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Vocational Rehabilitation Service Patterns and Outcomes for Individuals with Autism of Different Ages

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Abstract Young adults with autism spectrum disorders (ASD) often experience employment difficulties. Using Rehabilitation Service Administration data (RSA-911), this study investigated the service patterns and factors related to the employment outcomes of individuals with ASD in different age groups. Hierarchical logistic regression analyses were conducted to examine the effects of demographic and vocational rehabilitation (VR) service variables on employment outcomes in each age group. The results show that transition youth made up the largest portion of VR service users among the ASD population, yet they have the worst employment outcomes across all age groups. Factors that are significantly associated with increased odds for employment in each age group were identified. Implications from systemic, practical, and research perspectives are also provided.

Keywords Vocational rehabilitation · Employment outcome · Autism spectrum disorder · Transition · Youth

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Introduction

Autism spectrum disorders (ASD), according to the latest Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), is characterized as persistent deficits in social communications and social interactions, and by restricted, repetitive patterns of behaviors, interests, or activities. It has been recognized as a lifelong neurodevelopmental condition. According to the U.S. Department of Education, from 1996 to 2005 the number of students with ASD who are 6–11 years old increased by 410 %, whereas those who are 14–17 years old increased by 514 %, and there was a 317 % increase of students who are between 18 and 21 years old and have been diagnosed with ASD (U.S. Department of Education 2007). Those children who were first diagnosed with ASD in the 1990s are now reaching their adulthood (Gerhardt and Lainer 2011; Roux et al. 2013). Shattuck et al. (2012b) estimated that every year there are approximately 50,000 individuals with ASD turning 18 years old in the United States. The demands of specific age-appropriate services, such as postsecondary education, employment, residence, and community participation for these young adults, have significantly increased over the past few years (Gerhardt and Lainer 2011; Howlin 2008).

Employment as the most desirable social achievement for young adults, including those with disabilities (Hendricks 2010), has already been adopted as the priority of services for adults with disabilities in many states (Kiernan et al. 2011; Migliore et al. 2014). It has been well recognized that participation in employment, resulting job-related social status, and increased financial independence are essential components of adult life (Gerhardt and Lainer 2011; Roux et al. 2013). Being employed means earning one's own living, contributing to society, integrating into a

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social network, being seen as part of society, and being less reliant on taxpayer-funded programs. Additionally, studies show that employment can promote personal dignity, build up self-esteem, develop a sense of purpose in life, and improves the adaptive skills, mental health, and cognitive performance of individuals with ASD (Hurlbutt and Chalmers 2004; Mawhood and Howlin 1999; Stephens et al. 2005). Furthermore, successful employment is correlated with the degree of beneficial social immersion, which in turn contributes to better long-term quality of life (García-Villamisar et al. 2002).

Nevertheless, limited research has focused on employment for adults with ASD, and the employment outcomes for this population are substantially unsatisfactory. Studies indicate that employment is one of the most challenging aspects that many adults with ASD particularly struggle with (e.g., Müller et al. 2008), and unemployment and underemployment are profound issues for these adults. However, the situation has not been improved over the decades (Bennett and Dukes 2013; Howlin et al. 2004; Taylor and Seltzer 2011). Shattuck et al. (2012a, b) examined the National Longitudinal Transition Study-2 (NLTS2) and reported that only 55 % of young adults with ASD had been employed at least once in their first 6 years after high school, which was the lowest rate when compared with other developmental disability groups. They also found that youth with ASD, especially those who just graduated from high school (usually within 2 years), had the lowest employment rate. Similar results were also reported by Roux et al. (2013), showing that only 53 % of young adults with ASD ever had a paid job since leaving school, which is significantly lower than the employment rate of the general population (98 %), and of young people with other developmental disabilities (62–80 %). Vast concerns and huge employment related services needs for individuals with ASD in their immediate years after leaving school clearly show the need for more research and practice.

Authorized by the Rehabilitation Act of 1973, vocational rehabilitation (VR) services are provided to assist individuals with disabilities to maximize their employment outcomes that are consistent with their psychology and psychosocial functioning (Dutta et al. 2008). The VR program is one of the few formal systems that provides employment support to individuals with disabilities since their transition age (Lawer et al. 2009), and it serves approximately 1 million individuals annually (Chan et al. 2014). Previous studies have shown that VR services play a pivotal role in helping individuals with disabilities attain and retain competitive employment; however, these services continue to be underutilized by people with ASD. It was reported that adults with ASD only make up a very small proportion (0.6–3 %) of the total service users (Dew and Alan 2007; Lugas et al. 2010), although it is estimated that there are about 7 % of people with ASD in the total disability population (CDC 2013, 2014). Additionally, researchers indicate that the VR services provided to individuals with ASD are less than optimal (Burgess and Cimera 2014; Lawer et al. 2009), or virtually non-existent (Müller et al. 2003). Other studies also point out that the current VR system is inadequately prepared to support individuals on the spectrum to face their unique challenges in future employment (Dew and Alan 2007). Lawer et al. (2009) revealed that many individuals on the spectrum have been found to be ineligible or have been denied by the VR system, due to the "less degree of severity" nature of their disability when compared to other disability groups. Even for those who enter the system and successfully obtain employment, the majority are believed to be underemployed when considering their working competency (Hendricks 2010; Howlin et al. 2004). Individuals with ASD are found working fewer hours and earning lower wages, when compared to other disability groups in the system (Cimera and Cowan 2009; Lawer et al. 2009).

Despite the poor employment outcomes and lack of proper VR services for this population, recent studies have otherwise demonstrated an increase in the number of individuals with ASD who are seeking rehabilitation services. Cimera and Cowan (2009) reported 121 % growth in the number between 2002 and 2006, and Migliore et al. (2014) reported another 130 % increase from 2006 to 2010. Along with this change, researchers have also identified another interesting trend—the age of individuals with ASD entering the VR system is relatively younger than other disability groups. In Cimera and Cowan's study (2009), the average age for individuals with ASD is 28.8 years, whereas the average age for the overall VR service users is 39.3 years. Also, according to Migliore et al. (2014), the majority (85 %) of people with ASD who sought services were between 16 and 26 years old. This trend of younger service users again indicates the strong age-appropriate rehabilitation needs, which add new challenges to the current VR system.

To date, research focused on identifying effective vocational interventions has received relatively less attention than identifying the barriers to employment. Also, there is a big lack of research in understanding and preparation for accommodating the unique needs of transition-aged individuals with ASD within the VR system (Howlin 2013). Only six studies were found in literature—three of them highlighted poor employment outcomes among individuals with ASD right after exiting high school, yet none exam-

ined the related services that could promote successful transition outcomes (Roux et al. 2013; Shattuck et al. 2012a; Taylor and Seltzer 2011). The relatively small sample and the non-service oriented dataset used for this kind of study limits discussion and further exploration of the issues. The other three studies focused on the provision of VR services as predictors of employment outcomes for adults with ASD (Lawer et al. 2009; Migliore et al. 2012; Schaller and Yang 2005). The findings all suggested that job placement, job maintenance, and on-the-job support are critical factors for positive employment outcomes of individuals with ASD. Yet all these results were based on a wide-age-range sample (usually 16–26, or 16 and above); none examined the service patterns that vary by the age differences.

Therefore, research that focuses on transition age, rather than a broader age range, is indeed important and necessary for helping rehabilitation professionals to understand the transition process of youth with ASD. The present study used a large national database to examine the associations between VR services provided and employment outcomes among people with ASD, taking different age groups into consideration. It also examined the different service patterns for successful employment among transition-aged individuals with ASD, when compared to their adult counterparts.

In this study, the RSA-911 dataset was used; it contains information about demographic characteristics, types of VR services received, the costs and duration of services, and other employment-related outcomes, such as employment status, hourly wages, and weekly work hours. Three different age groups of VR service-users with ASD were included in this study; they were (1) "transition youth" who were 18 years old or below; (2) "transition young adults" who were between 19 and 25 years old; and (3) "adults" who were 26 years old or above. We expected to produce a more accurate picture of the usage pattern of VR services and related employment outcomes, especially the positive predictors for competitive employment in different age groups. Specifically, the following research questions were investigated in this study:

1. What are the employment outcomes (i.e., employment status, hourly wage, and weekly work hours) of individuals with ASD in different age groups?
2. How do demographic covariates and cash or medical benefits associate with employment outcomes among individuals with ASD in different age groups?
3. What rehabilitation services are related to the successful employment outcomes of individuals with ASD in different age groups, and who receive services from the VR system?

Methods

Participants

The data used in this study was extracted from the U.S. Department of Education's Rehabilitation Service Administration Case Services Report database (RSA-911). Information about service users' individual characteristics, type of services received, and employment outcomes are annually provided to this database by state vocational rehabilitation (VR) agencies across the country. The dataset of fiscal year (FY) 2011, which was the most recent national data file available at the time of the study, was used for analyses. A total number of 5681 individuals with autism who met the following criteria were selected as the participants in this study: (a) had autism diagnosis as either a primary or a secondary disability; (b) received VR services based on their Individualized Plan for Employment (IPE); (c) was not employed when applied for VR services; and (d) exited the VR system either successfully rehabilitated (i.e., competitively employed) or unsuccessfully rehabilitated (i.e., not able to be employed). Individuals with ASD as their secondary disability ($N = 745$) were included in this study because the distinction between primary and secondary disability in the RSA-911 dataset is not based on a diagnosis (Migliore et al. 2012). We also confirmed the possibility that "primary" and "secondary" disability refer to people with a similar level of autism, by examining their gender ratios. We excluded people who were employed when they applied for VR services ($N = 675$). We also excluded people who met the first three criteria but exited the system with non-competitive employment or extended employment ($N = 124$), because there is no detailed information for further understanding of their employment status at closure. The participants in this study represented 60 % ($n = 5681$) of the people with ASD who exited the VR program in FY2011; the rest ($n = 4983$) exited the system without receiving services due to a variety of reasons, such as being ineligible or decided to exit on their own. For those who received services, they only represented 1 % of the disability population being served in the VR system ($n = 589{,}773$).

For the purpose of this study, the sample was further divided into three subgroups according to individuals' age at application. Considering the definitions of transition age, both in IDEA and VR services (National Dissemination Center for Children with Disabilities 2013; Sheldon Jr and Golden 2005), the three subgroups in the current study included those who were 18 years old or younger (48 %) as the "Transition youth" group, those who were between 19 and 25 years old (38 %) as the "Transition young adults"

group, and those who were 26 years old or older (14 %) as the "Adults" group.

Variables

Dependent Variables

The dependent variables in this study were the VR outcomes at closure, including employment status, hourly wage, and weekly work hours. Two employment statuses were included as the primary dependent variable in the study: successful outcome (i.e., competitive employment) and unsuccessful outcome. "Competitive employment" is defined in the RSA-911 manual as employment in an integrated setting, self-employment, or employment in a state-managed Business Enterprise Program (BEP, which refers to vending facilities and small businesses operated by individuals with significant disabilities as well as home industries that fall under the management of the state VR agency) that is performed on a full-time or part-time basis, and for which an individual is compensated at or above the minimum wage. "Unsuccessful outcome" refers to clients who were not working at all after exiting their planned VR program. The other two dependent variables (i.e., hourly wages and weekly work hours) only applied to individuals who achieved a competitive employment outcome.

Independent Variables

The two sets of predictor variables used in this study were demographic characteristics and VR services. The first set of predictor variables (i.e., individual characteristics) included gender, race/ethnicity, co-occurring psychiatric disabilities (i.e., depression and anxiety), co-occurring intellectual disability, sources of referral, educational level at application, educational level at closure, and work disincentives (i.e., receiving SSI/SSDI benefits and/or Medicare/Medicaid benefits) (Chan et al. 2008). The second set of predictor variables (i.e., information about VR services) included cost of services, duration of services, and each of the types of VR services provided (see Table 1 for detailed description).

Data Analysis

Data were analyzed using SPSS 22.0. Chi-square tests and one-way ANOVAs were performed to examine the difference in employment outcomes among different age groups (i.e., employment status, hourly wages, and weekly work hours). A separate hierarchical logistic regression analyses was conducted for each age group, to examine the effect of demographic covariates and VR service variables on employment outcomes. Individual demographics were entered in step 1 to examine their unique effects on employment outcomes, whereas different types of services were entered into the model in step 2.

Results

Descriptive Statistics

In FY2011, a total of 2961 people were competitively employed after receiving VR services (successful employment rate = 52 %). (See Table 2 for the demographic characteristics of the sample and the case service information in each subgroup.) The successful employment rates were significantly different between the three age groups [$\chi^2(2, N = 5681) = 60.98$, $p < .001$]. Only 47 % of the transition youth were competitively employed after receiving services, which is significantly lower than the transition young adults (55 %) and the adults (61 %) on the spectrum.

Further comparisons were conducted among the individuals who achieved competitive employment outcomes between different age groups. Although there was no significant difference in weekly work hours among the three subgroups [F (2, 2960) = 1.60, p = .203], the adult group [M = 9.43, SD = 3.74; F (2, 2960) = 14.26, $p < .001$] earned a significantly higher hourly wage than the transition young adults (M = 8.75, SD = 2.58) and the transition youth (M = 8.54, SD = 3.32), respectively. The results also showed that it took a significantly longer time for the transition youth to move from application to eligibility determination for VR services (M = 46.00, SD = 74.07; F (2, 2960) = 12.32, $p < .001$), when compared to the transition young adult group (M = 35.06, SD = 49.52) or the adult group (M = 34.38, SD = 43.37). No significant difference in length of time was found between the two adult groups (p = 1.000). Moreover, the transition youth group was also found to spend the longest time in using services after the service plan had been developed [M = 800.54, SD = 639.55; F (2, 2960) = 115.45, $p < .001$], whereas the transition young adults (M = 524.45, SD = 423.72) spent significantly more time in services when compared to their adult counterparts (M = 466.42, SD = 397.26).

In addition, there were significant differences, both in the number of services [F (2, 2960) = 15.14, $p < .001$] and the cost of services [F (2, 2960) = 5.73, p = .003], among the three age groups of individuals who were successfully employed. Specifically, the transition youth group received significantly more services (M = 5.18, SD = 2.34) than the transition young adults (M = 4.74, SD = 2.21) and adults (M = 4.68, SD = 2.11). Moreover, the average case expenditure for the transition youth group

Table 1 Description of services provided by state VR agencies

Types of services	Descriptions of services
Assessment	Services provided and activities performed to determine an individual's eligibility for VR services, to assign an individual to a priority category of a state VR agency that operates under an order of selection, and/or to determine the nature and scope of VR services to be included in the individual plan for employment (IPE); 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
Counseling and guidance	Discrete therapeutic counseling and guidance services necessary for an individual to achieve an employment outcome, including personal adjustment counseling; counseling that addresses medical, family, or social issues; vocational counseling; and any other form of counseling and guidance necessary for an individual with a disability to achieve an employment outcome; this service is distinct from the general counseling and guidance relationship that exists between the counselor and the individual during the entire rehabilitation process
College or university training	Full-time 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
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 programs 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 labor market
Job readiness training	Training to prepare an individual for the world of work (e.g., appropriate work behaviors, 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 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 supports	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 VR service; includes adequate training in the use of public transportation vehicles and systems
Maintenance services	Maintenance means monetary support provided for those expenses such as food, shelter and clothing that are in excess of the normal expenses of the individual, and that are necessitated by the individual's participation in an assessment for determining eligibility and VR needs or while receiving services under an individualized plan for employment (IPE)
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
Reader services	Services for individuals who cannot read print because of blindness or other disability; includes reading aloud and transcribing printed information into Braille or sound recordings if requested by the individual; generally are offered to individuals who are blind or deaf-blind but may also be offered to individuals unable to read because of serious neurological disorders, specific learning disabilities, or other physical or mental impairments
Interpreter services	Sign language or oral interpretation services performed by specially trained persons for individuals who are deaf or hard of hearing, and tactile interpretation services for individuals who are deaf-blind; includes real-time captioning services; does not include language interpretation

Table 1 continued

Types of services	Descriptions of services
Personal attendant services	Those personal services that an attendant performs for an individual with a disability such as bathing, feeding, dressing, providing mobility and transportation, and so on
Technical assistance services	Technical assistance and other consultation services provided to conduct market analyses, to develop business plans, and to provide resources to individuals in the pursuit of self-employment, telecommuting, and small business operation outcomes
Information and referral services	Services provided to individuals who need assistance from other agencies (through cooperative agreements) not available through the VR program
Other services	All other VR services that cannot be recorded elsewhere; included here are occupational licenses, tools and equipment, initial stocks and supplies, and medical care for acute conditions arising during rehabilitation and constituting a barrier to the achievement of an employment outcome

Table 2 Demographic characteristics for clients with ASD of each age group (N = 5681)

	Transition youth (n = 2718)	Transition young adults (n = 2162)	Adults (n = 801)
Successfully employment or not			
Competitively employed	1280 (47.1 %)	1192 (55.1 %)	489 (61.0 %)
Unemployed	1438 (52.9 %)	970 (44.9 %)	312 (39.0 %)
Gender			
Male	2290 (84.3 %)	1812 (83.9 %)	669 (83.5 %)
Female	428 (15.7 %)	349 (16.1 %)	132 (16.5 %)
Race			
White American	2172 (79.9 %)	1705 (78.9 %)	678 (84.6 %)
Black/African American	249 (9.2 %)	223 (10.3 %)	63 (7.9 %)
Others	297 (10.9 %)	234 (10.8 %)	60 (7.5 %)
Co-occurring psychiatric disabilities			
Yes	303 (11.2 %)	292 (13.5 %)	182 (22.7 %)
No	2415 (88.8 %)	1870 (86.5 %)	619 (77.3 %)
Co-occurring intellectual disability			
Yes	189 (7.0 %)	234 (10.8 %)	75 (9.4 %)
No	2529 (93.0 %)	1928 (89.2 %)	726 (90.6 %)
Source of referral			
Educational institution	2180 (80.2 %)	737 (34.1 %)	17 (2.1 %)
Public or private service agency	112 (4.1 %)	368 (17.0 %)	229 (28.6 %)
Self-referral	152 (5.6 %)	525 (24.3 %)	308 (38.5 %)
Others	274 (10.1 %)	532 (24.6 %)	247 (30.8 %)
Educational level at application			
Less than HS	1910 (70.3 %)	493 (22.8 %)	48 (6.0 %)
Special education	451 (16.6 %)	455 (21.0 %)	118 (14.7 %)
HS diploma or equivalency	322 (11.8 %)	822 (38.0 %)	315 (39.3 %)
Postsecondary education	35 (1.3 %)	392 (18.1 %)	320 (40.0 %)
Educational level at closure			
Less than HS	478 (17.6 %)	169 (7.8 %)	39 (4.9 %)
Special education	520 (19.1 %)	508 (23.5 %)	109 (13.6 %)
HS diploma or equivalency	1197 (44.0 %)	994 (43.7 %)	312 (39.0 %)
Postsecondary education	523 (19.2 %)	541 (25.0 %)	341 (42.6 %)
Work disincentives			
Yes	889 (32.7 %)	984 (45.5 %)	369 (46.1 %)
No	1829 (67.3 %)	1178 (54.5 %)	432 (53.9 %)

Table 3 Differences in use of VR services between three age groups

Type of services	Transition youth (n = 2718)	Transition young adults (n = 2162)	Adults (n = 801)	χ^2	p
Assessment_used	1888 (69.5 %)	1418 (65.6 %)	632 (66.4 %)	8.81	.012
Diagnosis and treatment of impairments_used	621 (22.8 %)	488 (22.6 %)	219 (27.3 %)	8.23	.016
Counseling and guidance_used	1658 (61.0 %)	1329 (61.5 %)	479 (59.8 %)	.69	.710
College or university training_used	397 (14.6 %)	156 (7.2 %)	27 (3.4 %)	119.32	<.001
Occupational/vocational training_used	249 (9.2 %)	157 (7.3 %)	47 (5.9 %)	11.56	.003
On-the-job training_used	160 (5.9 %)	139 (6.4 %)	43 (5.4 %)	1.32	.515
Basic academic remedial or literacy training_used[a]	80 (2.9 %)	31 (1.4 %)	2 (0.2 %)	28.55	<.001
Job readiness training_used	662 (24.4 %)	512 (23.7 %)	171 (21.3 %)	3.10	.213
Disability-related, augmentative skills training_used[a]	62 (2.3 %)	36 (1.7 %)	15 (1.9 %)	2.41	.300
Miscellaneous training_used	560 (20.6 %)	278 (12.9 %)	77 (9.6 %)	82.55	<.001
Job search assistance_used	774 (28.5 %)	704 (32.6 %)	261 (32.6 %)	11.17	.004
Job placement assistance_used	1148 (42.2 %)	1089 (50.4 %)	448 (55.9 %)	60.06	<.001
On-the-job supports_used	848 (31.2 %)	928 (42.9 %)	348 (43.4 %)	85.75	<.001
Transportation services_used	589 (21.7 %)	510 (23.6 %)	210 (26.2 %)	7.80	.020
Maintenance services_used	249 (9.2 %)	191 (8.8 %)	81 (10.1 %)	1.15	.564
Rehabilitation technology_used[a]	89 (3.3 %)	42 (1.9 %)	16 (2.0 %)	9.76	.008
Reader services_used[a]	1 (0.0 %)	1 (0.0 %)	0 (0.0 %)	.36	.836
Interpreter services_used[a]	4 (0.1 %)	3 (0.1 %)	2 (0.2 %)	.50	.780
Personal attendant services_used[a]	6 (0.2 %)	5 (0.2 %)	3 (0.4 %)	.63	.731
Technical assistance services_used[a]	14 (0.5 %)	11 (0.5 %)	5 (0.6 %)	.17	.921
Information and referral services_used	558 (21.6 %)	407 (18.8 %)	147 (18.4 %)	7.69	.021
Other services_used	751 (27.6 %)	508 (23.5 %)	186 (23.2 %)	13.26	.001

[a] Basic academic remedial or literacy training, disability-related, augmentative skills training, rehabilitation technology, reader services, interpreter services, personal attendant services and technical assistance services were exclude in the further regression analyses, since the sample participants receiving these services was minuscule (<5 %)

($M = 6282.62$, $SD = 6541.02$) was higher than for the adults ($M = 5240.81$, $SD = 4839.44$).

There were 23 types of services provided by the state VR system. The percentages of different types of VR services received by each age group are presented in Table 3. There were seven services received by <5 % of the sample participants, and they were excluded from further regression analyses, including basic remedial or literacy, augmentative skills training, rehabilitation technology, reader services, interpreter services, personal attendant services, and technical assistance services. Among the services received by over 5 % of the clients, six of them were received by the transition-aged group significantly more than by the adult group; they were assessment [$\chi^2(2, N = 5681) = 8.81$, $p = .012$]; college or university training [$\chi^2(2, N = 5681) = 119.32$, $p < .001$]; occupational/vocational training [$\chi^2(2, N = 5681) = 11.56$, $p = .003$]; miscellaneous training [$\chi^2(2, N = 5681) = 82.55$, $p < .001$]; information and referral services [$\chi^2(2, N = 5681) = 7.69$, $p = .021$]; and other services [$\chi^2(2, N = 5681) = 13.26$, $p = .001$]. In contrast, the adult group received significantly more than the transition-aged group in five of the services, which were diagnosis and treatment of impairment [$\chi^2(2, N = 5681) = 8.23$, $p = .016$], job search assistance [$\chi^2(2, N = 5681) = 11.17$, $p = .004$], job placement assistance [$\chi^2(2, N = 5681) = 60.06$, $p < .001$], on-the-job support [$\chi^2(2, N = 5681) = 85.75$, $p < .001$], and transportation services [$\chi^2(2, N = 5681) = 7.80$, $p = .002$]. There were no significant differences in usage among the rest of the four service areas, i.e., VR counseling and guidance, on-the-job training, job readiness training, and maintenance services.

Logistic Regression Analyses

A hierarchical logistic regression was computed separately for each of the three age groups, to examine the relationship between demographic characteristics, VR service patterns, and employment status (i.e., competitively employed vs. unemployed). The results of the logistic regression analyses are presented in Table 4.

Table 4 Binary logistic regression coefficients and odd ratios for the final models

	Transition youth				Transition young adults				Adults			
	B	*OR*	95 % CI		B	*OR*	95 % CI		B	*OR*	95 % CI	
			Lower	Upper			Lower	Upper			Lower	Upper
STEP 1[a]												
Gender	−0.32	0.72**	0.57	0.92	−0.04	0.96	0.73	1.26	−0.27	0.76	0.50	1.17
Race												
Black/African American	0.13	1.14	0.84	1.54	−0.34	0.71*	0.51	1.00	−0.03	0.97	0.53	1.77
Other	−0.17	0.85	0.64	1.11	−0.25	0.78	0.56	1.08	−0.02	0.98	0.52	1.84
Co-occurring psychiatric disability	−0.21	0.81	0.62	1.06	−0.46	0.63**	0.47	0.85	−0.27	0.76	0.52	1.12
Co-occurring intellectual disability	−0.16	0.85	0.61	1.20	−0.16	0.85	0.61	1.20	−0.22	0.80	0.44	1.47
Source of referral												
Educational institution	0.27	1.31	0.90	1.91	−0.10	0.91	0.68	1.21	0.05	1.05	0.35	3.13
Public or private service agency	0.12	1.13	0.65	1.94	−0.19	0.83	0.61	1.14	−0.09	0.91	0.61	1.37
Others	0.16	1.18	0.76	1.83	−0.20	0.82	0.62	1.09	−0.08	0.92	0.62	1.37
Educational level at application												
Special education	−0.23	0.80	0.61	1.04	0.17	1.18	0.78	1.79	−0.67	0.51	0.07	3.89
HS diploma or equivalency	−0.09	0.92	0.69	1.21	0.19	1.21	0.84	1.74	−1.83	0.16	0.02	1.16
Postsecondary education	−0.38	0.69	0.31	1.52	0.10	1.10	0.65	1.86	−1.32	0.27	0.03	2.06
Educational level at closure												
Special education	0.37	1.45*	1.05	2.00	0.30	1.36	0.80	2.29	0.59	1.81	0.21	15.77
HS diploma or equivalency	0.73	2.07***	1.61	2.65	0.49	1.64*	1.02	2.62	1.80	6.03	0.74	48.93
Postsecondary education	0.75	2.12***	1.57	2.86	0.97	2.65***	1.49	4.69	1.52	4.55	0.53	39.25
Work disincentives	−0.57	0.57***	0.47	0.68	−0.47	0.62***	0.51	0.77	−0.51	0.60***	0.42	0.84
Days from service planned to case closure												
300–549 days	−0.30	0.74*	0.57	0.96	−0.47	0.62***	0.48	0.80	−0.74	0.47***	0.31	0.72
550–899 days	−0.53	0.59***	0.45	0.76	−1.01	0.36***	0.27	0.48	−1.66	0.19***	0.12	0.30
More than 900 days	−0.91	0.40***	0.31	0.52	−1.81	0.16***	0.12	0.22	−2.10	0.12***	0.07	0.21
Costs of services												
$750.00–$2999.99	0.25	1.28*	1.01	1.62	0.46	1.58***	1.20	2.08	0.40	1.49	0.96	2.32
$3000.00–$6499.99	1.45	4.27***	3.37	5.41	1.81	6.12***	4.61	8.12	1.30	3.68***	2.32	5.85
More than $6500.00	2.22	9.17***	7.11	11.83	2.82	16.71***	11.99	23.29	2.66	14.35***	7.98	25.81
STEP 2[a]												
Gender	−0.37	0.69**	0.53	0.90	−0.02	0.98	0.73	1.31	−0.16	0.85	0.53	1.37
Race												
Black/African American	−0.02	0.98	0.70	1.37	−0.41	0.66*	0.46	0.96	−0.20	0.82	0.40	1.65
Other	−0.16	0.85	0.63	1.15	−0.22	0.81	0.57	1.15	0.26	1.30	0.64	2.65
Co-occurring psychiatric disability	−0.21	0.81	0.60	1.10	−0.34	0.71*	0.52	0.97	−0.50	0.60*	0.39	0.93
Co-occurring intellectual disability	−0.26	0.77	0.52	1.13	−0.18	0.84	0.58	1.22	−0.27	0.76	0.38	1.53
Source of referral												
Educational institution	0.36	1.44	0.96	2.17	0.03	1.03	0.75	1.42	0.42	1.53	0.44	5.31
Public or private service agency	0.10	1.11	0.61	2.03	−0.31	0.73	0.52	1.03	−0.46	0.63	0.40	1.01
Others	0.22	1.25	0.77	2.02	−0.10	0.90	0.66	1.23	−0.15	0.86	0.56	1.33

Table 4 continued

	Transition youth				Transition young adults				Adults			
	B	*OR*	95 % CI		B	*OR*	95 % CI		B	*OR*	95 % CI	
			Lower	Upper			Lower	Upper			Lower	Upper
Educational level at application												
Special education	−0.37	0.69*	0.51	0.93	0.22	1.25	0.80	1.95	−0.17	0.85	0.06	11.30
HS diploma or equivalency	−0.08	0.92	0.68	1.26	0.18	1.20	0.81	1.78	−1.16	0.31	0.03	3.63
Postsecondary education	−0.36	0.70	0.29	1.68	0.00	1.00	0.57	1.78	−1.25	0.29	0.02	3.70
Educational level at closure												
Special education	0.60	1.83***	1.28	2.61	0.36	1.43	0.81	2.51	0.16	1.18	0.08	17.80
HS diploma or equivalency	0.72	2.05***	1.55	2.72	0.55	1.73*	1.04	2.86	0.93	2.54	0.20	32.24
Postsecondary education	1.03	2.80***	1.96	3.99	1.18	3.27***	1.73	6.16	1.26	3.52	0.25	49.82
Work disincentives	−0.69	0.50***	0.41	0.62	−0.47	0.63***	0.50	0.79	−0.76	0.47***	0.32	0.69
Days from service planned to case closure												
300–549 days	−0.29	0.75*	0.56	1.00	−0.52	0.60***	0.45	0.79	−0.90	0.41***	0.26	0.65
550–899 days	−0.49	0.62***	0.46	0.82	−0.94	0.39***	0.28	0.53	−1.69	0.18***	0.11	0.31
More than 900 days	−0.98	0.38***	0.28	0.50	−1.65	0.19***	0.14	0.27	−2.37	0.09***	0.05	0.17
Costs of services												
$750.00–$2999.99	−0.07	0.94	0.72	1.22	0.28	1.33	0.98	1.80	0.25	1.28	0.77	2.13
$3000.00–$6499.99	0.73	2.07***	1.56	2.73	1.41	4.10***	2.96	5.67	0.79	2.21***	1.28	3.81
More than $6500.00	1.29	3.63***	2.66	4.94	2.14	8.53***	5.79	12.56	2.11	8.22***	4.07	16.59
VR services[b]												
Assessment	0.02	1.02	0.83	1.26	−0.21	0.81	0.64	1.02	0.05	1.05	0.70	1.55
Diagnosis	−0.11	0.90	0.71	1.13	0.05	1.05	0.81	1.36	−0.04	0.96	0.63	1.46
Counseling and guidance	0.55	1.74***	1.40	2.16	0.56	1.75***	1.37	2.25	0.69	2.00***	1.32	3.03
College or university training	0.39	1.48*	1.09	2.02	−0.15	0.86	0.56	1.33	−0.04	0.96	0.34	2.73
Occupational/vocational training	0.54	1.72**	1.22	2.42	−0.02	0.98	0.64	1.49	0.76	2.13	0.96	4.74
On-the-job training	0.45	1.56*	1.02	2.39	−0.05	0.95	0.60	1.50	0.73	2.07	0.77	5.53
Job readiness training	0.23	1.26	0.99	1.59	0.09	1.09	0.83	1.44	−0.45	0.64	0.40	1.03
Miscellaneous training	0.15	1.16	0.91	1.47	0.10	1.10	0.79	1.53	0.59	1.81	0.97	3.40
Job search assistance	0.24	1.27	1.00	1.63	0.10	1.10	0.84	1.45	0.18	1.19	0.76	1.88
Job placement assistance	1.05	2.85***	2.32	3.51	1.11	3.03***	2.39	3.85	1.20	3.30***	2.23	4.89
On-the-job support	1.39	4.02***	3.21	5.03	1.12	3.06***	2.42	3.87	1.32	3.75***	2.47	5.70
Transportation	−0.03	0.97	0.76	1.24	−0.23	0.79	0.61	1.04	0.12	1.12	0.72	1.75
Maintenance	0.16	1.18	0.85	1.64	0.05	1.05	0.71	1.54	0.39	1.48	0.79	2.79
Info and referral	−0.13	0.88	0.68	1.14	−0.44	0.65**	0.48	0.88	0.08	1.08	0.64	1.81
Other services	0.22	1.25*	1.00	1.56	0.23	1.25	0.96	1.64	0.01	1.01	0.64	1.61

OR odds ratio. 95 % CI = 95 % confidence intervals

*** $p < .001$; ** $p < .01$; * $p < .05$

[a] Demographic covariates: gender (with men as the reference category), race/ethnicity (with European American as the reference category), co-occurring psychiatric disabilities (with no psychiatric disabilities as the reference category), co-occurring intellectual disability (with no intellectual disability as the reference category), source of referral (with self-referral as the reference category), educational level at application (with less than high school as the reference category), educational level at closure (with less than high school as the reference category), work disincentive (with not receiving cash benefits as the reference category), cost of services (categorized by quartile; and with < $749.99 as the reference group) and days from service planned to case closure (categorized by quartile; and with <299 days as the reference group)

[b] All the VR services are using not receiving services as the reference group

Overall, the omnibus tests for the final logistic regression models of the three groups were found to be statistically significant, which indicates that there was a significant effect for the combined predictor variables on employment status [transition youth group: $\chi^2(36, N = 2718) = 1015.03$, $p < .001$; transition young adult group: $\chi^2(36, N = 2162) = 880.84$, $p < .001$; and adult group: $\chi^2(36, N = 801) = 316.33$, $p < .001$]. The Nagelkerke R^2 ranged from .42 for the transition youth group, to .45 for the transition young adult group, and .44 for the adult group, indicating relatively large effect sizes for associations between predictor variables and employment outcomes. None of the Hosmer and Lemshow goodness of fit tests for any of the three regression models was significant ($p < .05$), indicating that all the final models fit the data reasonably well.

In the first step, demographic covariates were entered as predictors of employment status at closure, including gender, race/ethnicity, co-occurring psychiatric disabilities, co-occurring intellectual disabilities, sources of referral, educational levels at application, educational levels at closure, work disincentives, days from service planned to case closure, and costs of services. In the second step, the effects of the demographic covariates were controlled, and fifteen VR service usage variables were entered into the models as predictors of competitive employment status at closure.

After all the variables were entered in steps 1 and 2, the results revealed that work disincentives, duration of using VR services, and cost of VR services were found to be significant predictors for employment outcomes in all three age groups. Also, these variables appeared to share a similar pattern in predicting the competitive employment outcomes for each age group. Specifically, individuals who received cash or medical benefits prior to receiving VR service had a 37–53 % reduction in chances of obtaining employment in each age group, respectively (transition youth: *OR* 0.50; 95 % CI 0.41–0.62; transition young adults: *OR* 0.63; 95 % CI 0.50–0.79; and adults: *OR* 0.47; 95 % CI 0.32–0.69). Individuals who had higher case expenditures, generally were more likely to obtain employment in comparison to those who had <$750 case expenditures ($p < .001$). However, individuals who stayed in the VR system for services for a longer period of time were less likely to find employment, compared to those who received services for <300 days before they exited the VR system ($p < .001$). In addition, educational level at closure was a significant predictor for both transition groups but not the adult group. Specifically, when compared to those who had less than a high school degree, individuals having postsecondary education at closure had significant increases of 2.80 times to 3.27 times in the chances of obtaining competitive employment (transition youth group: *OR* 2.80; 95 % CI 1.96–3.99; transition young adult group: *OR* 3.27; 95 % CI 1.73–6.16). Other variables, such as gender, race/ethnicity, co-occurring psychiatric disabilities, and educational level at application, had different prediction effects in particular age group. In terms of VR services, the results showed that three of the services strongly predicted successful employment outcomes across all age groups, which were counseling and guidance, job placement assistance, and on-the-job support. Specifically, in the transition youth group, individuals who received on-the-job support services were 4.02 times more likely to be employed (*OR* 4.02; 95 % CI 3.21–5.03), 3.06 times more likely to be employed in the transition young adult group (*OR* 3.06; 95 % CI 2.42–3.87), and 3.75 times more likely to be employed in adult group (*OR* 3.75; 95 % CI 2.47–5.70). As for job placement assistance and counseling and guidance, they shared relatively similar predictive patterns for each age group (job placement assistance: *OR* 2.85–3.30; counseling and guidance: *OR* 1.74–2.00).

Additionally, for the two transition-aged groups, several other VR service variables were also found to predict significantly the employment outcomes. For the transition youth group, there were four additional significant service variables, including college or university training (*OR* 1.48; 95 % CI 1.09–2.02), occupational or vocational training (*OR* 1.72; 95 % CI 1.22–2.42), on-the-job training (*OR* 1.56; 95 % CI 1.02–2.39), and other services (*OR* 1.25; 95 % CI 1.00–1.56). The recipients of these services had good employment outcomes. However, receiving the information and referral service caused a 35 % (*OR* 0.65; 95 % CI 0.48–0.88) reduction in the chances of being employed in the transition young adult group.

Discussion

The overall employment outcomes for individuals with ASD in the VR service system in FY 2011 were found consistent, with a slightly greater number in percentage (52 %) when compared with FY 2005 (42 %, Lawer et al. 2009) and FY 2010 (50 %, Migliore et al. 2014). It is promising to see that there was a trend of gradual increase in the employment rate for this population, as the entire U.S. job market started to warm up from a universal economic downturn in 2010 (Migliore et al. 2014; United States Department of Labor 2014). Nevertheless, this study revealed that the majority of individuals with ASD who achieved successful employment outcomes continued to be underemployed (e.g., employed at entry-level jobs where they might be over-qualified), with limited wages and working hours (Cimera and Cowan 2009; Howlin et al.

2005; Migliore et al. 2014; Müller et al. 2003; Smith and Lugas 2010).

Differences in Employment Outcomes Across Age Groups

To answer the first research question of this study, it was found that the employment outcomes for individuals with ASD were significantly different among the three age groups. The transition youth (age 18 or below) exited the VR system with the lowest employment rate and hourly wage when compared with the transition young adults (age 19–25) and the adults (age 26 and above). Of those, the adults were the most likely to be employed after receiving VR services. From an overall perspective, this finding is nevertheless encouraging, because it suggests that individuals with ASD from all age groups can benefit from vocational interventions when appropriate services are provided, and this has been consistently shown and repeatedly emphasized during recent years (Howlin 2013; Lugas et al. 2010; Nicholas et al. 2014; Patterson and Rafferty 2001; Taylor and Seltzer 2011). This study further supports the conclusion that individuals with ASD have the competence of contributing to society by actively participating in employment, just like their peers (Cimera and Cowan 2009; Smith and Lugas 2010).

Consistent with previous reports (Roux et al. 2013; Shattuck et al. 2012a; Taylor and Seltzer 2011), our findings also emphasize that younger transition-aged individuals with ASD are at higher risk of being unemployed during their transition to adulthood, in comparison to their adult counterparts. Some researchers have suggested that increased work and life experience as an individual becomes older might be contributing factors, because those experiences would assist him/her in obtaining and maintaining a job (Ozonoff et al. 2003). In general, transition age youth need time to adjust to their new social roles (from a student to a non-student) and to gain employment related social skills. Especially, generalizing social skills and acclimatizing to new social environments always take longer time and more efforts for individuals with ASD (Laugeson and Ellingsen 2014). Thus, initiating appropriate training programs for work related social skills before their high school graduation would benefit these young people in their early adulthood life.

Other reasons for the significant age differences and the changing trend of employment outcomes among individuals with ASD are well worth future study. Such factors as individuals' career expectations, job motivations, and employment preparation skills might also be helpful for exploring this phenomenon. It is believed that understanding this unique employment pattern well will positively help to improve the customized transition plan for young adults with ASD, according to their age specific needs.

The majority of the participants in the transition youth group should be eligible and covered under the benefit of both school transition services and VR services, based on the IDEA and the Rehabilitation Act (VanBergeijk et al. 2008; Wittenburg and Maag 2002). If that is the case, then how come such service coverage ironically leads to less optimal outcomes? What could be missing between the education system and the VR system that might eventually contribute to such an unfavorable situation? Researchers have speculated that current educational and rehabilitation service systems may be inadequate to accommodate the needs of youths with ASD during their transition to adulthood (Taylor and Seltzer 2011). Although no definite conclusion can be drawn from these studies regarding the quality of the services provided to transition-aged individuals with ASD through both of the systems, these potential concerns should be further explored and investigated.

In examining the service costs and employment outcomes of individuals with ASD between 2002 and 2006 by using the RSA-911 data, Cimera and Cowan (2009) disclosed that the ASD population was one of the most costly groups in the VR system, when compared to other service users with intellectual disability (ID), traumatic brain injury (TBI), learning disability (LD), physical disability, etc. During 2002–2011, the cost of VR services for individuals with ASD was reported constantly increasing over the time period (Burgess and Cimera 2014). Our study not only showed consistency in the high expenditure of the services, but also indicated that the youngest transition group was the most costly subgroup among all age groups. Moreover, they also received the most types and highest number of services, stayed for the longest duration in the service system, but did not achieve as comparable employment outcomes as their elder counterparts did.

Previous study had indicated that the "trial and error" method being used during the VR service provision for transition aged individuals with ASD caused the increasing cost of services (Cimera and Cowan 2009). This raised a big argument about the VR counselors' infrequent exposure to this population and their unfamiliarity with their specified needs. Although Burgess and Cimera (2014) indicated that there might be other long-term or collateral benefits of VR services that were not captured by the RSA-911 database, the big concern around federal monetary matters still remains. Therefore, more research is needed for seeking solutions in order to understand better the situation and increased the cost-effectiveness and efficiency for providing vocational interventions for individuals with ASD, particularly for the transition youth group.

Differences in Service Usage Pattern Across Age Groups

To answer the second and third research questions, our findings from the three separate logistic regression analyses suggested different sets of demographic covariates and VR service factors predicted employment outcomes of individuals with ASD in each age group. The results provide a rich enhancement of the previous findings, and a better understanding of how different demographic characteristics associate with the employment outcomes of the target population (Lawer et al. 2009; Migliore et al. 2012). Based on our findings, gender, race/ethnicity, and education level only show significant prediction to employment outcomes when the individuals are still within their transition age; these effects do not seem to carry over when adulthood is reached. In contrast, co-occurring psychiatric disabilities start to show a negative relationship with being employed when individuals are approaching their adulthood, whereas the receipt of cash or medical benefits always increases the risk of being unemployed. In fact, the adverse effect of receiving cash or medical benefits on employment outcomes has been widely discussed among persons with different disabilities (Chan et al. 2008; Jung and Bellini 2011). It is indicated that for those individuals who are at high risk of being unemployed or underemployed, they might weigh the financial benefits of paid work against the real possibility of losing disability-related benefits (Dutta et al. 2008). Therefore, the VR service providers need to help individuals analyze the costs and benefits from a long-term and broad perspective.

Consistent with previous research, this study revealed that counseling and guidance, job placement assistance, and on-the-job support are common factors that have central roles in predicting successful employment across all age groups (Migliore et al. 2012; Schaller and Yang 2005). Quite a few existing rehabilitation studies have also indicated that job-related services, especially job placement services, are strongly associated with better employment outcomes for most disability groups, including individuals with ASD (Bolton et al. 2000; Dutta et al. 2008; Jung and Bellini 2011; Jung et al. 2010; Migliore et al. 2012; Schaller and Yang 2005). With the exception of the adult group, additional VR services were found to be significant predictors for the transition youth group and the transition young adult group. Services such as college or university training, occupational/vocational training, and on-the-job training were found positively to increase the likelihood of obtaining employment for the transition youth group. Interestingly, information and referral services were found negatively associated with the chances of being employed for the transition young adult. This result likely reveals the inadequacy in the current services to accommodate the unique needs of transition young adults with ASD when providing employment-related information and referral services. Another plausible reason could be that there are some other factors that are correlated with the need for information and referral services and that drive poor employment outcomes, such as co-occurring psychiatric conditions, and adaptive skills. Future studies are needed to investigate further and to understand better the negative relationships, and thus to improve the service provisions.

In terms of service usage, more interesting results with noticeable differences between the transition youth and adult groups have been identified. Generally speaking, the transition youth group was provided with more training and personal assistance services, whereas the adult group was provided with more job-related services. Specifically, more of the following services were provided to the adult group than to either of the transition groups: diagnosis and treatment of impairments, job search assistance, job placement assistance, and on-the-job support. Furthermore, only a small portion of clients in the transition youth group actually received services which might increase their chances of getting employment (15 % received college or university training, 9 % received occupational/vocational training, and 6 % received on-the-job training). Also, about one fifth (19 %) of individuals in the transition young adult group received information and referral services, which had an adverse relationship to their employment. This might be a reflection of misunderstanding and mismatching between VR services and the particular needs of transition-aged individuals with ASD. Therefore, a better understanding of the differential effects of different VR services on the employment outcomes of individuals with ASD across different ages is necessary, and future study around this topic is indeed warranted.

Under-Utilized Assistive Technology Services

Besides answering our three research questions, it is also important to highlight another interesting finding in our results. We found that the VR system provided limited use of rehabilitation technology services for individuals with ASD. Visual supports have been proven to be an evidence-based practice for most people on the spectrum who are visually dependent or visual thinkers (Grandin 2006). In recent years, an increasing number of studies have shown that providing visual prompting or video modeling via assistive technologies, such as potable personal digital assistants (PDAs), and Apple® products (iPhone, iPod, iPad), could significantly support young adults on the spectrum in improving their job related performance (Allen et al. 2010; Burke et al. 2013; Gentry et al. 2012; Goh and Bambara 2013; Kellems and Morningstar 2012). Meanwhile, certain

job training software and websites, such as VideoTote and JobTips, have been developed and put into use (Burke et al. 2013; Strickland et al. 2013). Thus, it was really surprising to find such a low percentage of clients using rehabilitation technology in this study. A possible reason could be the lack of awareness of these available technological devices, and also the lack of empirical support for the effectiveness of these practices. This again brings up the call for more evidence-based research on services and interventions for young adults with ASD, especially on the topic of implementation of assistive technology.

Implications

Although VR agencies have been playing a large and important role in helping individuals with disabilities to secure and maintain employment, they are significantly under-utilized by people with ASD, and there is limited information on how VR services correlate with the employment outcomes of individuals with ASD. Based on the results of this study, the following implications can be given from different perspectives.

First, from a systemic perspective, it is essential to develop individualized ASD and age specific vocational intervention programs for clients, especially for those vulnerable transition-aged groups, to facilitate and support their smooth transition from adolescence to adulthood and/or from school to work. For instance, TEACCH (Treatment and Education of Autistic and related Communication handicapped Children) and Project SEARCH are some sample programs which have been proposed to have potential in resolving the employment issues (Keel et al. 1997; Wehman et al. 2012a, b). Job-related services, such as job placement assistance and on-the-job support, should be more incorporated into an Individual Plan for Employment (IPE) for transition-aged individuals with ASD. Meanwhile, more communications between the VR system and the education system should be encouraged, in order to bridge the gap and help transition-aged individuals with ASD take full advantage of the transition services from both systems. The use of assistive technology should also be more emphasized during service provision for this population.

Second, from a practical perspective, continuing education and in-service training based on research evidence should be offered to service providers in order to promote their understanding of age-specific vocational needs and the unique characteristics of individuals with ASD, and their competence working with them. In particular, focus should be put on increasing the knowledge and skills of using evidence-based practices for this particular population, such as on the topics of job placement services and assistive technology. The awareness of service providers regarding the current age-specific factors related to employment outcomes of transition-aged individuals should be heightened. Meantime, practitioners should also be encouraged to establish collaboration with teachers in the education system, to initiate together the necessary transition training, especially work related social skills training, before the youth leave their schools.

Last but not least, from a research perspective, it is necessary to conduct a more comprehensive study about the employment outcomes of people with ASD. Finally, research on evidence-based practices in vocational rehabilitation and how to implement best practices in an effective and feasible way are much warranted in order to improve the current employment situation of the ASD population (Müller et al. 2003; Hillier et al. 2007; Cimera and Cowan 2009). High-quality individualized programs with ASD and age specific elements are indeed needed in the field.

Limitations

As a study using a secondary dataset, there are several limitations to be noted. First, although RSA-911 is a national database, participants were still bounded to those who were eligible for the services, which might limit the generalizability of the study. Second, all the information was entered by rehabilitation professionals who work in different state VR agencies. Although they were trained and provided with a manualized codebook, individual differences and human errors were still inevitable. Third, the dataset did not provide further detailed information about each service (e.g., cost for each service, time of using each service, outcome of each service, etc.), which limited the scope of the study. Finally, this study used archival data and employed an ex post facto design with correlational analyses; therefore, causality cannot be inferred.

Conclusions

Unemployment and underemployment have been profound problems experienced among individuals with ASD. Vocational services provided by state VR agencies represent a viable resource to assist them in seeking and maintaining employment. This study examined employment outcomes among individuals with ASD in three age groups who received VR services. Transition-aged young people generally had poorer employment outcomes when compared to their adult counterparts. Specific demographic factors and VR services related to employment status were identified, respectively, for each group. Rehabilitation professionals

who provide vocational interventions for people with ASD should be aware of the specific vocational service needs between different age groups, and they should tailor these services accordingly. Future studies investigating the specific effects of certain vocational services for unemployed individuals with ASD of different age groups are highly recommended.

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