) for eligible individuals, including those with SLD diagnoses. The five categories of Pre-ETS services are: 1) job exploration counseling, 2) work-based learning experiences, 3) counseling on post-secondary education and training, 4) workplace readiness training, and 5) instruction in self-advocacy (U.S. Department of Labor, 2014b). These services are universally relevant but may be particularly important for students with SLD who plan to transition into college or university environments, which likely differ greatly from their prior school environments. Specific attention should be focused on counseling for post-secondary education and training, as well as instruction in self-advocacy, both of which will help prepare students for the rigors of college life. It is important to note here that VR counselors can provide Pre-ETS services to customers who are as young as 14 years of age; it is never too early to encourage a young person to start thinking about college.

Delivering early interventions affords VR counselors and customers with SLD an opportunity to construct comprehensive support plans that may establish a strong foundation for future success in postsecondary education. This is especially important because since research suggests that students with disabilities often struggle advocating for accommodations and other postsecondary supports that could

help them succeed in college (De los Santos et al., 2019; Taylor et al., 2019).

Once VR customers with SLD are employed in competitive, integrated jobs in their chosen fields, attention from the VR counselor turns to helping them maintain employment even after VR services are discontinued. Here we advocate that rehabilitation professionals consider workplace accommodations, assistive technology, work adjustment services, on the job supports, mentors in workers' chosen fields, and self-advocacy training so that VR consumers can communicate effectively with their employers to address their support needs following case closure (Rumrill & Koch, 2021). VR counselors must also remind customers with SLD that their cases can be re-opened in the future should they require additional VR services in their efforts to maintain and advance in their careers (Strauser, 2021).

#### 4.2. Limitations

The current study had several limitations that should be kept in mind when interpreting results. First, the potential selection bias caused by the observational nature of the RSA-911 data could still exist and have effects on study results even though the rigorous PSM technique was used to isolate the effects of college or university training on participants' employment outcomes. The PSM procedure may not be able to eliminate all possible selection bias even though it mimics the randomization found in experimental design (Rosenbaum & Rubin, 1983). Though our two groups were determined to be equivalent on important covariates through the PSM procedure, the fact remains that there was no true random assignment of participants into the two groups. Therefore, caution is warranted when using the findings in this study to draw causal inferences. Also, the PSM procedure assumes that unobserved characteristics of the sample do not affect group membership. However, other unobserved variables may exist and their presence was not taken into account in this study. More covariates could be collected and explored in future studies to help increase the accuracy of matching.

#### 5. Conclusion

Regardless of disability status, people who attend and complete college have better employment outcomes than people who do not. Findings of the present study support the positive effects of college or



university training on employment outcomes in a sample of young adults with SLD, suggesting that postsecondary education may serve as an important equalizer to narrow the employment gap that currently exists between people with SLD and non-disabled people. State vocational rehabilitation counselors should consider postsecondary education as an important service that leads to success in competitive integrated employment settings for the capable but often disenfranchised population of young people with SLD.

### Acknowledgments

The authors have no acknowledgments.

### Conflict of interest

The authors have no conflicts of interest to report.

### Ethics statement

The Institutional Review Board at Kent State University approved the study (IRB#20-499).

### Informed consent

Not applicable.

### Funding

The contents of this paper were developed under a grant from the National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR grant number #90RTEM0003). NIDILRR is a Center within the Administration for Community Living (ACL), Department of Health and Human Services (HHS). The contents of this paper do not necessarily represent the policies of NIDILRR, ACL, or HHS, and you should not assume endorsement by the Federal Government.

### References

- Cameto, R., Marder, C., Wagner, M., & Cardoso, D. (2003). *NLTS2 data brief: Youth employment*. SRI International and National Center on Secondary Education and Transition. <http://www.ncset.org/publications/viewdesc.asp?id=1310>
- Catalano, D., Pereira, A. P., Wu, M. Y., Ho, H., & Chan, F. (2006). Service patterns related to successful employment outcomes of persons with traumatic brain injury in vocational rehabilitation. *NeuroRehabilitation, 21*(4), 279-293.
- Cederlöf, M., Maughan, B., Larsson, H., D'Onofrio, B. M., & Plomin, R. (2017). Reading problems and major mental disorders co-occurrences and familial overlaps in a Swedish nationwide cohort. *Journal of Psychiatric Research, 91*, 124-129.
- Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences*. Lawrence Erlbaum.
- Cortiella, C., & Horowitz, S. H. (2014). *The state of learning disabilities: Facts, trends and emerging issues*. National Center for Learning Disabilities. <https://www.nclld.org/wp-content/uploads/2014/11/2014-State-of-LD.pdf>
- Cutler, D., & Lleras-Muney, A. (2014). Education and health. In A. J. Culyer (Eds.), *Encyclopaedia of Health Economics* (pp. 232-245). Elsevier.
- Dahabreh, I. J., Sheldrick, R. C., Paulus, J. K., Chung, M., Varvarigou, V., Jafri, H., Rassen, J. A., Trikalinos, T. A., & Kitsios, G. D. (2012). Do observational studies using propensity score methods agree with randomized trials? A systematic comparison of studies on acute coronary syndromes. *European Heart Journal, 33*(15), 1893-1901. <https://doi.org/10.1093/eurheartj/ehs114>
- De los Santos, S. B., Kupczynski, L., & Mundy, M. A. (2019). Determining Academic Success in Students with Disabilities in Higher Education. *International Journal of Higher Education, 8*(2), 16-38. <https://doi.org/10.5430/ijhe.v8n2p16>
- Dillahunt-Aspillaga, C., Agonis-Frain, J., Hanson, A., et al. (2014). Applying a resiliency model to community reintegration and needs in families with traumatic brain injury: Implications for rehabilitation counsellors. *Journal of Applied Rehabilitation Counselling, 45*, 25-36. <https://doi.org/10.1891/0047-2220.45.1.25>
- Ditchman, N., Wu, M., Chan, F., Fitzgerald, S., Lin, C. P., & Tu, W. (2013). Vocational rehabilitation. In D. Strauser (Ed.), *Career development, employment, and disability in rehabilitation: From theory to practice* (pp. 343-360). Springer Publishing Company.
- Dutta, A., Gervy, R., Chan, F., Chou, C.-C., & Ditchman, N. (2008). Vocational rehabilitation services and employment outcomes for people with disabilities: A United States study. *Journal of Occupational Rehabilitation, 18*(4), 326-334. <https://doi.org/10.1007/s10926-008-9154-z>
- Federal Reserve Bank of St. Louis. (2019). *Unemployment rate by educational attainment and age, monthly, not seasonally adjusted: 25 years and over*. <https://fred.stlouisfed.org/release/tables?eid=48713&rid=50>
- Freyers, T. (2006). Work, identity and health. *Clinical Practice and Epidemiology in Mental Health, 2*, 1-7. <https://doi.org/10.1186/1745-0179-2-12>
- Gamble, D., & Moore, C. L. (2003). The relation between VR services and employment outcomes of individuals with traumatic brain injury. *Journal of Rehabilitation, 69*, 31-38.
- Grigorenko, E. L., Compton, D. L., Fuchs, L. S., Wagner, R. K., Willcutt, E. G., & Fletcher, J. M. (2020). Understanding, educating, and supporting children with specific learning disabilities: 50 years of science and practice. *American Psychologist, 75*(1), 37-51. <https://doi.org/10.1037/amp0000452>
- Hahn, R. A., & Truman, B. I. (2015). Education improves public health and promotes health equity. *International Journal*

- of *Health Services*, 45, 657-678. <https://doi.org/10.1177/0020731415585986>
- Hendricks, D. J., Sampson, E., Rumrill, P. et al. (2015). Activities and interim outcomes of a multi-site development project to promote cognitive support technology use and employment success among postsecondary students with traumatic brain injuries. *NeuroRehabilitation*, 37, 449-458.
- Jones, M. K., Latreille, P. L., & Sloane, P. J. (2006). Disability, gender and the British labour market. *Oxford Economic Papers*, 58, 407-449. <http://www.jstor.org/stable/3876978>
- Julian, T., & Kominski, R. (2011). Education and synthetic work-life earnings estimates. *American Community Survey Reports*, ACS-14. U.S. Census Bureau, Washington, DC.
- Kidd, M. P., Sloane, P. J., & Ferko, I. (2000). Disability and the labour market: An analysis of British males. *Journal of Health Economics*, 19, 961-981. [https://doi.org/10.1016/S0167-6296\(00\)00043-6](https://doi.org/10.1016/S0167-6296(00)00043-6)
- Leuven, E., & Sianesi, B. (2003). *PSMATCH2: Stata module to perform full Mahalanobis and propensity score matching, common support graphing, and covariate imbalance testing*. Statistical Software Components S432001, Boston College Department of Economics. <http://ideas.repec.org/c/boc/bocode/s432001.html>
- McDonough, J. T., & Revell, G. (2010). Accessing employment supports in the adult system for transitioning youth with autism spectrum disorders. *Journal of Vocational Rehabilitation*, 32(2), 89-100. <https://doi.org/10.3233/JVR-2010-0498>
- National Center for Education Statistics. (2013). *Children 3 to 21 years old served under Individuals with Disabilities Education Act (IDEA), Part B, by type of disability: Selected years, 1976-77 through 2011-12*. [http://nces.ed.gov/programs/digest/d13/tables/dt13\\_204.30.asp](http://nces.ed.gov/programs/digest/d13/tables/dt13_204.30.asp)
- National Center for Education Statistics. (2019). *Children and youth with disabilities*. [https://nces.ed.gov/programs/coe/pdf/Indicator\\_CGG/coe\\_cgg\\_2019\\_05.pdf](https://nces.ed.gov/programs/coe/pdf/Indicator_CGG/coe_cgg_2019_05.pdf)
- National Center for Learning Disabilities (2017). *Diplomas at risk: A critical look at the high school graduation rate*. <https://www.nclld.org/research/diplomas-at-risk-2/>
- National Center for Learning Disabilities. (2014). *The state of learning disabilities*. <https://www.nclld.org/wp-content/uploads/2014/11/2014-State-of-LD.pdf>
- Pryce, L., Gerber, P. J., & Mulligan, R. (2003). The Americans with Disabilities Act and adults with learning disabilities as employees: The realities of the workplace. *Remedial and Special Education*, 24 (6), 350-358. <https://doi.org/10.1177/07419325030240060601>
- Rajeev, H. D., & Sadek, W. (2002). Propensity score-matching methods for nonexperimental causal studies. *Review of Economics and Statistics*, 84, 151-161. <https://doi.org/10.1162/003465302317331982>
- Rosenbaum, P. R., & Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, 70(1), 41-55. <https://doi.org/10.1093/biomet/70.1.41>
- Rubin, S., Roessler, R., & Rumrill, P. (2016). *Foundations of the vocational rehabilitation process (7<sup>th</sup> ed.)*. Pro-Ed.
- Rumrill, P., & Koch, L. (2021). Employment, career development, and vocational rehabilitation considerations for people with emerging disabilities. In D. Strauser (Ed.), *Career development, employment, and disability in rehabilitation, 2<sup>nd</sup> edition* (pp. 381-399). Springer Publishing Company.
- StataCorp. (2011). *Stata Statistical Software: Release 12*. Stata-Corp LP.
- Strauser, D. R. (2021). *Career development, employment, and disability in rehabilitation, 2<sup>nd</sup>*. Springer Publishing Company.
- Taylor, J. P., Whittenburg, H., Thoma, C. A., Gokita, T., & Pickover, G. S. (2019). Collaboration to improve employment outcomes for youth with disabilities: Implications of the PRETS components of WIOA on IDEA transition requirements. *DADD Online Journal*, 6(1), 38-47. [https://www.researchgate.net/profile/Juliet\\_Hart\\_Barnett/publication/339389996\\_doj\\_6\\_2019\\_final/links/5e4ee1c2a6fdccd965b439e9/doj-6-2019-final.pdf#page=42](https://www.researchgate.net/profile/Juliet_Hart_Barnett/publication/339389996_doj_6_2019_final/links/5e4ee1c2a6fdccd965b439e9/doj-6-2019-final.pdf#page=42)
- Tucker, M. S., & Degeneffe, C. E. (2017). Predictors of employment following postsecondary education for vocational rehabilitation participants with traumatic brain injury. *Rehabilitation Counseling Bulletin*, 60, 215-226. <https://doi.org/10.1177/0034355216660279>
- U. S. Department of Labor (2014b). *The Workforce Innovation and Opportunity Act. Factsheet: Detailed Overview of All Final Rules*. <https://www.doleta.gov/WIOA/Docs/Final-Rules-A-Detailed-Look-Fact-Sheet.pdf>
- U. S. Department of Education, Office of Special education and Rehabilitative Services Rehabilitation Services Administration. (2017). *Reporting manual for the case service report (RSA-911)*. <https://rsa.ed.gov/sites/default/files/subregulatory/pd-16-04.pdf>
- U. S. Department of Education. (2004). *Individuals with Disabilities Education Improvement Act. Sec. 300.8 (c) (10), Amendments of 2004 (PL 108-446)*. <https://ies.ed.gov/ncser/pdf/pl108-446.pdf>
- U. S. Department of Labor. (2014a). *Earnings and unemployment rates by educational attainment*. [http://data.bls.gov/cgi-bin/print.pl/emp/ep\\_chart\\_001.htm](http://data.bls.gov/cgi-bin/print.pl/emp/ep_chart_001.htm)
- Kirk, S. A. (1968). Special education for handicapped children, first annual report of the National Advisory Committee on Handicapped Children. *U.S. Department of Health, Education, & Welfare, U.S. Office of Education*.
- Wehman, P. (2013). *Life beyond the classroom*. Paul Brookes.
- Winkleby, M. A., Jatulis, D. E., & Frank, E. (1992). Socioeconomic status and health: How education, income, and occupation contribute to risk factors for cardiovascular disease. *American Journal of Public Health*, 82, 816-820. <https://doi.org/10.2105/ajph.82.6.816>
- Zimmerman, E., & Woolf, S. H. (2014). *Understanding the relationship between education and health*. National Academy of Medicine.