

Vocational rehabilitation services and employment outcomes for adults with cerebral palsy in the United States

I-CHUN HUANG¹ | JEROME J HOLZBAUER² | EUN-JEONG LEE³ | JULIE CHRONISTER⁴ | FONG CHAN⁵ | JOHN O'NEIL⁶

1 Graduate Institute of Rehabilitation Counseling, National Changhua University of Education, Changhua City, Taiwan; **2** Private Research Consultant, Milwaukee, WI; **3** Institute of Psychology, Illinois Institute of Technology, Chicago, IL; **4** Department of Counselling, San Francisco State University, San Francisco, CA; **5** Department of Rehabilitation Psychology and Special Education, University of Wisconsin-Madison, Madison, WI; **6** Kessler Foundation, West Orange, NJ, USA.

Correspondence to Dr I-Chun Huang, Graduate Institute of Rehabilitation Counseling, National Changhua University of Education, 1 Jin-De Road, Changhua City 500, Taiwan.
E-mail: ichunhuang@cc.ncue.edu.tw

This article is commented on by Vogtle on page 973 of this issue.

PUBLICATION DATA

Accepted for publication 28th May 2013.
Published online 8th August 2013.

ABBREVIATIONS

RSA-911	Rehabilitation Service Administration Case Service Report
SSDI	Social security disability insurance
SSI	Supplemental security income

AIM The aim of this study was to examine the relationship between vocational rehabilitation services provided and work outcomes among people with cerebral palsy (CP), taking in to account demographic characteristics.

METHOD From the US Department of Education Rehabilitation Service Administration Case Service Report (RSA-911) database, data from 3162 individuals with CP (1820 males [57.6%] and 1342 females [42.4% age range 16–54y) whose cases were closed in 2009, were used in this study. A total of 1567 cases (49.6%) were closed with clients being categorized as 'successful employment' and 1595 cases (50.4%) were closed with clients being classified as unemployed.

RESULTS Multivariate logistic regression was used to examine the relationship between services provided and work outcomes with regard to demographic characteristics. Males aged between 26 and 54 years old with higher education attainment were more likely to be employed. Individuals receiving disability benefits were less likely to be employed. After controlling for the effect of demographic and work disincentive variables, five vocational rehabilitation services significantly predicted employment outcomes ($p < 0.05$), including (1) on-the-job training; (2) job placement assistance; (3) on-the-job support; (4) maintenance services; and (5) rehabilitation technology.

INTERPRETATION Medical and health professionals need to be aware of vocational rehabilitation agencies as a resource for providing medical, psychological, educational, and vocational interventions for adults with CP to help them maximize their employability, to address their much needed work adjustment skills, to establish independent living, and to eventually reach their full potential in participation in society.

Cerebral palsy (CP) is considered the most common childhood disability. According to Best,¹ international studies show an incidence of over 2.0 per 1000 live births. CP describes a group of permanent conditions that affects the development of movement and posture and causes life-long limitations in activity. These motor limitations result from non-progressive disturbances that have occurred in the developing fetal or infant brain. Speech and language disorders, sensory deficits, intellectual disabilities, behavioural problems, and seizures are impairments that can be associated with CP.²

Economic independence and social integration are basic rights that are important to people with CP. In a study conducted by Liptak,³ adults with CP listed work and an independent economic life as two of the most important life domains related to their health and well-being. Steven-

son et al.⁴ reported that young people with CP who were in school ranked getting a job as a top priority. However, for decades, adults with CP have continued to experience significantly lower rates in attaining and maintaining employment in comparison with their peers without disabilities.^{5–7} Furthermore, in the United States rates of employment for persons with CP have been cited to be considerably lower than employment rates of people living with other disabilities.⁸

Studies suggest that educational achievement, vocational training/education, work disincentives, and socialization skills are important factors influencing employment outcomes of persons with CP. For example, in a study conducted in Denmark⁹ comparing the educational achievement and employment status among participants with CP and a typical comparison group, participants with

CP were more likely to complete only primary and lower secondary school and less likely to attend college compared with the comparison group. Also, only 29% of the participants with CP were gainfully employed compared with 82% of the comparison group. Similarly, researchers in Israel examined the educational outcomes of 75 young people with CP¹⁰ and found that 29% achieved complete matriculation and 23% were competitively employed. Studies also suggest that persons with CP have limited vocational education and training opportunities during primary, secondary, and tertiary schools. For example, Sillanpaa et al.¹¹ surveyed 86 individuals with CP between the ages of 15 and 27 years and found that 70% of the respondents had not received any type of formal vocational education or training. Work disincentives associated with US government programmes such as Social Security and Medicaid have also been cited as barriers to economic independence among persons with CP in the United States.⁷ For example, Murphy et al.¹² found that of the 53% of adults with CP who were competitively employed, 22% earned an income high enough that advancement at work would cause financial loss through termination of disability benefits. Finally, studies suggest that individuals with CP experience increased social isolation (e.g. Michelsen et al.;⁹ Murphy et al.¹²) and decreased psychosocial well-being¹³ as a result of unsatisfying employment outcomes.

Although these studies point to possible factors contributing to low rates of employment among persons with CP, there is a dearth of research investigating factors associated with employment among adults with CP. Further, there are no studies investigating the impact of vocational rehabilitation services on employment outcomes among adults with CP. As such, the primary aim of this paper is to investigate the association between vocational rehabilitation services and employment outcomes among adults with CP using the US Department of Education's Rehabilitation Service Administration Case Service Report (RSA-911) database. The primary purpose of the state-federal vocational rehabilitation programme in the United States is to assist individuals with disabilities to obtain employment, consistent with the individual's current physical and/or psychological strengths and limitations. State vocational rehabilitation agencies have focused on facilitating employment and career development among people with various types of health conditions and disabilities since the 1920s,¹⁴ therefore research in this area can better inform our understanding of what services are most beneficial in improving employment outcomes among persons with CP.

METHOD

Participants

Data for this study were extracted from the RSA-911 database. The RSA-911 data contain detailed information about demographics, disability, types of intervention services, and employment outcomes for all clients receiving

What this paper adds

- This study provides a review of the current literature relevant to employment and living with CP.
- Five vocational rehabilitation services were found as predictors of employment outcomes among people with CP.
- The importance of vocational rehabilitation services to maximize the employability for people with CP is addressed.

state vocational rehabilitation services in the United States, and are renewed annually by state-federal vocational rehabilitation service agencies. In the fiscal year 2009, data from the RSA-911 were used for analyses because it was the most current dataset available at the time of study. Ethics approval was obtained from the social and behavioural science institutional review board of the University of Wisconsin-Madison.

The state-federal vocational rehabilitation programme is the oldest and most successful public programme in the United States, supporting the employment and independence of individuals with disabilities. In order to be eligible for services, an applicant for vocational rehabilitation services must meet the criteria presented in USC §102(a) (1) of the Rehabilitation Act of 1973: (1) an individual has a physical or intellectual disability that constitutes or results in a substantial impediment to employment; (2) an individual can benefit from the provision of vocational rehabilitation services to improve employment outcome; and (3) an individual requires vocational rehabilitation services to prepare for, enter into, engage in, or retain gainful employment.¹⁵

Only individuals who had been determined to be eligible for vocational rehabilitation services with an individualized plan for employment were included in this study. The individualized plan for employment delineated the rehabilitation goals and services needed to achieve these goals and must be jointly developed by the counsellor and the client with CP. The sample consisted of all 3162 individuals with CP aged between 16 and 54 years old whose cases were closed in the fiscal year 2009. Of these, 291 participants (9.2%) were diagnosed with an intellectual disability and 109 (3.4%) had co-occurring epilepsy. About 54% of the participants reported receiving cash benefits (e.g. supplemental security income [SSI], social security disability insurance [SSDI], and temporary assistance for needy families) and 60% reported receiving medical insurance (e.g. Medicare/Medicaid) from the government. Table I summarizes the demographic characteristics of the study sample.

Variables

Outcome variables

Competitive employment was used as the outcome variable. According to the Rehabilitation Services Administration,¹⁵ competitive employment is defined as working full time or part time in an integrated competitive setting, in self-employment or in a state-managed business enterprise programme with an income compensated at or above the minimum wage. Unsuccessful outcome is defined as being unable to find employment after receiving vocational rehabilitation service interventions.

Table I: Characteristics of the study sample (*n*=3162)

Variable	Males, <i>n</i> (%)	Females, <i>n</i> (%)	Total, <i>n</i> (%)
Age (y)			
16–20	763 (41.9)	532 (39.6)	1295 (41.0)
21–25	290 (15.9)	228 (17.0)	518 (16.4)
26–54	767 (42.1)	582 (43.4)	1349 (42.7)
Race			
European-American	1376 (75.6)	983 (73.2)	2359 (74.6)
African-American	238 (13.1)	210 (15.6)	448 (14.2)
Hispanic-American	135 (7.4)	95 (7.1)	230 (7.3)
Asian-American	49 (2.7)	36 (2.7)	85 (2.7)
Native-American	22 (1.2)	18 (1.3)	40 (1.3)
Education level at application			
Special education	263 (14.5)	169 (12.6)	432 (13.7)
Less than high school	543 (29.8)	383 (28.5)	926 (29.3)
High school	584 (32.1)	402 (30.0)	986 (31.2)
Post-secondary/associate	271 (14.9)	268 (20.0)	539 (8.8)
Bachelor degree or higher	159 (8.7)	120 (8.9)	279 (8.8)
Intellectual disability			
Yes	164 (9.0)	127 (9.5)	291 (9.2)
No	1656 (91.0)	1215 (90.5)	2871 (90.8)
Epilepsy			
Yes	62 (3.4)	47 (3.5)	109 (3.4)
No	1758 (96.6)	1295 (96.5)	3053 (96.6)
Medical insurance at application			
Yes	954 (52.4)	760 (56.6)	1714 (54.2)
No	866 (47.6)	582 (43.4)	1448 (45.8)
Cash benefits at application			
Yes	1066 (58.6)	831 (61.9)	1897 (60.0)
No	754 (41.4)	511 (38.1)	1265 (40.0)

Predictor variables

Three sets of predictor variables were used for the analysis, including demographic variables, work disincentive variables, and rehabilitation service variables. Demographic variables included sex, age (16–20y, 21–25y, or 26–54y), ethnic group (European-American, African-American, Hispanic-American, Asian-American, or Native-American), co-occurring disabilities (intellectual disability or epilepsy), and education level at client case application (special education, less than high school education, high school graduate, post-secondary education, or at least bachelor degree). Based on the regulation of the Rehabilitation Services Administration,¹⁵ special education refers to an individual if who (1) is currently a special education student; (2) received special education and earned a certificate of completion or a high school diploma; or (3) received special education but did not receive a certificate or diploma. Intellectual disability is defined as impairments involving learning, thinking, processing information, and concentration. In addition, work disincentive variables include cash benefits and medical insurance. Cash benefits refer to cash payments made by federal, state, and/or local government for the reason of an individual's disability, mostly including SSI, SSDI, and temporary assistance for needy families. Medical insurance includes Medicaid and Medicare.

Rehabilitation service variables included assessment, diagnostics and treatment of impairments, vocational rehabilitation counselling and guidance, college or university training, occupational/vocational training, on-the-job

training, basic academic remedial or literacy training, job readiness training, augmentative skills training, miscellaneous training, job search assistance, job placement assistance, on-the-job support, transportation services, maintenance, and rehabilitation technology. A description of each vocational rehabilitation service is presented in Table II and the frequency of usage of vocational rehabilitation services by the study participants is presented in Table III.

Statistical analysis

Multivariate logistic regression analysis was used to examine determinants of employability for adults with CP receiving vocational rehabilitation services. In the first analysis, the effect of demographic and work disincentive variables on employment outcomes was computed. In the second analysis, the effect of demographic covariates and vocational rehabilitation services on employment outcomes was identified. The odds ratios (ORs) were presented with a 95% confidence interval (CI). Data analysis was computed using the Statistical Package for the Social Sciences version 19.0 (SPSS Statistics, IBM Corporation, NY, USA).

RESULTS

Vocational rehabilitation services and employment outcomes

In the fiscal year 2009, the cases of 3162 clients with CP aged between 16 and 54 years were closed. The mean time between eligibility and case closure was 41.16 months (SD 36.21). The mean number of service types was 4.52 (SD 1.60) and the median case expenditure US\$3031 (range 0–480544). Of the 3162 clients with CP, the cases of 1567 clients (49.6%) were closed as successful employment and the cases of 1595 clients (50.4%) were closed as unemployed. The successful group received significantly more

Table II: Frequency of usage of vocational rehabilitation services (*n*=3162)

Vocational rehabilitation service	Males, <i>n</i> (%)	Females, <i>n</i> (%)	Total, <i>n</i> (%)
Assessment	1271 (69.8)	952 (70.9)	2223 (70.3)
Diagnostics and treatment	540 (29.7)	403 (30.0)	943 (29.8)
Counselling and guidance	1211 (66.5)	873 (65.1)	2084 (65.9)
College or university training	368 (20.0)	332 (24.7)	700 (22.1)
Occupational or vocational training	158 (8.7)	122 (9.1)	280 (8.9)
On-the-job training	93 (5.1)	52 (3.9)	145 (4.6)
Remedial training	26 (1.4)	23 (1.7)	49 (1.5)
Job readiness training	283 (15.5)	203 (15.1)	486 (15.4)
Augmentative skills training	60 (3.3)	36 (2.7)	96 (3.0)
Miscellaneous training	259 (14.2)	193 (14.4)	452 (14.3)
Job search assistance	580 (31.9)	375 (27.9)	955 (30.2)
Job placement assistance	773 (42.5)	516 (38.5)	1289 (40.8)
On-the-job support	472 (25.9)	295 (22.0)	767 (24.3)
Transportation services	522 (28.7)	451 (33.6)	973 (30.8)
Maintenance	267 (14.7)	202 (15.1)	469 (14.8)
Rehabilitation technology	364 (20.0)	287 (21.4)	651 (20.6)

Table III: Description of services provided by state vocational rehabilitation agencies

Type of service	Description
Assessment	Services provided and activities performed to determine an individual's eligibility for vocational rehabilitation services, to assign an individual to a priority category of a state vocational rehabilitation agency that operates under an order of selection, and/or to determine the nature and scope of vocational rehabilitation services to be included in the individual plan for employment; included in this category are trial work experiences and extended evaluation
Diagnosis and treatment of impairments	Surgery, prosthetics and orthotics, nursing services, dentistry, occupational therapy, physical therapy, speech therapy, and drugs and supplies; this category includes diagnosis and treatment of mental and emotional disorders
Vocational rehabilitation counselling and guidance	Discrete therapeutic counselling and guidance services necessary for an individual to achieve an employment outcome, including personal adjustment counselling; counselling that addresses medical, family, or social issues; vocational counselling; and any other form of counselling and guidance necessary for an individual with a disability to achieve an employment outcome. This service is distinct from the general counselling and guidance relationship that exists between the counsellor and the individual during the entire rehabilitation process
College or university training	Full- or part-time academic training above the high-school level that leads to a degree (associate, baccalaureate, graduate, or professional), a certificate, or other recognized educational credential; such training may be provided by a 4-year college or university, community college, junior college, or technical college course
Occupational/vocational training	Occupational, vocational, or job-skill training provided by a community college and/or a business, vocational/trade, or technical school to prepare students for gainful employment in a recognized occupation; this training does not lead to an academic degree or certification
On-the-job training	Training in specific job skills by a prospective employer; generally the individual is paid during this training and will remain in the same or a similar job upon successful completion; this category also includes apprenticeship training programmes conducted or sponsored by an employer, a group of employers, or a joint apprenticeship committee representing both employers and a union
Basic academic remedial or literacy training	Literacy training or training provided to remediate basic academic skills needed to function on the job in the competitive labour market
Job readiness training	Training to prepare an individual for the world of work (e.g. appropriate work behaviours, methods for getting to work on time, appropriate dress and grooming, methods for increasing productivity)
Disability-related augmentative skills training	Service includes, but is not limited to, orientation and mobility, rehabilitation teaching, training in the use of low-vision aids, Braille, speech reading, sign language, and cognitive training/retraining
Miscellaneous training	Any training not recorded in one of the other categories listed, including general educational development (GED) or high-school training leading to a diploma
Job search assistance	Job-search activities that support and assist a consumer in searching for an appropriate job; may include help in preparing resumes, identifying appropriate job opportunities, and developing interview skills, and may include making contacts with companies on behalf of the consumer
Job placement assistance	A referral to a specific job resulting in an interview, whether or not the individual obtained the job
On-the-job support	Support services provided to an individual who has been placed in employment in order to stabilize the placement and enhance job retention; such services include job coaching, follow-up and follow-along, and job retention services
Transportation services	Travel and related expenses necessary to enable an applicant or eligible individual to participate in a vocational rehabilitation service; includes adequate training in the use of public transportation vehicles and systems
Maintenance	Monetary support provided for those expenses such as food, shelter, and clothing that are excess of the normal expenses of the individual, and that are necessitated by the individual's participation in an assessment for determining eligibility and vocational rehabilitation services
Rehabilitation technology	The systematic application of technologies, engineering methodologies, or scientific principles to meet the needs of, and address the barriers confronted by, individuals with disabilities in areas that include education, rehabilitation, employment, transportation, independent living, and recreation; includes rehabilitation engineering services, assistive technology devices, and assistive technology services

Information in this table was extracted from the RSA-911 code book (www.ed.gov/policy/speced/guid/rsa).

service types (mean 4.88, SD 1.71) than the unsuccessful group (mean 4.15, SD 1.41) ($t[3160]=-13.11$, $p<0.001$). The median case expenditure for the successful group (US\$4764) was significantly higher than the unsuccessful group (US\$1800; Mann-Whitney $U=898\ 456$; $p<0.001$). However, there was no significant difference with regard to service time between the employed (mean 37.19mo, SD 34.73mo) and unemployed applicants (mean 45.05mo, SD 37.22mo).

Predictors of employment

To identify the important determinants of employment for clients with CP, hierarchical logistic regression was com-

puted with demographic characteristics, work disincentives, and rehabilitation service types as predictor variables and employment outcome as the dependent variable. In the first analysis, we were interested in examining demographic and work disincentive variables as predictors of employment outcome. Demographic variables include sex (with female as the reference category), age at application (with the 26–54y group as the reference category), ethnic group (with European-American as the reference category), education level (with bachelor degree or higher as the reference category), and co-occurring intellectual disability and epilepsy (both with 'No' as the reference category). Work disincentives include cash and medical benefits (both with 'No' as

the reference category). The omnibus test for the model was found to be statistically significant (χ^2 [15, $n=3162$] =158.11, $p<0.001$). The Nagelkerke R^2 was computed to be 0.07. The results showed sex, age, education level, and cash benefits to be significant predictors ($p<0.05$). Males were more likely (OR=1.33; 95% CI 1.15–1.54) than females to be employed. Clients in the 16-to-20 year group were less likely (OR=0.68; 95% CI 0.56–0.83) to find employment than those in the 26-to-54 year group. In addition, the results indicated that, in comparison with participants with a college education, those without a college education had significantly less chance of finding employment. The OR for cash benefits was computed to be 0.65 (95% CI 0.54–0.77), indicating a 35% reduction in the odds of clients receiving cash benefits to be employed than those without cash benefits. The result of the logistic regression analysis is presented in Table IV.

In the second analysis, we were interested in demographic covariates and types of vocational rehabilitation services as predictors of employment outcomes. Based on the first analysis, a dummy variable was created for education, with lower than bachelor degree as the reference category. The ethnic group categories were split into the European-, Asian-, and Hispanic-American group and the African-American and Native-American group. In addition, based on the purposeful selection criteria, only six vocational rehabilitation services (diagnostic and treatment of impairments, on-the-job training, job placement assistance, on-the-job support, maintenance services, and rehabilitation technology services) were entered into the model as predictors. Overall, the omnibus test for the model was found to be statistically significant (χ^2 [13, $n=3162$] =538.87, $p<0.001$). The Nagelkerke R^2 was computed to be 0.21, indicating a relatively robust effect size. The results showed that, after controlling for the effect of demographic and work disincentive variables, five vocational

rehabilitation services significantly predicted employment outcomes ($p<0.05$), with ORs greater than those who were not receiving that service. These were (1) on-the-job training (OR=1.53, 95% CI 1.04–2.25); (2) job placement assistance (OR=2.80; 95% CI 2.39–3.28); (3) on-the-job support (OR=2.33; 95% CI 1.93–2.80); (4) maintenance (OR=1.51; 95% CI 1.21–1.87); and (5) rehabilitation technology (OR=1.80; 95% CI 1.48–2.18). Additionally, sex, age, education level, and cash benefits remained significant predictors in this model. The results of the hierarchical logistic regression analysis are presented in Table V.

DISCUSSION

This study found that specific demographic, work disincentive, and types of service variables were predictors of employment among individuals with CP who received vocational rehabilitation services. Specifically, adult males aged 26 to 54 years with a college education at application were more likely to obtain employment than those in other groups. Applicants who did not receive any disability-related benefits at application were more likely to obtain employment after receiving vocational rehabilitation services. Notably, receipt of disability benefits may be related to functional severity, and therefore could possibly be a proxy for severity, which could more directly be linked to unemployment. However, this area needs to be investigated further.

With respect to vocational rehabilitation services, the results also showed that, after controlling for the effect of demographic variables and disability-related benefits, the following were related to increased odds of employment: (1) on-the-job training; (2) job placement assistance to help individuals with CP find jobs; (3) on-the-job support to provide job coaching and job retention services to stabilize the placement; (4) support services such as maintenance services for basic living; and (5) rehabilitation assistive

Table IV: Demographic predictors of employment outcomes

	B	SE	df	<i>p</i>	Exp (B)	95% CI
Sex (with female as the reference category)	0.29	0.07	1	<0.001	1.33	1.15–1.54
Age at application (with 26–54y as the reference category)			2	<0.001		
16–20y	–0.38	0.10	1	<0.001	0.68	0.56–0.83
21–25y	–0.15	0.11	1	0.171	0.86	0.70–1.07
Race (with European-American as the reference category)			4	0.356		
African-American	–0.21	0.11	1	0.053	0.81	0.66–1.00
Native-American	–0.18	0.33	1	0.580	0.83	0.43–1.59
Asian	–0.08	0.23	1	0.724	0.92	0.59–1.44
Hispanic	0.05	0.14	1	0.712	1.05	0.80–1.39
Education level (with bachelor degree or higher as the reference category)			4	<0.001		
Special education	–1.05	0.18	1	<0.001	0.35	0.25–0.50
Less than high school	–0.97	0.17	1	<0.001	0.38	0.27–0.53
High-school graduate	–0.99	0.16	1	<0.001	0.37	0.27–0.50
Some college	–0.91	0.16	1	<0.001	0.40	0.29–0.56
Medical insurance (with 'No' as the reference category)	–0.11	0.07	1	0.126	0.90	0.79–1.03
Cash benefits (with 'No' as the reference category)	–0.43	0.09	1	<0.001	0.65	0.54–0.77
Intellectual disability (with 'No' as the reference category)	0.17	0.13	1	0.191	1.18	0.92–1.53
Epilepsy (with 'No' as the reference category)	0.10	0.20	1	0.612	1.11	0.75–1.64
Constant	1.18	0.15	1	<0.001	3.25	

B, logistic regression coefficient; CI, confidence interval; df, degrees of freedom; Exp (B), odds ratio; SE, standard error.

Table V: Demographic and vocational rehabilitation predictors of employment outcomes

	B	SE	df	<i>p</i>	Exp (B)	95% CI
Sex (with female as the reference category)	0.24	0.08	1	0.002	1.27	1.09–1.48
Age at application (with 26–54y as the reference category)			2	<0.001		
16–20y	–0.39	0.09	1	<0.001	0.68	0.56–0.81
21–25y	–0.15	–0.12	1	0.200	0.86	0.69–1.08
Race (with European-, Asian-, and Hispanic- American as the reference category)	0.13	0.11	1	0.225	1.14	0.92–1.42
Education level (with lower than bachelor degree as the reference category)	1.01	0.16	1	<0.001	2.74	2.02–3.71
Medical insurance (with ‘No’ as the reference category)	–0.12	0.07	1	0.105	0.89	0.77–1.03
Cash benefits (with ‘No’ as the reference category)	–0.61	0.10	1	<0.001	0.55	0.45–0.66
Diagnostics and treatment (with ‘No’ as the reference category)	0.16	0.09	1	0.058	1.18	1.00–1.39
On-the-job training (with ‘No’ as the reference category)	0.43	0.20	1	0.031	1.53	1.04–2.25
Job placement assistance (with ‘No’ as the reference category)	1.03	0.08	1	<0.001	2.80	2.39–3.28
On-the-job support (with ‘No’ as the reference category)	0.84	0.10	1	<0.001	2.33	1.93–2.80
Maintenance (with ‘No’ as the reference category)	0.41	0.11	1	<0.001	1.51	1.21–1.87
Rehabilitation technology (with ‘No’ as the reference category)	0.59	0.10	1	<0.001	1.80	1.48–2.18
Constant	–0.65	0.15	1	<0.001	0.52	

B, logistic regression coefficient; CI, confidence interval; df, degrees of freedom; Exp (B), odds ratio; SE, standard error.

technology for job accommodation and independent living. We also found that the successfully employed group received more services and had higher case expenditures than the unemployed group. In addition, the employed group spent less time in vocational rehabilitation services.

Several findings of this study call for further discussion. First, males with CP receiving vocational rehabilitation services were more likely to experience positive employment outcomes than woman. This finding is consistent with other studies which have suggested that males with disabilities are more likely to become employed and be competitive in the labour market than females with disabilities.^{16–18} Randolph and Andresen¹⁹ note that a greater proportion of females are unemployed in society in general, as are a greater proportion of persons with disabilities, resulting in dual discrimination for females with disabilities. Females with disabilities often experience multiple discriminations such as attitudinal barriers and sex bias, which may exacerbate environmental constraints such as inaccessibility.⁷ The issue of sex disparity in employment rates for persons with disabilities needs further research in order to identify factors that facilitate employment for females with disabilities.

In this study, age at application was identified as an important factor influencing employment outcomes. Individuals in the 26-to-54 year group were more likely to be employed than those aged 16 to 20 years old and 21 to 25 years old. This result concurs with the study of Bottos et al.,²⁰ who reported that, owing to the prolonged needs for education and vocational training, a reduced employment rate for young adults with CP was generally found. In addition, education level at application played a critical role in gaining employment. The results indicated that individuals with a college education had a higher chance of becoming employed after receiving vocational rehabilitation services than those without a college education. This finding is consistent with previous research, suggesting that individuals with disabilities with at least a college education experienced better employment outcomes than indi-

viduals with less education.^{21,22} In a sample of adults with CP aged 27 to 74 years, Murphy et al.¹² found that the most significant factor in achieving employment was education beyond high school.

Unfortunately, persons with disabilities have significantly lower rates of attending college. Recent data show that one in five people with disabilities aged 18 to 34 years do not finish high school, and of those who have earned a high-school degree, only 19% earn a college degree or higher.²³ For persons with CP, acquiring an education may be difficult because of the physical limitations associated with managing simultaneous courses. In addition, students with CP may have learning difficulties and communication problems, which can present additional challenges to the education process. Indeed, having both a physical and a cognitive disability creates educational barriers that can impact employment. Therefore, it is important to develop transition programmes in high schools and have vocational rehabilitation counsellors participate in individualized education programme meetings for students with CP. Collaboration between educators and vocational rehabilitation counsellors will assist young adults with CP in their early career development and job preparation, which may lead to more successful transition from school to work. Indeed, a successful transition programme is likely to allow young adults with CP to find a job that matches their interests and skill level, and thus increase successful employment opportunities.

The results also revealed the adverse effects of cash benefits on employment, with cash benefits (such as SSI and SSDI) in this study reducing the odds of employment. According to Shrey et al.,²⁴ fewer than one per cent of SSDI beneficiaries stopped receiving SSDI when provided with vocational rehabilitation services. Legislative efforts such as the Ticket to Work and Work Incentive Improvement Act of 1999, which provide social security beneficiaries incentives and supports, are needed to prepare for, attach to, or advance in work.²⁵ At present, SSI and/or SSDI recipients are now permitted to work for longer

periods of time with less reduction of financial and medical benefits.²⁶ Despite these legislative efforts, people with disabilities are not well informed about disability benefits and associated legislations; thus, they are often afraid of losing benefits owing to changes in their income and work status.⁷ This lack of information, coupled with the fear-driven motivation to participate in these programmes, keeps people with disabilities in a cycle of poverty and unemployment. Indeed, persons with CP who are receiving SSI and/or SSDI benefits are at higher risk of unemployment, of not living independently, and of obtaining an additional disability.²⁷ Rehabilitation professionals need to assist persons with CP and their family members with access to benefits counselling and financial planning services offered by the Social Security Administration and state vocational rehabilitation agencies.

Among the many vocational rehabilitation services investigated in this study, on-the-job training, job placement assistance, on-the-job support, maintenance, and rehabilitation technology all played a central role in the employment success of people with CP. With regards to job placement assistance, our finding is consistent with the rehabilitation literature that shows that job placement services have a strong positive relationship with employment outcomes for persons with disabilities.²⁸ Our finding that on-the-job training is a predictor of employment is also consistent with the literature. On-the-job support includes work and social skill development tailored specifically to the context, workplace accommodations, and employee education and consumer advocacy. Addressing work and social skills is particularly important for developing the skills necessary to maintain employment. Wadsworth and Harper²⁹ noted that for people with and without disabilities, social skills are a critical factor in maintaining employment, and those who have both the necessary work and social skills are more likely to be hired and experience longevity and career advancement. In addition, identifying and facilitating the necessary accommodations (e.g. the use of augmentative communication devices) needed to reduce the impact of functional limitations on the job is critical for persons with CP. Employers often need education around *how* to accommodate an employee with CP. In addition, disability education and advocacy on behalf of the employee with CP by the vocational rehabilitation counsellor reduces the chances of poor performance, disability harassment, and unfair treatment in the workplace. The finding that maintenance services are important to successful employment outcomes is important to consider. Specifically, maintenance services (e.g. food, clothing, and shelter) and other services (e.g. emergency healthcare) were related to the employment outcomes in individuals with CP. It appears that providing persons with CP who have significant basic-service needs during rehabilitation might have allowed them to better engage in their vocational rehabilitation programme and further help them to achieve better employment outcomes.

Rehabilitation technology is an important service for people with sensory, communicative, and physical

disabilities, particularly with respect to being successful at work. For example, rehabilitation technology services such as a wheelchair, personal assistant, or augmentative communication devices are especially important to increasing the chances of being successful at work for persons with CP. In the study by McNaughton et al.,¹⁶ participants with CP identified rehabilitation technology as an important support for obtaining and maintaining employment. Participants reported that augmentative and alternative communication systems were of particular importance at work, as many people with CP have significant speech impediments. Augmentative and alternative communication systems allow for persons with speech impediments to communicate better with employers and co-workers by improving the quality of speech production (i.e. pacing, pitch, intonation, and emphasis). Nonetheless, there is a dearth of research in this area; further investigation into the rehabilitation technology needs of persons with CP is needed.

Finally, we found that clients in the employed group received more services than clients in the unemployed group; it is possible that counsellors were more willing to spend money and provide services to clients who they thought had a higher chance of being successfully employed, reflecting a selection bias of the counsellors.

Limitations

This study used archival data extracted from the RSA-911 database. A notable problem with using the RSA-911 database can be subjective recall bias. Rehabilitation counsellors handle and enter case service information at various stages in the rehabilitation process. For example, the information regarding type of disability is entered before an eligibility decision is made, and the wage and occupation data are entered when the case is closed. Thus, it is possible that counsellors may rely on recall without consulting the case file to verify which services were delivered. As a result, data on services could be influenced by recall bias. In addition, as with any administrative database, there may be possible input errors. Although the Rehabilitation Services Administration has developed 18 cross-checks to reduce the potential for such errors, an unknown number of errors may still exist. Moreover, the limited data in the RSA-911 database do not allow us to identify specific disability and service information related to CP, such as severity, types of CP, physical function, and types of assistive technology/accommodation services. Therefore, we are limited in our ability to study specific factors associated with employment. Finally, because this study used archival data and employs a cross-sectional design, causality cannot be inferred.

CONCLUSION

In summary, work is a central element of human life and well-being.³⁰ Work is the way in which individuals define themselves in society and a means of participating in society. However, disability often affects work rela-

tionships, employability, and work performance. About 50% of persons with CP were successfully employed after receiving state vocational rehabilitation services compared with the 69% employment rate of people without disabilities. Rehabilitation professionals need to partner with allied health providers more effectively in the medical and educational arena during critical transition periods for persons with CP. Currently there is a gap between the medical and educational systems that serve persons with CP and the vocational rehabilitation service system, resulting in barriers towards receiving employment services and reaching optimal participation in the community.³¹ Effective transition planning offers a natural structure for building important relationships between individuals with CP, their families, medical professionals, special educators, and vocational rehabilitation counsellors.³² The vocational rehabilitation counsellor is a professional who 'assists persons with disabilities in adapting to the environment, assists environments in accommodating the needs of the individual, and works toward full participation of persons with disabilities in all aspects of society, especially work'.³³ Therefore, medical and health professionals and special educators need to invite vocational rehabilitation counsellors into treatment planning so that they can assist the person with CP to maximize their employability, to address their much

needed work adjustment skills, to establish independent living, and to eventually reach their full participation in society.

In addition, it is important for rehabilitation researchers to conduct research that continues to identify factors that contribute to successful employment for persons with CP, and examine factors that prevent, for example, the 30.3% of the unemployed persons with CP in this study, from obtaining and maintaining employment. Finally, it is important to acknowledge that not all individuals with CP are interested in gaining employment; considering each person with CP individually with respect to the appropriateness of this outcome in his or her rehabilitation plan is critical.

ACKNOWLEDGEMENTS

The contents of this paper were developed with support of the Rehabilitation Research and Training Center on Effective Vocational Rehabilitation Service Delivery Practices established at both the University of Wisconsin–Madison and the University of Wisconsin–Stout under a grant from the Department of Education, National Institute on Disability and Rehabilitation Research (NIDRR) grant number PR# H133B100034. However, the contents of this study do not necessarily represent the policy of the US Department of Education, and endorsement by the Federal Government should not be assumed.

REFERENCES

- Best SJ. Cerebral palsy. In: Broadwin MG, Siu FW, Howard J, Broadwin ER, editors. *Medical, Psychosocial and Vocational Aspects of Disability*, 3rd edn. Athens, GA: Elliott & Fitzpatrick, 2009: 305–18.
- Rosenbaum P, Paneth N, Leviton A, et al. A report: the definition and classification of cerebral palsy April 2006. *Dev Med Child Neurol* 2007; **49**(Suppl. 109): 8–14.
- Liptak GS. Health and well-being of adults with cerebral palsy. *Curr Opin Neurol* 2008; **21**: 136–42.
- Stevenson CJ, Pharoah PO, Stevenson R. Cerebral palsy – the transition from youth to adulthood. *Dev Med Child Neurol* 1997; **39**: 336–42.
- Magill-Evans J, Galambos N, Darrah J, Nickerson C. Predictors of employment for young adults with developmental motor disabilities. *Work* 2008; **31**: 433–42.
- O'Grady RS, Nishimura DM, Kohn JG, Bruvold WH. Vocational predictions compared with present vocational status of 60 young adults with cerebral palsy. *Dev Med Child Neurol* 1985; **27**: 775–84.
- Rutkowski S, Riehle E. Access to employment and economic independence in cerebral palsy. *Phys Med Rehabil Clin N Am* 2009; **20**: 535–47.
- Flippo KF, Gardner JF. Employment: it is everybody's business. *Intellect Dev Disabil* 2011; **49**: 305–9.
- Michelsen SI, Udall P, Kejs AMT, Madsen M. Education and employment prospects in cerebral palsy. *Dev Med Child Neurol* 2005; **47**: 511–17.
- Mesterman R, Leitner Y, Yifat R, et al. Cerebral palsy – long-term medical, functional, educational, and psychosocial outcomes. *J Child Neurol* 2010; **25**: 36–42.
- Sillanpaa M, Piekkala P, Pisirici H. The young adult with cerebral palsy and his chances of employment. *Int J Rehabil Res* 1982; **5**: 467–76.
- Murphy KP, Molnar GE, Lankasky K. Employment and social issues in adults with cerebral palsy. *Arch Phys Med Rehabil* 2000; **81**: 807–11.
- Livingston MH, Rosenbaum PL, Russell DJ, Palisano RJ. Quality of life among adolescents with cerebral palsy: what does the literature tell us? *Dev Med Child Neurol* 2007; **49**: 225–31.
- Sung C, Brooks J, Muller V, Chan F, Strand D. Employment and career development. In: Chan F, Bishop M, Chronister J, Lee EJ, Chiu CY, editors. *CRC Examination Preparation: A Concise Guide to the Foundations of Rehabilitation Counseling*. New York: Springer Publishing Company, 2012: 57–80.
- Rehabilitation Services Administration. *Reporting Manual for the Case Service Report (RSA-911)*. Washington, DC: Rehabilitation Services Administration, 2008.
- McNaughton D, Light J, Arnold KB. Getting your wheel in the door: successful full-time employment experiences of individuals with cerebral palsy who use augmentative and alternative communication. *Augment Altern Commun* 2002; **18**: 59–76.
- US Census Bureau. *Survey of Income and Program Participation*, June–September 2002. <http://www.census.gov/sipp/> (accessed 5 June 2013).
- Findley PA, Sambamoorthi U. Employment and disability: evidence from the 1996 medical expenditures panel survey. *J Occup Rehabil* 2004; **14**: 1–11.
- Randolph DS, Andresen EM. Disability, gender, and unemployment relationships in the United States from the behavioral risk factor surveillance system. *Disabil Soc* 2004; **19**: 403–14.
- Bottos M, Feliciangeli A, Sciuto L, Gericke C, Vianello A. Functional status of adults with cerebral palsy and implications for treatment of children. *Dev Med Child Neurol* 2001; **43**: 516–28.
- Marini I, Lee GK, Chan F, Chapin MH, Romero MG. Vocational rehabilitation services patterns related to successful competitive employment outcomes of persons with spinal cord injury. *J Vocat Rehabil* 2008; **28**: 1–13.
- Short PF, Vasey J, Tunceli K. Employment pathways in a large cohort of adult cancer survivor. *Cancer* 2005; **103**: 1291–302.
- Rumbaut RG. Ages, life stages, and generational cohorts: decomposing the immigrant first and second generations in the United States. *Int Migr Rev* 2004; **38**: 1160–205.
- Shrey D, Bangs S, Mark L, Hursh N, Kues J. Returning social security beneficiaries to the work force: a proactive disability employment model. *Rehabil Couns Bull* 1991; **34**: 257–73.
- Wehman P, Revell G. Lessons learned from the provision and funding of employment services for the MR/DD population: implications for assessing the adequacy of the SSA Ticket to Work. *J Disabil Policy Stud* 2005; **16**: 84–101.
- Kregel J. Work incentives planning and assistance: assisting beneficiaries to obtain employment and reduce

- dependence on SSA benefits. *J Vocat Rehabil* 2000; **31**: 1–9.
27. Baker JP, Mixner DB, Harris SD. The State of Disability in America: An Evaluation of the Disability Experience by the Life Without Limits Project. Washington, DC: United Cerebral Palsy, 2009.
28. Bolton B, Bellini J, Brookings J. Predicting client employment outcomes from personal history, functional limitations, and rehabilitation services. *Rehabil Couns Bull* 2000; **44**: 10–21.
29. Wadsworth JS, Harper DC. The social needs of adults with cerebral palsy. *Dev Med Child Neurol* 1993; **35**: 1019–22.
30. Szymanski EM, Parker RM. *Work and Disability: Issues and Strategies in Career Development and Job Placement*, 3rd edn. Austin, TX: Pro-Ed, 2010.
31. Morningstar ME, Turnbull AP, Turnbull HR. What do students with disabilities tell us about the importance of family involvement in the transition from school to adult life? *Except Child* 1996; **62**: 249–60.
32. Oertle KM, Trach JS. Interagency collaboration: the importance of rehabilitation professionals' involvement in transition. *J Rehabil* 2007; **73**: 36–44.
33. Szymanski EM, Parker RM, Ryan C, Merz MA, Trevino-Espinoza B, Johnston-Rodriguez S. *Work and disability: basic concepts*. In: Szymanski EM, Parker RM, editors. *Work and Disability: Issues and Strategies in Career Development and Job Placement*, 2nd edn. Austin, TX: Pro-Ed, 2003: 1–25.

An International Meeting on Developmental Neurology

INSPIRING INFANCY

Interrelations between sensory, motor, and cognitive abilities during typical and atypical development

Organized by the University Medical Center,
Groningen, the Netherlands

May 15-17 2014

Further information:

www.developmentalneurology.com

m.hadders-algra@umcg.nl