

Vocational Rehabilitation of Transition-Age Youth with Disabilities: A Propensity-Score Matched Study

by Filma Langi 10

Submission date: 07-Jun-2023 07:55AM (UTC+0700)

Submission ID: 2110651411

File name: ge_Youth_with_Disabilities__A_Propensity-Score_Matched_Study.pdf (666.61K)

Word count: 7184

Character count: 39403

Vocational Rehabilitation of Transition-Age Youth with Disabilities: A Propensity-Score Matched Study

**F. L. Fredrik G. Langi, Ashmeet Oberoi,
Fabricio E. Balcazar & Jessica Awsumb**

30

**Journal of Occupational
Rehabilitation**

ISSN 1053-0487

Volume 27

Number 1

J Occup Rehabil (2017) 27:15-23
DOI 10.1007/s10926-016-9627-4

Journal of Occupational Rehabilitation

 Springer

Volume 27, Number 1
March 2017
10926 · ISSN 1053-0487
27(1) 1-158 (2017)

 Springer

Your article is protected by copyright and all rights are held exclusively by Springer Science +Business Media New York. This e-offprint is for personal use only and shall not be self-archived in electronic repositories. If you wish to self-archive your article, please use the accepted manuscript version for posting on your own website. You may further deposit the accepted manuscript version in any repository, provided it is only made publicly available 12 months after official publication or later and provided acknowledgement is given to the original source of publication and a link is inserted to the published article on Springer's website. The link must be accompanied by the following text: "The final publication is available at link.springer.com".



Vocational Rehabilitation of Transition-Age Youth with Disabilities: A Propensity-Score Matched Study

F. L. Fredrik G. Langi^{1,2} · Ashmeet Oberoi³ · Fabricio E. Balcazar² · Jessica Awsumb²

41

Published online: 27 January 2016

© Springer Science+Business Media New York 2016

Abstract *Objective* To investigate the employment outcomes of vocational rehabilitation (VR) services for youth with disabilities in a targeted, enhanced, and contract-based secondary transition program as compared to the traditional VR transition services. *Methods* A population-based study was conducted on 4422 youth with physical, intellectual, learning, mental and hearing disabilities aged 14–21 at application and whose case was closed after receiving VR transition services in a Midwestern state. Selected youth were classified into either targeted secondary transition program (START) or non-START treatment group. The employment outcomes of the groups were compared using propensity-score matching procedures. *Results* 2211 youth with disabilities in each treatment group were successfully matched based on demographic characteristics, types of disabilities, existence of severe functional limitations, and year of referral. The overall rehabilitation rate was 57 % [95 % confidence interval (CI) 56–59 %], where the START group rate was 61 % (95 % CI 59–63 %) and the non-START group 53 % (95 % CI 51–55 %). The propensity-score matched odds ratio (OR) was 1.40 (95 % CI 1.24–1.58; $p < 0.001$). Subgroup analyses showed that the odds of rehabilitation in youth with disabilities were

consistently higher when they were in START as compared to non-START (OR ranged from 1.27 to 1.92 with $p < 0.05$ except for the Hispanic subgroup). *Conclusion* The results suggest that VR services in a targeted, enhanced, and contract-based secondary transition program are more effective in transitioning youth with disabilities to employment than the regular VR transition services.

Keywords Youth with disabilities · Vocational rehabilitation · Transition services · Propensity score analysis

Introduction

Occupational rehabilitation and health practitioners have long recognized the adverse effects of unemployment on health, such as depression and anxiety, alcohol abuse, and poor physical well-being [1–6]. The effects seem to vary by subgroups of individuals [7–9], where youth are particularly vulnerable [10–12]. Among youth, those with disabilities deserve attention because they are prone to decreased chances of employment. Data from the National Longitudinal Transition Survey-2 in 2005 indicated that the proportion of employed individuals age 17–21 with disabilities who were out of high school was 9 % less (57 vs. 66 %) than their peers without disabilities [13]. The difference is even more pronounced in the general population. More recently in August 2014, the monthly rate of youth employment in the United States (US) based on the current population survey was 17 and 30 % for individuals age 16–19 with and without disabilities, respectively, and 32 and 65 % for those age 20–24 [14, 15].

Transition in vocational rehabilitation (VR) refers to the process of preparing secondary education students with

54

✉ F. L. Fredrik G. Langi
flangi2@uic.edu; flfglangi@yahoo.com

¹ Division of Epidemiology and Biostatistics, School of Public Health, University of Illinois at Chicago, Chicago, IL, USA

² Department of Disability and Human Development, College of Applied Health Sciences, University of Illinois at Chicago, Chicago, IL, USA

³ Department of Educational and Psychological Studies, School of Education and Human Development, University of Miami, Coral Gables, FL, USA

disabilities for adult living and employment [16]. It originated in special education settings in the early 1980s, when there was a growing concern about employment prospects for youth with disabilities. The Rehabilitation Act of 1973 [17] and the Education for All Handicapped Children Act of 1975 [18] were in place, but did not provide enough stimulus for schools and VR agencies to adequately prepare youth to transition from school to work. A combination of unique physical and emotional changes during youth, the reality of zero-to-minimal work experience, and the level of education rendered transition-age youth with disabilities in crucial need of individualized plans for moving from school to work. Advocacy efforts for including transition planning in the educational plan for all secondary education students eventually led to the establishment of mandated transition services in the Individual with Disabilities Education Act of 1990 (IDEA) [19]. IDEA further required that transition planning begin at age 14. The rationale was that the student should articulate a plan at the earliest appropriate age and refine it during high school to reflect updated knowledge of the labor market as well as changes in personal interests. Youth with disabilities who completed work preparation programs have been shown to be more likely to secure employment, and when they do so, tend to earn higher salaries than those who do not finish such programs [13, 20].

Traditionally, VR transition services are provided by the state–federal VR agencies through collaboration with local educational entities [20]. Eligible youth with disabilities receive the services after they develop an individualized plan for employment (IPE) [21]. Several VR agencies also offer “special” transition programs to improve outreach to resources beyond the traditional service delivery [20, 22]. These programs often contain best-practice VR transition services targeted at a particular group of youth, and in principle, are different from traditional VR transition services in terms of the design of service delivery. In many cases cooperative arrangements exist with third-party providers. Examples of such programs include the VR Transition Curriculum, the Supported Education Program, the Shared Youth Vision Federal Collaborative Partnership, and the Secondary Transitional Experience Program. Detailed descriptions of these programs are available at the US Department of Education Rehabilitation Services Administration (RSA) [22]. Empirical evaluation of the effectiveness of specially delivered transition programs is sparse. Without adequate scientific evidence, the programs are susceptible to policy changes and/or discontinuation.

Assessment of delivery designs for VR secondary transition services is important. In a comprehensive investigation on how youth with disabilities transition to work, researchers concluded that existing studies failed to supply

appropriate evidence regarding the effectiveness of the secondary transition services [20]. The authors emphasized the lack of design rigor, selection bias, and mishandling of the data as the primary factors for failure. Other investigators dealt with the effectiveness issue by identifying the components of secondary transition services that fit into evidence-based practices (EBP) [23–28]. In their search for effective components of secondary transition services, however, researchers may overlook the possibility that the whole program works as a result of delivering the components in a correct combination and within an appropriate design. Perhaps a more holistic approach to address the question of effectiveness may be to investigate the secondary transition services at the program level.

One highly regarded source of EBP is the randomized controlled trial (RCT). Unfortunately, it is not always feasible or ethical to implement RCTs in the areas of health and social care such as VR services [29]. Several investigators managed to perform RCTs for specific types of disabilities or services [30–32]. The trials were conducted primarily on participants of adult VR programs. Thus, the results may not translate completely to youth receiving VR transition services. Despite differences in participant characteristics, development of VR services for transition-age youth is highly habituated to secondary education settings due to the legal and policy requirements [16, 20].

Several baseline characteristics have been suggested as potential confounders for the effect of secondary transition services on employment outcomes. These include age, gender, race, place of residence, and time period [20, 28, 33–36]. The employment outcomes were also demonstrated to be affected by type of disability and functional limitations [37–41]. In addition, youth with disabilities receiving public support such as supplemental security income (SSI) and/or social security disability income (SSDI), or those with Medicaid or Medicare have been reported to benefit differentially from VR transition services [20, 42–45].

We conducted the present study to address the gap in the literature with respect to effectiveness of VR secondary transition services in promoting employment outcomes among youth with disabilities. The objective was to establish whether there is benefit in a specially delivered secondary transition program over traditional VR transition services. There were two research questions for the study:

1. How effective are VR services in a targeted, enhanced, and contract-based secondary transition program as compared to conventional VR transition services for promoting youth with disabilities to employment?
2. Does the effect of VR secondary transition services at the subgroup level conform to that of all youth with disabilities?

To facilitate our study, we took advantage of the availability of a large, population-based dataset in a state VR system. The nature of the data presented a unique opportunity for implementing the propensity-score method, which has become increasingly popular in numerous scientific endeavors for its ability to mimic a randomized experimental design in situations where the available data are observational [46, 47]. The propensity-score method allows the balancing of covariates, which minimizes selection bias.

Methods

Study Participants, Treatment, and Outcome Measures

Participants in the present study were youth with disabilities aged 14–21 who were accepted for transition services and whose records had been closed after they received services from a VR agency in a Midwestern state. We divided the selected youth into two treatment groups based on the classification of their VR secondary transition services: the targeted secondary transition program (START) youth and the non-START youth.

Accepted participants of START received enhanced transition services in integrated school and community-based training/work sites during and after high school. The components of the program are best practices in VR transition services, including classroom instruction that facilitates career exploration and job-readiness development, job shadowing (learning about a job by spending time with a competent worker), training in independent living skills, on-the-job evaluation and training, fully employer-funded work experience, and job coaching. These services were provided by school personnel on a contractual basis with the state VR agency.

The contract regulated the provision of incentives for performance outcome, which refers to the achievement of competitive (the work has at least minimum wage and possibly certain benefits), integrated (the person with disabilities works in the same environment as coworkers without disabilities), and unsubsidized (the employer fully pays the wages) employment in the community for 240 h and a minimum of 60 working days while in high school. To be approved for participation in START, youth with disabilities must have been referred to the VR agency through its START counselor or transition specialist, who would then determine the eligibility based on the individualized education plan (IEP) and the existing medical and psychological record reviews and social history. The START contract required school personnel and counselor/transition specialists to work closely in the development of IEP and IPE.

In contrast to those in the START program, the non-START youth received transition services through the regular curriculum in their respective schools, or via a series of trainings or educational programs provided or coordinated by the VR agency. Provision of VR services took place either through a partnership with the local educational agencies, via the residential schools for youth with disabilities (there was one residential school for youth who were blind/visually impaired and one for youth who were deaf or hard of hearing in this study), or by collaboration with parents and caregivers. There was no official agreement or contract between the VR agency and the school or the community rehabilitation program in the VR non-START treatment group. Accordingly, performance outcome was not enforced. The VR agency provided transition services directly through its own VR counselors, who were assigned to high schools throughout the state. The non-START youth received general VR services that were endorsed in the RSA case service report (commonly known as RSA 911) [21], such as counseling and guidance, occupational training, and job placement, but not in an enhanced way nor in integrated training/working sites as was the case for the START youth.

Transition services were closed and considered as successful rehabilitation when the individual had a developed IPE, had exited high school, and had stable employment for at least 90 days. Note that the performance outcome in START was only contractual, meaning it was not a closure criterion unless the employment was maintained for at least 90 days post-high school. If for certain reasons the services had to be closed after an IPE had been developed and the individual did not meet the employment stability requirement, the case was regarded as unsuccessfully rehabilitated. In the present study, there were 14,165 youth with disabilities receiving transition services that were closed after an IPE was developed. Among them, only three individuals had missing data on at least one of the variables used for propensity-score matching, such that the study had 14,162 (nationally, 100 %) completed cases for the analyses. All procedures were reviewed and approved by the Institutional Review Board of the University of Illinois at Chicago.

Data and Matching Variables

Data consisted of the information originally collected by the VR agency during the staff's contact with youth with disabilities who received transition services, either in appointed meetings, work site visits, or classroom visits. Documentation was standardized throughout the agency offices, and all records were maintained in an integrated database by a state-level data management office. We were granted access to retrieve the de-identified records from

2004 through 2013. Rigorous algorithms for data extraction in addition to close communication with personnel from the data management office and the VR agency were implemented during the present analyses to ensure the accuracy of each variable.

Demographic background information used for propensity-score matching included age, gender, race, and residential information. Age at referral was the recorded age on the admission interview. Gender was a dichotomous (male and female) variable. White, African American and Hispanic indicators (yes or no) were used to inform the individual's race. These variables were not mutually exclusive as our data source allowed a person to report multiple races. County population size of the individual's residence was based on the estimate from the 2013 census and was classified into four major categories: 100,000 or less; 100,001–500,000; 500,001–1,000,000; and more than 1,000,000.

Five types of primary impairment in the matching scenarios were employed. All were 'have' versus 'not have' variables. Similar to race, individuals may have reported multiple disabilities. Classification followed that of the VR agency in the study, since our intention was to also provide the authorities practical and operational recommendations to deal with transitional cases. Deaf/hearing disability encompassed any condition where deafness or hearing loss was predominant, deaf blindness, and other hearing impairments. Intellectual disability referred to either a cognitive impairment related to mental retardation, or a psychosocial impairment such as autism. Learning disability was the term used for cognitive impairment that stemmed from specific learning disabilities or attention-deficit hyperactivity disorder. Mental illness covered a variety of psychosocial and other mental impairments due to any of the following: depressive and mood disorders, neurotic anxiety, personality disorders, schizophrenia and other psychotic conditions, or other unclassified mental illness. Finally, physical/orthopedic disability represented as mobility orthopedic/neurological impairments, manipulation/dexterity orthopedic/neurological disorders, both mobility and manipulation/dexterity impairments, and other orthopedic conditions.

The variables indicating any serious limitation to functional capacities in the form of communication, interpersonal skills, mobility, self-care, self-direction, and work tolerance, were based on the VR counselors' notes during their contact with the participants. Determination of the form and degree of functional limitation followed the RSA guidelines. For instance, limitation in mobility was assessed through the observation of an individual's physical ability to move from place to place (walking, climbing, and similar activities) and to adjust the body into certain positions (such as kneeling, stooping, sitting, or standing).

We also included the quantity of the forms of limitation an individual possessed to reflect the severity of disability condition.

Finally, the cases were also matched based on referral year. For this purpose, the variable year was dichotomized into 2004–2008 and 2009–2013.

Statistical Analysis

Baseline characteristics that served as the matching factors for START and non-START groups were compared using Chi-squared tests for categorical variables and *t* tests for numerical variables. The confidence interval of the proportion of individuals with successful rehabilitation, referred to as the 'rehabilitation rate,' was constructed based on the *z* statistics. To obtain the propensity scores, a binomial logistic regression model was fit on the data using the type of transition services (START vs. non-START) as the outcome and the baseline characteristics as the covariates. Then, START individuals were matched without replacement to those of non-START in a 1:1 ratio with a caliper size of 0.2 of the standard deviation of the logit of the estimated propensity scores. Potential matching individuals were matched with the best accordance regarding the matching variable. Note that the direction of matching was from treated-to-untreated individuals since the latter group had fewer people. Covariate balance was assessed by comparing the two groups with respect to the distribution and standardized difference of the variables. The procedures used to examine the pre-matched characteristics (Chi-squared and *t* tests) were re-applied for testing the post-matching distributions. The standardized differences were computed using Cohen's *d* statistic, with mean and variance for numerical variables, and proportion for categorical variables; the results were plotted as absolute percentages. We opted for the conventional 20 % or less of absolute standardized difference to suggest appropriate covariate balance. The relationship between the rehabilitation outcome and the type of transition services was evaluated using a generalized linear mixed model with binomial logit link, and the result was obtained as an odds ratio and the 95 % confidence interval.

Separate propensity-score model, matching, balance confirmation, and outcome regression was conducted for each subgroup analysis. However, due to the anticipated small number of individuals on this level of analysis, covariate balance was evaluated using only the standardized difference scores that are independent of sample size. Except for the subgroups of transition youth with disabilities receiving SSI or SSDI and who had Medicare/Medicaid, the algorithm of the subgroup analyses required the removal of one of the matching variables when predicting the propensity-scores. For instance, we needed to exclude

gender in the analysis of female and male transition youth. A similar situation happened when the matching was undertaken for a restricted class of race (only White, African American or Hispanic youth), and type of disability (in particular, intellectual and learning disabilities).

Data management and statistical analysis were performed using R statistical software version 3.2.0. In particular, the package nonrandom [48] was used in the most part of the propensity-score matching procedures.

Results

A disproportionately large proportion of START youth was found among the study cases. of 14,162 individuals, 11,951 (84.4 %) were in START and only 2211 (15.6 %) were in non-START (Table 1). START individuals were significantly a year younger (17 vs. 18) and more likely to be White than their counterparts in non-START. They appeared to come from two distinct residences, that is, either a county with a population of 500,000 or less, or the county with more than 1 million inhabitants, while more than a third non-START youth resided in small counties (100,000 or less). In terms of impairment, the START group had more individuals with intellectual and learning disabilities, but fewer with deaf/hearing disabilities, mental disabilities, and physical/orthopedic disabilities, than non-START group. The two groups also differed significantly in severe functional limitations: START youth were more likely to have communication and self-direction limitations, and yet less chance of limitations in work tolerance, as compared to youth in non-START.

It appears that the propensity-score model and the matching procedure were effective to eliminate the baseline differences between START and non-START individuals. Table 1 shows the characteristics after matching, which indicated that the matched youth with START did not differ significantly on any of the covariates from those with non-START. Moreover, Fig. 1 confirmed the balance of the groups after matching. The absolute standardized difference between matched START and non-START individuals was no larger than 10 % in each of the 18 covariates. Similar situations were noted for all subgroup analyses; no adjustment was needed for the propensity-score based treatment effects, as the absolute standardized differences for the entire matching factors (varied between 17 and 18 variables) were <20 % in every subgroup studied.

Of all matched individuals ($n = 4422$), the overall rehabilitation rate was 57 % (95 % CI 56–59 %). Within the two secondary transition groups (each $n = 2211$), 1348 youth (61 %; 95 % CI 59–63 %) in the START group and 1173 youth (53 %; 95 % CI 51–55 %) in the non-START

group were rehabilitated. The propensity-score matched odds ratio (OR) was 1.40 (95 % CI 1.24–1.58; $p < 0.001$). Figure 2 shows the OR for successful rehabilitation of the propensity-score matched START group to the non-START group. At the subgroup level, the estimated ORs were in similar direction with those for all individuals irrespective of gender, race, disability type, SSI/SSDI status, or Medicare/Medicaid support. With the exception of the subgroups of African Americans, Hispanics, and Medicare/Medicaid recipients, the ORs ranged from 1.27 to 1.62 with a p value of 0.001 or less (0.003 for the intellectual disability group). The odds of rehabilitation among African Americans was 1.86 (95 % CI 1.45–2.40; $p < 0.001$), and in individuals receiving Medicare/Medicaid was 1.92 (95 % CI 1.37–2.68; $p < 0.001$) when they were in START. The OR for Hispanics was not statistically significant at the 0.05 level.

Discussion

Our study provides empirical evidence of the effectiveness of the VR secondary transition services that is delivered through a targeted, integrated, and contract-based program to the conventional VR transition services in promoting youth with disabilities to employment. After controlling for potential confounders through propensity-score matching in the analysis to answer the first research question (RQ 1), the effect of START treatment on employment outcomes was significantly greater than that of non-START. This finding may indicate the importance of a particular design for delivering VR transition services.

The possible reasons for START superiority may be arguably obvious from the description of the program. START has an additional selection process, which means that only youth who are considered likely to benefit from the program become the target recipients. The implementation is secured with a binding agreement, and hence all parties are ensured to adequately assume their responsibilities. START includes a reward system through the performance-based incentives, and it is not difficult to think of its effect on the providers. Enhanced work experience in an integrated environment is another important factor that should have given this program an advantage over non-START. And the use of best-practice components in START also could be responsible for the higher odds of rehabilitation among youth in the program.

On the provider side, the application of measurable performances may have helped school personnel to determine the right direction for youth that eventually lead to successful rehabilitation. And, among the counselors or transition specialists, there should be an increased capability of developing appropriate IPEs for the START youth

Table 1 Baseline characteristics of youth with disabilities in the study, by type of transitional program, before and after propensity-score matching

Matching characteristic	Before matching (<i>n</i> = 14,162)			After matching (<i>n</i> = 4422)	
	Non-START, % (<i>n</i> = 2211)	START, % (<i>n</i> = 11,951)	<i>p</i> value	START, % (<i>n</i> = 2211)	<i>p</i> value
Age at referral, year [<i>m</i> (SD)]	17.7 (1.1)	17.0 (1.1)	<0.001	17.8 (1.1)	0.565
Gender					
Female	35.7	36.2	0.613	37.0	0.381
Male	64.3	63.8		63.0	
White	76.5	79.1	0.006	76.8	0.887
African American	23.7	20.3	<0.001	23.4	0.832
Hispanic	9.2	10.6	0.050	8.6	0.493
County of residence population size					
100,000 or less	37.6	30.9	<0.001	37.2	0.194
100,001–500,000	21.6	24.6		21.0	
500,001–1,000,000	20.4	18.1		22.9	
More than 1,000,000	20.4	26.3		18.9	
With deaf/hearing disability	5.7	1.6	<0.001	5.0	0.285
With intellectual disability	20.4	24.5	<0.001	19.8	0.626
With learning disability	53.6	60.1	<0.001	55.5	0.205
With mental illness	12.9	8.4	<0.001	13.1	0.893
With physical/orthopedic disability	3.0	1.4	<0.001	2.8	0.789
Have communication limitation	65.0	69.4	<0.001	64.5	0.706
Have interpersonal skills limitation	42.0	39.8	0.052	40.6	0.344
Have mobility limitation	9.7	9.6	0.954	8.7	0.298
Have self care limitation	27.4	29.1	0.091	26.1	0.359
Have self direction limitation	60.5	66.2	<0.001	60.6	1.000
Have work tolerance limitation	22.4	14.7	<0.001	20.5	0.133
Number of functional limitations [<i>m</i> (SD)]	3.2 (1.2)	3.2 (1.2)	0.333	3.1 (1.2)	0.173
Referral year					
2004–2008	64.4	64.5	0.916	63.0	0.348
2009–2013	35.6	35.5		37.0	

following a close working relationship with school personnel and the requirement that they remain involved in every decision regarding the youth.

All but one subgroup analysis for RQ 2 demonstrated a significantly higher likelihood of rehabilitation when youth with disabilities were participating in START instead of non-START. There were two youth subgroups that seemed to have a much higher OR than all youth with disabilities: African Americans and Medicare/Medicaid recipients. In both cases, the odds of successful rehabilitation when comparing the START youth to those in non-START were almost twice as likely (the all-group OR was 1.40). It remains a subject for future research to determine why these subpopulations appeared to benefit more from START than the overall youth in the study. The demographic characteristics and the types of disability are very

unlikely to be the related factors, because they had been balanced through the matching procedure. We can hypothesize that the variables which could not be adjusted for in the present study, such as the school where the youth attended, the counselor/transition specialist to whom they were assigned, or the variety of the service components that they received, might be associated with the anomaly. No gender difference appeared, while the discrepancy with respect to race/ethnicity was likely due to chance (the intervals of true OR for African American and Hispanic groups were grossly overlapped, as was true also for Whites and Hispanics). Note that the Hispanic group was relatively small and thus the estimate was less precise. The analyses showed that youth with intellectual and learning disabilities were not quite different from each other in how they benefited from START. There was also no indication

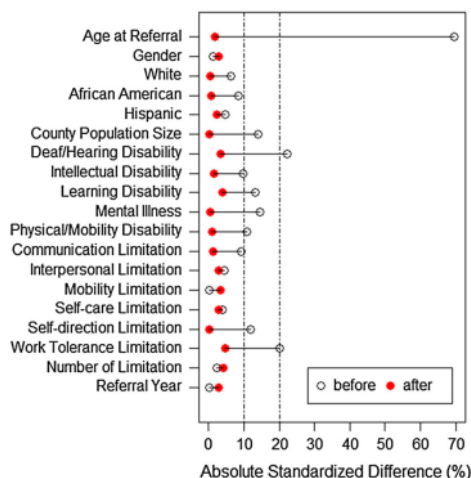


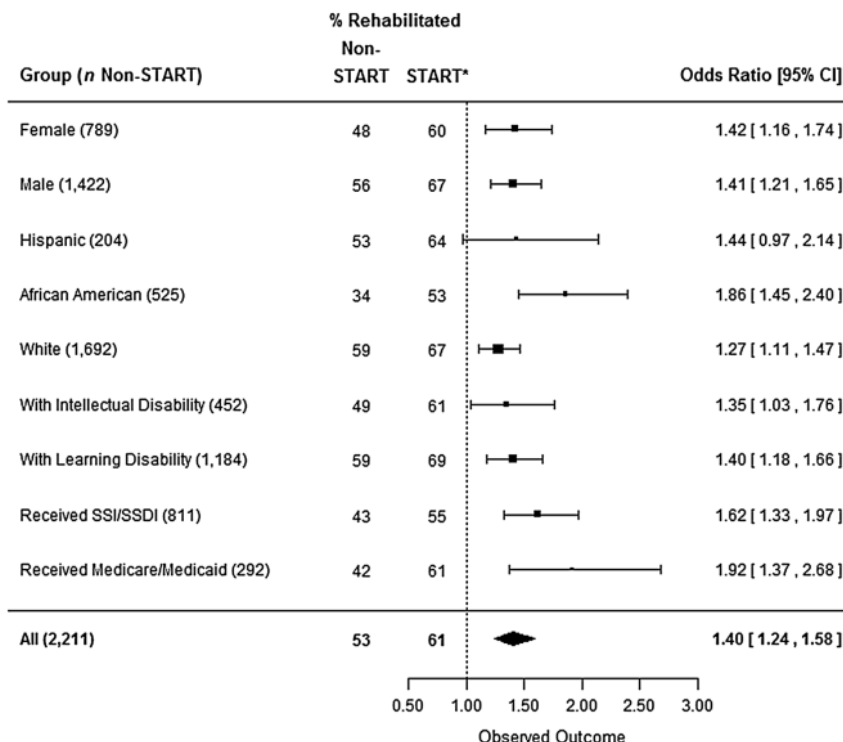
Fig. 1 Absolute standardized difference (%) for each matching characteristics, before and after propensity-score matching on all individuals

of improved or reduced benefit from START when youth with disabilities received SSI/SSDI, with the subgroup's OR close to that for the overall youth.

There are a few limitations of the present study. The measure of successful outcomes was limited to the VR standard definition of a stable employment for at least 90 consecutive days. There was no assessment of the occurrence of non-qualified employment (not meeting the closure criteria) prior to the accepted outcome, the amount of time elapsed post-high school prior to employment, the total of working hours, the earnings from employment, the presence of any benefit, productivity in the workplace, or workplace activity limitations. The pursuit of these alternative outcomes was impractical because the details of the employment outcomes in our data were insufficient. For the same reason, there was no analysis on the youth employment status after the closure; such as how long the job was held, or how satisfied the individual was with the work. In addition, the present study focused exclusively on the employment component of post-school outcomes of transition services. Other outcomes, such as post-secondary education and independent living, were not included since we considered them to require separate studies. Further information available for those outcomes was near non-existent in the data to which we were granted access.

Application of 1:1 ratio for matching individuals in START to non-START had artificially created a population where both groups were proportional. A downside of this

Fig. 2 Odds of vocational rehabilitation of propensity-score matched youth receiving START compared to all and subgroups of non-START youth in the study. *START** propensity-score matched 53, *CI* confidence interval, *SSI* supplemental security outcome, *SSDI* social security disability insurance



approach was the removal of a large proportion of START youth in the original observations. Among 11,951 youths participating in START, only 2211 (18.5 %) were used for evaluation. Therefore, it would be difficult to avoid that the youth in the matched START group may be less representative of the entire population of youth in the original group (Table 1). However, the objective of matching in the propensity-score analysis is to obtain comparable groups in terms of the confounding variables. Table 1 indicates that the two treatment groups were not different in any of the confounding variables after the matching. On the other hand, a similar effect of treatment in a number of subgroups strengthens the prospect of generalizability.

The present study had a number of strengths. First, the study was population-based, and hence, the findings should be applicable to the youth with disabilities in the population. Some caution should be considered as our data included only those who sought VR services in a Midwestern area of the United States. Second, the present study included a fairly large sample size, which improved the power of the analysis and enabled the investigation of demographically and geographically diverse groups of youth with disabilities. Third, the researchers had exclusive access to the parties that originally stored and managed the data, assuring that any questions or concerns regarding the variables could be clarified, and any conflicting entries could be reconciled for the majority of cases. Finally, the implementation of the propensity-score matching procedures to imitate the randomized experimental design should have improved the capacity of the present study to provide evidence for the effectiveness of VR transition services for youth with disabilities.

Developing suitable VR plans for youth with disabilities often presents a challenge for counselors because these youth differ in age, education level, and work experience from the typical, adult VR client. Without a clear idea of the path from school to work, determination of necessary services can be a daunting task. In START, there is an emphasis on providing youth with extensive work experience in an integrated environment, which may help to their IPEs which in turn may help to facilitate counselors in their search for more appropriate supports and services for the youth. A close collaboration between counselors and the third-party providers, perhaps through binding arrangements, may also help facilitate the development of VR plans and improve the employment prospects of youth with disabilities. VR professionals should, therefore, consider implementing and encouraging practices that are similar to START.

Future studies should include an in-depth investigation into the characteristics of employment outcomes following secondary transition services to provide more support towards the design of appropriate mechanisms of service

delivery. It is also essential to develop effective combinations and/or structures for services offered and skills taught within the transition programs which will help to achieve optimal employment among youth with disabilities. Lastly, the superior rehabilitation outcome of the VR contract-based START group as compared to traditional VR transition services indicate that a cost-benefit analysis of delivery options for VR transition services may be helpful to identify ways of making secondary transition services more beneficial in promoting the successful movement of youth with disabilities into employment.

11 Acknowledgments This research was supported in part by funding from the Illinois Division of Rehabilitation Services (IDRS) contract #46CSD00459. The authors are grateful to Patricia Kratochwill and George E. Manning II for technical assistance, and to the reviewers for constructive comments and advices.

35 Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

28 References

1. Law M, Steinwender S, Leclair L. Occupation, health and well-being. *Can J Occup Ther*. 1998;65:81–91.
2. Linn MW, Sandifer R, Stein S. Effects of unemployment on mental and physical health. *Am J Public Health*. 1985;75:502–6.
3. Ross CE, Mirowsky J. Does employment affect health? *J Health Soc Behav*. 1995;36:230–43.
4. McKee-Ryan F, Song Z, Wanberg CR, Kinicki AJ. Psychological and physical well-being during unemployment: a meta-analytic study. *J Appl Psychol*. 2005;90:53–76.
5. Backhans MC, Hemmingsson T. Unemployment and mental health—who is (not) affected? *Eur J Public Health*. 2012;22:429–33.
6. Montgomery SM, Cook DG, Bartley MJ, Wadsworth ME. Unemployment pre-dates symptoms of depression and anxiety resulting in medical consultation in young men. *Int J Epidemiol*. 1999;28:95–100.
7. Norström F, Virtanen P, Hammarström A, Gustafsson PE, Janlert U. How does unemployment affect self-assessed health? A systematic review focusing on subgroup effects. *BMC Public Health*. 2014;14:1–13.
8. Puig-Barrachina V, Malmusi D, Martínez JM, Benach J. Monitoring social determinants of health inequalities: the impact of unemployment among vulnerable groups. *Int J Health Serv Plan Eval*. 2011;41:459–82.
9. Hammarström A. Health consequences of youth unemployment: review from a gender perspective. *Soc Sci Med*. 1994;38:699–709.
10. Hultman B, Hemlin S. Self-rated quality of life among the young unemployed and the young in work in northern Sweden. *Work*. 2008;30:461–72.
11. Bacikova-Sleskova M, van Dijk JP, Geckova AM, Nagyova I, Salonna F, Reijneveld SA, et al. The impact of unemployment on school leavers' perception of health. Mediating effect of financial situation and social contacts? *Int J Public Health*. 2007;52:180–7.
12. Cooper D, McCausland WD, Theodossiou I. Unemployed, uneducated and sick: the effects of socio-economic status on health

- duration in the European Union. *J R Stat Soc Ser A Stat Soc.* 2008;171:939–52.
13. Newman L, Wagner M, Cameto R, Knokey AM. The post-high school outcomes of youths with disabilities up to 4 years after high school: a report from the National Longitudinal Study-2 (NLTS2) (NCSE 2009-17). Menlo Park, CA: SRI International; 2009. <http://www.ies.ed.gov/ncser/pdf/20093017.pdf>.
 14. U.S. Department of Labor Office of Disability Employment Policy. Youth employment rate [Internet]; 2015. <http://www.dol.gov/odep/categories/youth/employment.html>.
 15. U.S. Department of Labor Bureau of Labor Statistics. Person with a disability: labor force characteristics—2014 [Internet]. U.S. Department of Labor; 2015. <http://www.bls.gov/news.release/pdf/disabl.pdf>.
 16. Frey WD. Transition in education and employment. In: Albrecht GL, editor. *Encyclopedia of disability*, vol IV. Thousand Oaks: Sage Publication; 2006. p. 155–66.
 17. 93rd United States Congress. *Vocational Rehabilitation Act of 1973*. The Congress of the United States of America; 1973.
 18. 94th United States Congress. *Education for All Handicapped Children Act of 1975*. The Congress of the United States of America; 1975.
 19. 101st United States Congress. *Individuals with Disabilities Education Act of 1990*. The Congress of the United States of America; 1990.
 20. National Council on Disability. *The Rehabilitation Act: outcomes for transition-age youth*. Washington: National Council on Disability; 2008.
 21. U.S. Department of Education Rehabilitation Services Administration. Reporting manual for state case service report (RSA 911): state-federal program for vocational rehabilitation [Internet]. U.S. Department of Education Rehabilitation Services Administration; 2011. <http://www.ed.gov/policy/speced/guid/rsa/40>.
 22. U.S. Department of Education Rehabilitation Services Administration. Emerging practices [Internet]. U.S. Department of Education Rehabilitation Services Administration; 2015. <https://rsa.ed.gov/emerging-practices.cfm>.
 23. Test DW, Fowler CH, Richter SM, White J, Mazzotti V, Walker AR, et al. Evidence-based practices in secondary transition. *Career Dev Except Individ.* 2009;32:115–28.
 24. Test DW, Cease-Cook J. Evidence-based secondary transition practices for rehabilitation counselors. *J Rehabil.* 2012;78:30.
 25. Landmark LJ, Ju S, Zhang D. Substantiated best practices in transition: fifteen plus years later. *Career Dev Except Individ.* 2010;33:165–76.
 26. Cobb RB, Alwell M. Transition planning/coordinating interventions for youth with disabilities: a systematic review. *Career Dev Except Individ.* 2009;32:70–81.
 27. Mazzotti VL, Test DW, Mustian AL. Secondary transition evidence-based practices and predictors implications for policy-makers. *J Disabil Policy Stud.* 2014;25:5–18.
 28. Mazzotti VL, Plotner AJ. Implementing secondary transition evidence-based practices a multi-state survey of transition service providers. *Career Dev Transit Except Individ.* 2014;216514341244360:1–11.
 29. Pruet SR, Swett EA, Chan F, Rosenthal DA, Lee GK. Empirical evidence supporting the effectiveness of vocational rehabilitation. *J Rehabil.* 2008;74:56–63.
 30. Craig T, Shepherd G, Rinaldi M, Smith J, Carr S, Preston F, et al. Vocational rehabilitation in early psychosis: cluster randomised trial. *Psychiatry.* 2014;205(2):145–50. doi:10.1192/bjp.bp.113.136283.
 31. Cook CC, Lehman AF, Drake R, McFarlane WR, Gold PB, Leff HS, et al. Integration of psychiatric and vocational services: a multisite randomized, controlled trial of supported employment. *J Psychiatry.* 2005;162:1948–56.
 32. Rogers ES, Anthony WA, Lyass A, Penk WE. A randomized clinical trial of vocational rehabilitation for people with psychiatric disabilities. *Rehabil Couns Bull.* 2006;49:143–56.
 33. Wehman P, Sima AP, Ketchum J, West MD, Chan F, Luecking R. Predictors of successful transition from school to employment for youth with disabilities. *J Occup Rehabil.* 2014;25:323–34.
 34. Haber MG, Mazzotti VL, Mustian AL, Rowe DA, Bartholomew AL, Test DW, et al. What works, when, for whom, and with whom a meta-analytic review of predictors of postsecondary success for students with disabilities. *Rev Educ Res.* 2015. doi:10.3102/0034654315583125.
 35. Fleming AR, Fairweather JS. The role of postsecondary education in the path from high school to work for youth with disabilities. *Rehabil Couns Bull.* 2012;55:71–81.
 36. U.S. Department of Education Office of Special Education and Rehabilitation Services. 36th annual report to congress on the implementation of the Individuals with Disabilities Education Act, 2014 [Internet]. Washington, DC: US Department of Education; 2014. <http://www2.ed.gov/about/reports/annual/osep/414/parts-b-c/36th-idea-arc.pdf>.
 37. Dutta A, Gervery R, Chan F, Chou C-C, Ditchman N. Vocational rehabilitation services and employment outcomes for people with disabilities: a United States study. *J Occup Rehabil.* 2008;18:326–34.
 38. Bolton BF, Bellini JL, Brookings JB. Predicting client employment outcomes from personal history, functional limitations, and rehabilitation services. *Rehabil Couns Bull.* 2000;44:10–21.
 39. Chan JY, Wang C-C, Ditchman N, Kim JH, Pete J, Chan F, et al. State unemployment rates and vocational rehabilitation outcomes: a multilevel analysis. *Rehabil Couns Bull.* 2014;57:209–18.
 40. Roux AM, Shattuck PT, Cooper BP, Anderson KA, Wagner M, Narendorf SC. Postsecondary employment experiences among young adults with an autism spectrum disorder RH: employment in young adults with autism. *J Am Acad Child Adolesc Psychiatry.* 2013;52:931–9.
 41. Chen JL, Sung C, Pi S. Vocational rehabilitation service patterns and outcomes for individuals with autism of different ages. *J Autism Dev Disord.* 2015;45(9):1–15. doi:10.1007/s10803-015-1455-y.
 42. National Council on Disability Social Security Administration. *Transition and post-school outcomes for youth with disabilities: closing the gaps to post-secondary education and employment*. Washington: National Council on Disability; 2000.
 43. Newman L, Wagner M, Cameto R, Knokey AM, Shaver D. Comparisons across time of the outcomes of youth with disabilities up to 4 years after high school: a report of findings from the National Longitudinal Transition Study-2 (NLTS2) (NCSE 2010-3008). Menlo Park, CA: SRI International; 2010. <http://ies.ed.gov/pubsearch/pubsinfo.asp?pubid=NCSE20103008>.
 44. Wittenburg DC, Loprest PJ. Early transition experiences of transition-age child SSI recipients: new evidence from the National Survey of Children and Families. *J Disabil Policy Stud.* 2007;18:176–87.
 45. Cameto R, Levine P, Wagner M. Transition planning for students with disabilities: a special topic report of findings from the National Longitudinal Transition Study-2 (NLTS2). Washington, DC: Office of Special Education and Rehabilitative Services (SE); 2004. <http://eric.ed.gov/?id=ED496547>.
 46. Rosenbaum PR, Rubin DB. The central role of the propensity score in observational studies for causal effects. *Biometrika.* 1983;70:41–55.
 47. Austin PC. A tutorial and case study in propensity score analysis: an application to estimating the effect of in-hospital smoking cessation counseling on mortality. *Multivar Behav Res.* 2011;46:119–51.
 48. Stampf S. Propensity score based data analysis [Internet]; 2014. <http://www.cran.r-project.org/web/packages/nonrandom/vignettes/nonrand.om.pdf>.

Vocational Rehabilitation of Transition-Age Youth with Disabilities: A Propensity-Score Matched Study

ORIGINALITY REPORT

19%

SIMILARITY INDEX

16%

INTERNET SOURCES

17%

PUBLICATIONS

%

STUDENT PAPERS

PRIMARY SOURCES

1	journals.sagepub.com Internet Source	1%
2	www.sjweh.fi Internet Source	1%
3	Bouck, E. C.. "The postschool outcomes of students with mild intellectual disability: does it get better with time? : Mild intellectual disability postschool outcomes", <i>Journal of Intellectual Disability Research</i> , 2013. Publication	1%
4	www.mdpi.com Internet Source	1%
5	Riskin-Mashiah, S, A Riskin, D Bader, A Kugelman, V Boyko, L Lerner-Geva, and B Reichman. "Antenatal corticosteroid treatment in singleton, small-for-gestational-age infants born at 24-31 weeks' gestation: a population-based study", <i>BJOG An International Journal of Obstetrics & Gynaecology</i> , 2015.	1%

6	espace.curtin.edu.au Internet Source	1 %
7	tigerprints.clemson.edu Internet Source	1 %
8	Kelly Huegaerts, Vanessa Puig-Barrachina, Christophe Vanroelen. "The mental health of unemployed Brussels youth: the role of social and material resources", Archives of Public Health, 2017 Publication	1 %
9	ouci.dntb.gov.ua Internet Source	1 %
10	www.frontiersin.org Internet Source	<1 %
11	Alo Dutta. "Vocational Rehabilitation Services and Employment Outcomes for People with Disabilities: A United States Study", Journal of Occupational Rehabilitation, 12/2008 Publication	<1 %
12	ajph.aphapublications.org Internet Source	<1 %
13	pubmed.ncbi.nlm.nih.gov Internet Source	<1 %
14	D. F. Mellard. "Incorporating Adult Community Services in Students' Transition	<1 %

Planning", Remedial and Special Education,
12/01/2003

Publication

15

Jayeshkumar Patel, Khalid Alhussain, Usha Sambamoorthi. "What Explains Poor Health-related Quality of Life Associated With Opioid Use Among Adults With Chronic Noncancer Pain Conditions? A Blinder-Oaxaca Decomposition", Addictive Disorders & Their Treatment, 2021

Publication

<1 %

16

[core.ac.uk](https://www.core.ac.uk)

Internet Source

<1 %

17

sites.ed.gov

Internet Source

<1 %

18

digital.library.adelaide.edu.au

Internet Source

<1 %

19

www.researchsquare.com

Internet Source

<1 %

20

slidelegend.com

Internet Source

<1 %

21

Paul Wehman, Adam P. Sima, Jessica Ketchum, Michael D. West, Fong Chan, Richard Luecking. "Predictors of Successful Transition from School to Employment for

<1 %

Youth with Disabilities", Journal of Occupational Rehabilitation, 2014

Publication

22

www.wpanet.org

Internet Source

<1 %

23

www2.ed.gov

Internet Source

<1 %

24

Kanako Iwanaga, Fong Chan, Timothy N. Tansey, William T. Hoyt, Norman L. Berven. "Evaluation of Constructs Based on Self-Determination Theory and Self-Efficacy Theory as Predictors of Vocational Rehabilitation Engagement for People With Physical and Sensory Disabilities", Rehabilitation Counseling Bulletin, 2020

Publication

<1 %

25

Lillywhite, Wolbring. "Undergraduate Disabled Students as Knowledge Producers including Researchers: A Missed Topic in Academic Literature", Education Sciences, 2019

Publication

<1 %

26

discovery.ucl.ac.uk

Internet Source

<1 %

27

escholarship.org

Internet Source

<1 %

28

portal.research.lu.se

Internet Source

<1 %

29	bmccancer.biomedcentral.com Internet Source	<1 %
30	openarchive.usn.no Internet Source	<1 %
31	Peter C. Austin. "A Tutorial and Case Study in Propensity Score Analysis: An Application to Estimating the Effect of In-Hospital Smoking Cessation Counseling on Mortality", <i>Multivariate Behavioral Research</i> , 2011 Publication	<1 %
32	preserve.lehigh.edu Internet Source	<1 %
33	vdoc.pub Internet Source	<1 %
34	G. Gmel. "Alcohol-related adverse consequences: cross-cultural variations in attribution process among young adults", <i>The European Journal of Public Health</i> , 03/31/2008 Publication	<1 %
35	mural.maynoothuniversity.ie Internet Source	<1 %
36	www.medrxiv.org Internet Source	<1 %
37	j-stroke.org Internet Source	<1 %

38

www.letsgettoworkwi.org

Internet Source

<1 %

39

"Careers for Students with Special Educational Needs", Springer Science and Business Media LLC, 2020

Publication

<1 %

40

Flannery, K. B., M. R. Benz, P. Yovanoff, M. M. Kato, and L. Lindstrom. "Predicting Employment Outcomes for Consumers in Community College Short-Term Training Programs", Rehabilitation Counseling Bulletin, 2011.

Publication

<1 %

41

socialrelationslab.psychology.columbia.edu

Internet Source

<1 %

42

Barbara L. Pazey, Robert L. Schalock, James Schaller, Jerry Burkett. "Incorporating Quality of Life Concepts Into Educational Reform", Journal of Disability Policy Studies, 2016

Publication

<1 %

43

Phillip Rumrill, Paul Wehman, Robert Cimera, Cahit Kaya, Chad Dillard, Fong Chan. "Vocational Rehabilitation Services and Outcomes for Transition-Age Youth With Traumatic Brain Injuries", Journal of Head Trauma Rehabilitation, 2016

Publication

<1 %

44

www.ncd.gov

Internet Source

<1 %

45

Debra Neubert. "Articles: The Role of Assessment in the Transition to Adult Life Process for Students With Disabilities", *Exceptionality*, 06/01/2003

Publication

<1 %

46

Pamela J. Loprest, David C. Wittenburg. "Posttransition Experiences of Former Child SSI Recipients", *Social Service Review*, 2007

Publication

<1 %

47

protocolexchange.researchsquare.com

Internet Source

<1 %

48

Chung-Yi Chiu, Fong Chan, Malachy Bishop, Elizabeth da Silva Cardoso, John O'Neill. "State vocational rehabilitation services and employment in multiple sclerosis", *Multiple Sclerosis Journal*, 2013

Publication

<1 %

49

David Strauser, Michael Feuerstein, Fong Chan, Juan Arango, Elizabeth da Silva Cardoso, Chung-Yi Chiu. "Vocational services associated with competitive employment in 18–25 year old cancer survivors", *Journal of Cancer Survivorship*, 2010

Publication

<1 %

ieee-ceda.org

50

Internet Source

<1 %

51

pure.eur.nl

Internet Source

<1 %

52

www.nobarriersusa.org

Internet Source

<1 %

53

K. Campbell. "Who Benefits From Supported Employment: A Meta-analytic Study", *Schizophrenia Bulletin*, 08/06/2009

Publication

<1 %

54

Xiaoling Xiang, Randall Owen, F. L. Fredrik G. Langi, Kiyoshi Yamaki et al. "Impacts of an Integrated Medicaid Managed Care Program for Adults with Behavioral Health Conditions: The Experience of Illinois", *Administration and Policy in Mental Health and Mental Health Services Research*, 2018

Publication

<1 %

55

Zhong-Guo Liang, Fan Zhang, Bin-Bin Yu, Ling Li, Song Qu, Ye Li, Ying Guan, Ren-Ba Liang, Lu Han, Xiao-Dong Zhu. "

The Double-Edge Role of the Addition of Adjuvant Chemotherapy to Concurrent Chemoradiotherapy in the Treatment of Nasopharyngeal Carcinoma

", *Cancer Management and Research*, 2020

<1 %

56

louis.apph.org

Internet Source

<1 %

57

researchonline.lshtm.ac.uk

Internet Source

<1 %

58

rsa.ed.gov

Internet Source

<1 %

59

vocational-rehab.com

Internet Source

<1 %

60

www.dir.ca.gov

Internet Source

<1 %

61

www.dshs.wa.gov

Internet Source

<1 %

62

www.tigweb.org

Internet Source

<1 %

63

Matthew Evan Sprong, Bryan Dallas, Erina Paul, Michelle Xia. "Rehabilitation technology services and employment outcomes among consumers using division of rehabilitation services", *Disability and Rehabilitation: Assistive Technology*, 2018

Publication

<1 %

64

N/A. "Current World Literature", *Current Opinion in Psychiatry*, 09/2006

Publication

<1 %

65

Steven Mendelsohn, Dave L. Edyburn, Kathy L. Rust, Todd D. Schwanke, Roger O. Smith. "Using Assistive Technology Outcomes Research to Inform Policy Related to the Employment of Individuals With Disabilities", Assistive Technology, 2008

Publication

<1 %

66

stars.library.ucf.edu

Internet Source

<1 %

Exclude quotes Off

Exclude matches Off

Exclude bibliography Off