

Employment and Vocational Skills Among Individuals with Autism Spectrum Disorder: Predictors, Impact, and Interventions

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Abstract Much research has been devoted to early intervention for individuals with autism spectrum disorder (ASD), with a lesser emphasis on research examining the outcomes for, or support of, these individuals as they reach employment age. Historically, employment opportunities for individuals with ASD have been limited. The current literature review sought to investigate the existing predictors and impact of employment or vocational placements among persons with ASD. Interventions described in the literature to teach individuals with ASD employment or vocational skills were also assessed. A total of 26 studies were reviewed, and results indicate that there is limited extant research on employment and vocational skills among individuals with ASD. However, it was found that employment positively impacted on the quality of life, cognitive functioning, and well-being of participants with ASD. Predictors of employment were found to be a complex interplay of personal and external factors. All interventional studies reported improvements in the vocational skills targeted, although a limited range of skills have been taught across these studies. The implications of these findings for individuals with ASD and future research in this area are discussed.

Keywords Autism spectrum disorder · Asperger's syndrome · Developmental disabilities · Employment · Vocational skills · Work

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Introduction

In recent years, the diagnosis of autism spectrum disorder (ASD) has become increasingly common, with 1 in 68 children in the USA diagnosed with the disorder (Centers for Disease Control and Prevention [CDC] 2014). Traditionally, research and clinical focus has been on early intervention for individuals with ASD, with a lack of emphasis on supporting adolescents or adults as they progress through life. This is particularly problematic as research suggests that post-second-level employment opportunities for individuals with ASD are typically limited (Hendricks and Wehman 2009), and among employment-aged adults with disabilities, some of the lowest employment rates are reported for individuals on the autism spectrum (Burke et al. 2010).

The Individuals with Disabilities Education Act (IDEA 2004) ensures that in the USA, special education services are provided to youth with disabilities, including autism (Chiang et al. 2013). Further, IDEA specifies that appropriate postsecondary goals, including further education or employment, based upon students' interests and strengths, should be included in their individualized education plan (IEP) and that students should receive the support necessary to achieve these aims (Chiang et al. 2013). However, research indicates that, in reality, approximately as few as 25 % of individuals with ASD are employed (Holwerda et al. 2012). A recent study of 169 adults with high-functioning ASD found that only about half of the participants were in paid employment (49 %) and many (36 %) were on social security benefits (Barneveld et al. 2014).

The limited employment opportunities available to those with ASD may be the result of the challenges associated with the disorder. The impairments in social and communicative functioning associated with ASD can impact every aspect of adaptive functioning (American Psychological Association 2000). Due to these deficits, traditional training methods used

by employers (e.g., lengthy verbal instruction or the use of modeling) are often counterproductive for individuals with ASD and may negatively impact their ability to secure employment (Burke et al. 2010). Further, most workplaces require adherence to social norms and an understanding of social decorum which may also be problematic for those with ASD (Vogeley et al. 2013). Individuals on the spectrum may also have physical health problems, behavioral issues, and various comorbid diagnoses that may complicate their participation in employment-related activities. Behavioral issues such as stereotyped motor movements and vocalizations, insistence on maintaining routines or sameness, and sensory difficulties are all associated with ASD (Schall 2010). Persons with ASD also frequently present with comorbid disorders including gastrointestinal disorders, intellectual disabilities, epilepsy, and anxiety among others (e.g., Hofvander et al. 2009; Lugnegård et al. 2011). These challenges may create barriers to securing and maintaining employment for those diagnosed with ASD.

However, in spite of the identified difficulties, some individuals with ASD possess traits and attributes that are often highly desired by employers and should be viewed as strengths in the workplace. Persons with ASD may have the ability to be highly focused in certain situations and possess excellent visual perception abilities (Kellems and Morningstar 2012). Thorkil Sonne, founder of the Specialist People Foundation and Specalisterne, which employs individuals with ASD in Denmark, seeks to transform the way society perceives autism from viewing it as a handicap to recognizing that it can become a competitive advantage (Sonne 2009). While communication and repetitive behavior can be a barrier to employment for people on the autism spectrum, Sonne (2009) emphasizes the value of employing those with ASD by describing the ability to focus on a given task, exceptional persistency, attention to detail, and the tendency to thrive on routine as pertinent skills that any employer would value.

However, an adequate employment service, including environmental accommodations and individualized support and skills training, is necessary to aid individuals with ASD to join the workforce. Currently, the specific interventions that lead to positive employment outcomes for individuals with ASD are poorly understood, and the lack of specific employment-related skills may prevent individuals with ASD from accessing available employment opportunities. Existing employment options for people with disabilities described in the literature include sheltered employment, supported employment, and competitive employment. Sheltered employment involves people with disabilities working, below minimum wage, together in a segregated setting designed to employ people with disabilities (Gottlieb et al. 2010). Supported employment represents an integrated model of employment where workers with disabilities are assisted throughout the employment process and work in community-based settings

(Gottlieb et al. 2010). Competitive employment involves people with disabilities working at an equivalent rate to those without disabilities, and research illustrates that between 6 and 10 % of individuals with ASD are competitively employed (Wilczynski et al. 2013). Although these employment options exist, positions are limited and are typically directed toward individuals who are high functioning (Sonne 2009).

The lack of employment opportunities for persons with ASD is further problematic given the positive impact of employment on quality of life (QoL) that has been frequently evidenced for typically developing persons (Barneveld et al. 2014). Research has shown that the three key domains of QoL common to all adults are residential living, employment, and socialization (Graetz 2010). Further, among typically developing persons, employment has been related to a variety of other important outcomes; a meta-analysis by McKee and colleagues (2005) indicated that across 52 studies, employed individuals demonstrated greater mental health, life satisfaction, marital or family satisfaction, and self-perceived physical health than those who were unemployed. It has also been recognized that work is an important means of social inclusion and offers individuals often excluded from society, such as those with disabilities, a social outlet and a chance to contribute to society (Carew et al. 2010). Employment is also a necessary step toward economic self-sufficiency and, hence, greater inclusion in society (Migliore et al. 2014). With the considerable benefits of employment across many domains, it is important that individuals with ASD have the opportunity to gain meaningful, supported, or competitive employment.

Thus, given the positive outcomes associated with employment and the seeming dearth of employment opportunities for individuals with ASD, the present literature review sought to critically examine the predictors and impact of employment for individuals with ASD and to evaluate the interventions described in the literature to teach employment and vocational skills.

Method

Literature Search

Systematic searches were conducted using five electronic databases: Academic Search Complete (EBSCO), ERIC, Scopus, PsycInfo, and Psychology and Behavioral Science Collection (EBSCO). In all databases, searches were conducted by inputting the words “employment AND autism*” as well as “vocational skills AND autism*” as sole search terms. Autism was also inputted as a search term in combination with the following keywords: vocational education, vocational training, and work. Developmental disability* was inputted as a search term in combination with the following keywords: vocational skills, vocational education, vocational training,

and work. All abstracts returned during the initial electronic searches were reviewed to determine their suitability for inclusion.

Inclusion and Exclusion Criteria

The criteria for inclusion in this review were (a) the inclusion of at least one participant diagnosed with ASD, Asperger's syndrome, or a pervasive developmental disorder; (b) the examination of either predictors of employment, the impact of employment, or an intervention designed to increase vocational or employment-related skills; and (c) publication in an English language, peer-reviewed journal. Studies which evaluated interventions implemented for skills other than employment-related or vocational skills were excluded. Studies which utilized group designs in which the data for participants with ASD were analyzed in conjunction with participants with other developmental disabilities were excluded as this precluded the extraction of data pertaining to those diagnosed with ASD specifically.

Categorization of Studies

The studies which met the inclusion criteria were separated into three categories: *Predictor Studies* examined the factors correlated with successful employment outcomes among individuals with ASD. These studies were reviewed as an account of the predictors of employment may potentially indicate skills or other variables which can be targeted to improve the likelihood of individuals on the autism spectrum gaining employment. *Impact Studies* assessed the consequences of employment on the overall life or well-being of individuals with ASD and were reviewed in order to further our understanding of the benefits or outcomes of employment for those with ASD. *Intervention Studies* included an evaluation of training programs or behavioral strategies implemented with the intention of teaching new employment-related skills, developing existing skills, or otherwise preparing individuals for the workplace. The review of such studies may allow for the suggestion of appropriate and effective interventions for the promotion of employment or employment-related skills for individuals on the spectrum.

Results

A total of 26 studies met the criteria for inclusion in the current review. Of these, 6 were classified as predictor studies, 3 studies were categorized as impact studies, and 17 were interventional studies.

Predictor Studies

Burt et al. (1991) conducted a series of case studies investigating factors relating to success or failure of employment among four unemployed adults with ASD. Participants were aged between 21 and 29 years old and had not previously been able to secure employment due to behaviors associated with their autism diagnosis. The predictors identified for successful employment were individual characteristics (i.e., level of communication ability, interpersonal skills, and control of self-stimulatory behaviors), amount of family and work support, and characteristics of the job (i.e., success was less likely if the job involved problem solving, flexibility, decision making, or prioritization skills). Participants were in competitive employment for 6 to 30 months. The individual characteristics that predicted job failure were lack of motivation, inability to make decisions and solve problems, lack of flexibility and speed, and, in one participant, uncontrolled encopresis. Family support in the form of financial incentives, daily praise, and maintenance of program contingencies was a predictor of successful employment. Lack of family support was a predictor of job failure. Elements of employer support which promoted job success were participation in educational programs, modifications of the environment, and supervision and implementation of behavioral contracts. A final predictor identified was the consistency of long-term support.

Research by Schaller and Yang (2005) investigated predictive factors of competitive employment and supported employment for 815 individuals with autism aged between 15 and 64 years. Data were extracted from the Rehabilitation Services Administration (RSA) 911 database for 2001. It was found that for competitive employment, individual characteristics (i.e., being older, having accrued 10 to 15 years of education, and not having a comorbid diagnosis) and employment support services (i.e., support with job finding, job placement, and maintenance) were significant predictors of employment. For supported employment, race (i.e., being Caucasian) and availability of appropriate job placements were the significant predictors.

Lawer et al. (2009) examined predictive factors for participation in competitive employment for individuals with disabilities aged between 18 and 65 years old (including 1,707 individuals with autism) using the US Department of Education, Office of Special Education, and Rehabilitative Services data. It emerged that gender (i.e., being male), having more education, and greater service expenditures predicted better employment outcomes. Age was also identified by the authors as a predictor of competitive employment with increased age associated with a greater likelihood of success in competitive employment.

Yokotani (2011) investigated whether attachment style, specifically an avoidant attachment style, was related to job adaptation in competitive employment settings of people with

high-functioning ASD. The questionnaire-based study involved 22 participants all with an IQ of at least 69. Results showed that an avoidant attachment style was an indicator of better job adaptation of people among individuals with high-functioning ASD.

Research by Migliore et al. (2012) investigated predictors of participation in integrated employment and postsecondary education of youth with autism. The study consisted of 2,913 participants with ASD aged between 16 and 26 years old. Predictors identified for participation in integrated employment were supportive placement services (i.e., those who had support were more likely to participate), higher education, shorter time in the vocational rehabilitation program, receiving training, not receiving college services, and being male.

Most recently, research by Chiang et al. (2013) investigated predictive factors for participation in employment for high school leavers with autism ($N=830$) aged between 13 and 16 years old. The predictors of employment identified were annual household income, parental education, gender (females were more likely to participate in employment), social competence, presence of a comorbid intellectual disability (ID), graduation from high school, and whether the participant's school liaised with postsecondary vocational training programs or potential employers.

Impact Studies

García-Villamizar et al. (2002) investigated the impact of supported employment versus sheltered workshops on quality of life. Participants were divided into two groups: 26 were assigned to a sheltered workshop group and 21 were assigned to a supported employment group. All participants worked 15 to 30 h and were paid competitive wages. The results indicated that individuals in the supported employment group had higher scores on a quality of life measure than those in the sheltered employment group.

García-Villamizar and Hughes (2007) examined the effects of a supported employment program on measures of executive functioning for 44 adult participants with ASD. They described two groups: a supported employment group and a non-supported employment group. The type of employment was varied and included positions in food services and retail. Participants in both groups worked 20 h a week and were paid competitive wages. Participants' memory and executive functioning were evaluated at the beginning and end of the program. While both groups presented similarly at baseline, post-test outcomes indicated that the participants in the supported employment group had higher scores for executive functioning and memory than those in the other group.

Hillier et al. (2011) evaluated the impact of an 8-week vocational and social skills program, "Aspirations," on 49 participants with ASD aged 18 to 28 years. Participants

completed questionnaires measuring depression, anxiety, and peer relationships. The results indicated significantly reduced anxiety and depression following participation in the program. Peer relationships were also improved post-intervention, but this did not reach statistical significance.

Intervention Studies

A summary of the 17 studies evaluating interventions implemented to teach or improve employment-related skills is presented in Table 1. A total of 78 participants were included in these studies (69 male, 9 female). Participants had a diagnosis of ASD ($n=121$) or AS ($n=39$) and some participants had comorbid diagnoses (intellectual disability ($n=1$), attention deficit hyperactivity disorder ($n=1$), seizure disorder ($n=1$), and Tourette's syndrome ($n=1$)). The weighted mean age of participants was calculated across all studies which provided information on participants' ages and was found to be 18.2 years (range 13–30 years).

Table 1 shows the type of employment-related skills that were targeted across the studies reviewed. Four studies taught participants the skill of wearing a "WalkAround" costume and promoting stores or entertaining customers (Allen et al. 2010a, b, 2012; Burke et al. 2010). Photocopying skills were targeted in two studies (Bennett et al. 2013c; Berezna et al. 2012), one of which also taught additional vocational skills of using a washing machine and making noodles (Berezna et al. 2012). Interview skills were successfully taught in one study (Strickland et al. 2013). Dotto-Fojut and colleagues (2011) taught four participants how to request assistance for a work-related problem while in an employment setting. Other targeted skills included T-shirt folding (Bennett et al. 2013b), clerical skills (Bennett et al. 2013a; Dotson et al. 2013), shipping products (Burke et al. 2013), newspaper route (Robinson and Smith 2010), cover letter writing (Pennington et al. 2014), cleaning (Kellems and Morningstar 2012), recycling (Bennett 2013), stocking inventory (Kellems and Morningstar 2012), self-employment skills (Dotson et al. 2013), and sorting mail (Alexander et al. 2013). All reviewed studies reported that participants acquired the target skills to satisfactory levels of performance. Out of 17 intervention studies, maintenance data was not reported for 4 studies. Maintenance assessments varied from a 1-month follow-up to a 3-month follow-up and, in the majority of cases, indicated maintenance of the skills acquired during intervention.

All studies, excepting one (Allen et al. 2010a), reported the use of reinforcement-based procedures, such as verbal praise, in conjunction with other interventions. Seven of the studies used video modeling interventions (Allen et al. 2010a, b; Alexander et al. 2013; Bennett et al. 2013a; Berezna et al. 2012; Burke et al. 2013; Kellems and Morningstar 2012) which involved showing participants a videotape of a person(s) engaging in the target behavior (Flynn and Healy

Table 1 Studies evaluating interventions for teaching employment and vocational skills

Study	N	Age range (mean)	Gender	Diagnosis	Level of functioning	Experimental design	Target skill	Intervention	Outcome	Maintenance
Alexander et al. (2013)	7	15–18 years (17.3 years)	6 male; 1 female	ASD (n=7)	Moderate ID	Multiple probe design across participants	Sorting Mail	Video Modeling and Positive reinforcement and error correction (n=3)	5 Participants mastered the target skill	Maintained for 3 participants from 1.5 to 6 weeks
Allen et al. (2012)	3	16–20 years (17 years)	2 male; 1 female	ASD and ID (n=2); ASD, ADHD, and seizure disorder (n=1)	Mild ID (n=1); moderate ID (n=3)	Reversal design	Wearing a WalkAround costume to promote products in retail stores	Video modeling and positive reinforcement; Audio cuing and positive reinforcement	Video modeling was not effective Audio cuing was highly effective	Maintained at 1 and 3 months
Allen et al. (2010a)	3	17–22 years (19.3 years)	Male	PDD-NOS and learning disability (n=1); PDD-NOS (n=1); AS or PDD-NOS (conflicting diagnoses) and ID (n=1)	Mild ID (n=1); borderline (n=1); average (n=1)	Multiple baseline design across participants	Wearing a WalkAround costume to promote products and entertain customers in retail stores	Video modeling	Video modeling was effective for teaching the targeted skill. The skills generalized to a novel work setting 3 months later. A social validity measure indicated participant satisfaction with the intervention and the opportunity to work and earn money.	Maintained above criterion or 2 of 3 participants at 1-month follow-up and all 3 participants performed above criterion at 3-month follow-up
Allen et al. (2010b)	4	16–25 years (19 years)	Male	ASD (n=2); AS (n=2)	-	Multiple baseline design across participants	Wearing a WalkAround costume	Video modeling	All participants acquired the skill to high accuracy levels	Maintained at 1 month
Bennett (2013)	1	-	Male	ASD	-	Reversal design	Empty recycling bins	Covert audio coaching	Acquired skill	Maintained at 3 weeks following removal of the intervention
Bennett et al. (2013a)	5	13–18 years (15.4 years)	Male	ASD (n=5)	-	Alternating treatments design	Clerical skills	Video modeling with and without voice-over narration.	All participants made significant gains in skills	-
Bennett et al. (2013b)	3	15–18 years (16 years)	2 male; 1 female	ASD (n=3)	-	Multiple baseline design across participants	Folding T-Shirts	Covert audio coaching and support statements	All participants acquired the skill to high accuracy levels	Maintained for 3 weeks
Bennett et al. (2013c)	3	13–22 years (17 years)	Male	ASD (n=3)	-	Multiple baseline design across participants	Making photocopies	Covert audio coaching	All participants acquired the skill to high accuracy levels	Maintained for 3 weeks
Bereznak et al. (2012)	3	15–18 years (16.53 years)	Male	ASD (n=3)	-	Multiple probe design across behaviors	Using a washing machine, making noodles and using a copy machine	Video prompting	iPhones can be used as a self-prompt for vocational and daily living skills	Results indicate some loss of skills following removal of the intervention

Table 1 (continued)

Study	N	Age range (mean)	Gender	Diagnosis	Level of functioning	Experimental design	Target skill	Intervention	Outcome	Maintenance
Burke et al. (2013)	4	19–28 years (22.5 years)	Male	ASD (n=1); AS (n=3)	Borderline (n=1); average (n=3)	Multiple baseline design across participants	Shipping products	Video modeling and prompting	Acquired skill	-
Burke et al. (2010)	6	18–27 years (20.83 years)	Male	ASD (n=1); AS (n=4)	Borderline (n=1); Average or above average (n=4)	Multiple baseline design across participants	Wearing a WalkAround costume and scripted behaviors.	Behavioral skills training; Performance cue system	5 of 6 participants reached criterion	Maintained at 1 month for 2 participants
Dotson et al. (2013)	4	21–30 years (22.5 years)	1 male; 3 female	ASD (n=3); AS (n=1)	-	Multiple probe design across jobs design	Self-employment skills (e.g., office work, supervisor, clerical work)	7-step teaching procedure, role play, positive reinforcement	Acquired skills to a high degree of accuracy	Maintained from 1 to 5 months
Dorto-Fojut et al. (2011)	4	12–13 years (12.75 years)	Male	ASD (n=4)	-	Multiple baseline design across participants	Approach an instructor; describe a problem and request assistance	Graduated guidance, scripts, and time delay	All participants learned target skills	Maintained for 1 month for 2 participants
Kellens an Morningstar (2012)	4	20–22 years (21.5 years)	Male	ASD (n=2); AS (n=2)	-	Multiple probe design across behaviors	Individualized skills (cleaning, stocking inventory, recycling, polishing)	Video modeling	Increased skill with immediate and substantial gains for all	Maintenance data provided for 2/3 skills from 5 to 10 days after intervention
Pennington et al. (2014)	1	20	Male	ASD	-	Concurrent multiple probe design	Cover letter writing	Self-monitoring, modeling, response prompts	Increased skill to high level of accuracy	Maintained at 4 weeks
Robinson and Smith (2010)	1	13	Male	ASD and Tourette's Syndrome	Significant cognitive delay	AB single-case design	Newspaper delivery	Reinforcement, prompts, written schedule and simulation training	Increased skill to high accuracy levels	Maintained at 3-month follow-up
Strickland et al. (2013)	22	16–19 years	Male	High functioning ASD (n=22)	-	Correlational	Interview skills	Internet accessed training program, video models, visual supports and virtual reality practice sessions	Those who received the JobTIPS program demonstrated more effective verbal content skills that those who did not	-

ASD autism spectrum disorder, ID intellectual disability, AS Asperger's syndrome, ADHD attention deficit hyperactivity disorder, PDD-NOS pervasive developmental disorder-not otherwise specified

2012). A further two studies used video modeling in combination with other procedures such as audio cuing, and visual supports (Allen et al. 2012; Strickland et al. 2013). Covert audio coaching was used in two studies (Bennett et al. 2013b, c) and involved the delivery of antecedent prompts and performance feedback delivered privately through a pair of two-way radios and headsets from a distance (Bennett et al. 2013b). Two studies used a combination of instruction, modeling, performance cue systems, and time delay prompting with graduated guidance (Burke et al. 2010; Dotto-Fojut et al. 2011). Pennington et al. (2014) used a combination of self-monitoring, modeling, and response prompts. Robinson and Smith (2010) also used a combination of reinforcer assessment, written schedules, and simulation-based training. Fourteen studies reported overall treatment success across participants (Allen et al. 2010a, b; Bennett 2013; Bennett et al. 2013a, b, c; Berezna et al. 2012; Burke et al. 2013; Dotson et al. 2013; Dotto-Fojut et al. 2011; Kellems and Morningstar 2012; Pennington et al. 2014; Robinson and Smith 2010; Strickland et al. 2013). Of the remaining studies, Allen et al. (2012) reported treatment success for an audio cuing intervention and not for video modeling. Burke et al. (2010) reported success for all but one participant, and Alexander et al. (2013) reported treatment success for five out of seven participants. Maintenance data were reported for 14 of the studies (Alexander et al. 2013; Allen et al. 2010a, b, 2012; Bennett 2013; Bennett et al. 2013b, c; Berezna et al. 2012; Burke et al. 2010; Dotson et al. 2013; Dotto-Fojut et al. 2011; Kellems and Morningstar 2012; Pennington et al. 2014; Robinson and Smith 2010) across 1 month or less in 9 studies (Allen et al. 2010b; Bennett 2013; Bennett et al. 2013b, c; Berezna et al. 2012; Burke et al. 2010; Dotto-Fojut et al. 2011; Kellems and Morningstar 2012; Pennington et al. 2014), 3 months or less in 4 studies (Alexander et al. 2013; Allen et al. 2010a, 2012; Robinson and Smith 2010). Only one study assessed maintenance across a period of longer than 3 months (Dotson et al. 2013).

Discussion

With the abundance of resources invested in early intervention research for individuals with ASD, it is somewhat surprising that fewer published studies are available that have examined the long-term planning for, and support of, these individuals during adolescence and adulthood. The current literature review has highlighted the paucity of research which addresses employment and the teaching of vocational skills among those with ASD, in spite of findings which highlight the positive impact of engagement in employment-related activities on well-being, cognitive functioning, and quality of life for these individuals. However, the extant research, while limited,

suggests that there are promising interventions available that can teach employment skills and which warrant further research and development.

The current review suggests that there is a complex interplay between personal and external factors in the prediction of employment of those with ASD. Individual characteristics and employment service characteristics were found to predict employment in the studies reviewed. Two studies reported that being male was a predictor factor for employment (Lawer et al. 2009; Migliore et al. 2012) while Chiang et al. (2013) found that females were more likely to find employment. Increased age in adulthood was also found to be a predictor of employment (Lawer et al. 2009; Schaller and Yang 2005) as well as the absence of any comorbid condition (Chiang et al. 2013; Schaller and Yang 2005). Participant education levels were also implicated as a predictive factor (Chiang et al. 2013; Lawer et al. 2009; Migliore et al. 2014; Schaller and Yang 2005). Family support and employment support were found to predict employment (Burt et al. 1991; Chiang et al. 2013; Lawer et al. 2009; Migliore et al. 2014; Schaller and Yang 2005). The importance of treating challenging behaviors and the symptoms of comorbid diagnoses was also evident with these variables being implicated as predictors of job failure or impediments to securing employment (Burt et al. 1991; Schaller and Yang 2005). The identification of such predictors of employment, or job failure, suggests an important target area for intervention by practitioners. Applied behavior analysis has had much success in improving variables associated with many of the identified predictors of employment such as communication abilities, interpersonal abilities, self-stimulatory behavior, social skills, self-management skill, safety skills, and organization skills (e.g., Flynn and Healy 2012; Holloway et al. 2014; Matson et al. 2012; Mulligan et al. 2014). The evidence-based procedures that exist to teach these skills should be utilized and further investigated to improve employment prospects among this population. Findings of the current review also suggest that a supportive work environment leads to better success in employment outcomes for people with ASD. Thus, the provision of support to, and education of, employers and other staff members around working with people with ASD may also be considered imperative to successful employment.

There is evidence that employment can positively impact the lives of individuals with ASD similar to that of typically developing individuals (Capo 2001). Across the studies reviewed, employment had positive outcomes relating to cognitive performance (García-Villamizar and Hughes 2007), reduced anxiety and depression (Hillier et al. 2011), and improvements in peer relationships and quality of life (García-Villamizar et al. 2002; Hillier et al. 2011), all considered important variables in the context of ASD. While relatively few studies have examined the impact of employment, the positive outcomes observed mirror those that have been

reported among typically developing individuals (McKee-Ryan et al. 2005). The importance of these outcomes further underscores the need to promote employment, and supportive interventions for employment, among individuals diagnosed with ASD.

Of the interventional studies reviewed, all reported that participants made gains in the targeted skill repertoire. However, the range of skills taught was somewhat limited. Four studies taught participants very specific skills such as wearing a WalkAround costume that may not be transferable to other workplaces. Other studies targeted more general skills such as making photocopies or interview skills which could be applied in many different employment settings. It was also noted that participants included in the intervention studies were predominantly male. Out of 78 participants, only 9 were female. This imbalance may be attributable to the greater prevalence of ASD among males; however, future research studies should ensure that the female population is adequately represented. Also, across the studies reviewed, individuals were generally on the high-functioning end of the autism spectrum (IQ>80) or described as having Asperger's syndrome. Research is needed to investigate possible employment opportunities for individuals with ASD who are presenting with lower functioning profiles. Additionally, future intervention studies should aim to examine the effects of teaching social skills in conjunction with vocational skills when preparing an individual with ASD for employment, given the importance of these skills for successful functioning in an employment setting. Identified predictor variables such as communication abilities, presence of challenging behavior, and education levels should also be targeted. In order to enhance the experience of individuals, both as they transition from school to work and for those already in employment, a collaborative effort is needed. Schools and vocational rehabilitation services should work together to ensure that students with ASD are provided with the necessary training needed to become successful employees (Chappel and Somers 2010). Thus, while the studies reviewed reported successful teaching techniques, the current research base is limited given the paucity of studies in the area, the limited skills that have been taught, the questionable relevance of some of the skills targeted, the non-consideration of employers or coworkers during interventions, the high level of functioning of the individuals included, and the sole focus on the employment skills and non-consideration of other vital skills for success in the workplace such as communication and social skills.

The current review has several important implications for research on employment among those with ASD. First, and perhaps most conspicuously, it demonstrates the considerable need for further study in the area of employment and vocational skills for individuals with ASD. Given that only 26 studies were available for review, we echo Gerhardt and Lainer's (2011) call for a greater research focus on

determining effective and socially valid interventions for promoting employment and societal inclusion for those with ASD. The neglect of this area in the literature adversely impacts post-second-level outcomes for individuals with ASD as there is a lack of evidence-based interventions available. Response to early intervention varies and there is little data on how these interventions impact the need for support as adolescents or adults (Cimera and Cowan 2009; O'Connor and Healy 2010). This research gap could be effectively addressed through the consideration of the identified predictors of employment and using these to formulate effective interventions and supportive employment systems for individuals with ASD in the workforce. With the incidence of ASD rising and with the identification of the positive outcomes associated with employment for this vulnerable population, this issue is one of pressing concern. It is essential that employment programs and vocational skills not be viewed as relevant only upon graduation from the education system. The goals of education for individuals with ASD should provide opportunities to acquire skills that increase personal independence and social responsibility and subsequently employability (Hendricks and Wehman 2009). Second, it is pertinent that individuals with ASD have equal employment rights to their neuro-typical peers and their peers with other disabilities. A person-centered approach is vital in ensuring equality in the workplace. The first step in achieving equality may be to target employers' and coworkers' attitudes regarding the employability of people with ASD (Gerhardt and Lainer 2011). Research suggests that the willingness of employers to accommodate individuals with disabilities in their companies may be the most significant factor that determines success (Morgan and Alexander 2005). While companies such as Specialisterne are realizing the potential employability of individuals on the autism spectrum in practice, methods for changing employers' and coworkers' attitudes regarding employing adults with ASD should be examined. The training and education of those individuals who work as disability support workers with regards to the employability, and the importance of employment for individuals with ASD, may also be seen as crucial as we seek to better outcomes for those on the spectrum (Gerhardt and Lainer 2011). Gerhardt (2007) has also previously discussed the issue of underemployment in ASD and has suggested several other means in which those with ASD could be more effectively included in the workplace. These included the emphasis of the notion that all individuals with ASD are potentially suitable for employment, the viewing of first job experiences as opportunities for learning and future planning, the development of active links between support services and community businesses, and the use of creativity in job planning and development for individuals with ASD.

The current review demonstrates that at least some individuals with ASD are employable and can effectively contribute

to the workplace. ASD may be seen as a competitive advantage in some business sectors, such as IT, where attention to detail is foremost (Sonne 2009). It may be possible that with adequate support and intervention, adults with ASD may function as contributing members of society in the workplace. Given appropriate education, training, and ongoing support, some persons with ASD could potentially flourish in employment settings. This would not only benefit the individual in terms of QoL but also their families and society in general. The cost in terms of resources, time, and effort of attending school until 18 years is immense; recent studies estimate that the lifetime cost of caring for an individual with ASD is \$3.2 million dollars (Kellems and Morningstar 2012). This effort and expenditure should not go unrewarded by a limited availability of employment opportunities for adults with ASD. Without employment, long-term outcomes for individuals on the autism spectrum have been found to be quite poor, affecting those individuals, their families, and society (Allen et al. 2012). Gerhardt and Lainer (2011, p.43) have aptly described these poor outcomes faced by the majority of those with ASD as “completely unacceptable.” Autism is a spectrum disorder with individuals presenting with various levels of functioning. Every effort should be made so that opportunities for employment exist for all individuals, wherever they may lie on the autism spectrum.

References

*Study included in the review

- *Alexander, J.L., Ayres, K.M., Smith, K.A., Shepley, S.B., & Mataras, T.K. (2013). Using video modeling on an iPad to teach generalized matching on a sorting mail task to adolescents with autism. *Research in Autism Spectrum Disorders*, 7, 1346–1357
- *Allen, K. D., Wallace, D. P., Greene, D. J., Bowen, S. L., & Burke, R. V. (2010a). Community-based vocational instruction using videotaped modeling for young adults with autism spectrum disorders performing in air-inflated mascots. *Focus on Autism & Other Developmental Disabilities*, 25, 186–192.
- *Allen, K. D., Wallace, D. P., Renes, D., Bowen, S. L., & Burke, R. V. (2010b). Use of video modeling to teach vocational skills to adolescents and young adults with autism spectrum disorders. *Education and Treatment of Children*, 33, 339–349.
- *Allen, K. D., Burke, R., Howard, M., Wallace, D., & Bowen, S. (2012). Use of audio cuing to expand employment opportunities for adolescents with autism spectrum disorders and intellectual disabilities. *Journal of Autism & Developmental Disorders*, 42, 2410–2419.
- American Psychological Association. (2000). *Encyclopedia of Psychology*. Retrieved from <http://www.apa.org/topics/autism/index.aspx>.
- Barneveld, P. S., Swaab, H., Fagel, S., van Engeland, H., & deSonneville, L. M. J. (2014). Quality of life: a case-controlled long-term follow-up study, comparing young high-functioning adults with autism spectrum disorder with adults with other psychiatric disorders diagnosed in childhood. *Comprehensive Psychiatry*, 55, 302–310.
- *Bennett, K. D. (2013). Improving vocational skills of students with disabilities: applications of covert audio coaching. *Exceptional Children*, 46, 60–67.
- *Bennett, K.D., Gutierrez, A., & Honsberger, T. (2013b). A comparison of video prompting with and without voice-over narration on the clerical skills of adolescents with autism. *Research in Autism Spectrum Disorders*, 7, 1273–1281.
- *Bennett, K., Ramasamy, R., & Honsberger, T. (2013c). Further examination of covert audio coaching on improving employment skills among secondary students with autism. *Journal of Behavioral Education*, 22, 103–119.
- *Bennett, K., Ramasamy, R., & Honsberger, T. (2013). The effects of covert audio coaching on teaching clerical skills to adolescents with autism spectrum disorder. *Journal of Autism & Developmental Disorders*, 43, 585–593.
- *Bereznak, S., Ayres, K., Mechling, L., & Alexander, J. (2012). Video self-prompting and mobile technology to increase daily living and vocational independence for students with autism spectrum disorders. *Journal of Developmental & Physical Disabilities*, 24, 269–285.
- *Burke, R. V., Andersen, M. N., Bowen, S. L., Howard, M. R., & Allen, K. D. (2010). Evaluation of two instruction methods to increase employment options for young adults with autism spectrum disorders. *Research in Developmental Disabilities*, 31, 1223–1233.
- *Burke, R.V., Allen, K.D., Howard, M.R., Downey, D., Matz, G.M., & Bowen, S.L. (2013). Tablet-based video modeling and prompting in the workplace for individuals with autism. *Journal of Vocational Rehabilitation*, 38, 1–14.
- *Burt, D.B., Paige Fuller, S., & Lewis, K.R. (1991). Brief report: competitive employment of adults with autism. *Journal of Autism and Developmental Disorders*, 21, 237–242.
- Capo, L. C. (2001). Autism, employment, and the role of occupational therapy. *Work*, 16, 201–207.
- Carew, D., Birkin, R., & Booth, D. (2010). Employment, policy and social inclusion. *The Psychologist*, 23, 28–30.
- Centers for Disease Control and Prevention. (2014). Prevalence of autism spectrum disorder among children aged 8 years: autism and developmental disabilities monitoring network, 11 sites, united states, 2010. *Morbidity and Mortality Weekly*, 63, (SSO3) 1-21 Retrieved from <http://www.cdc.gov/mmwr/pdf/ss/ss6302.pdf>.
- Chappel, S. L., & Somers, B. C. (2010). Employing persons with autism spectrum disorders: a collaborative effort. *Journal of Vocational Rehabilitation*, 32, 117–124.
- *Chiang, H. M., Cheung, Y., Li, H., & Tsai, L. (2013). Factors associated with participation in employment for high school leavers with autism. *Journal of Autism & Developmental Disorders*, 43, 1832–1842.
- Cimera, R. E., & Cowan, R. J. (2009). The costs of services and employment outcomes achieved by adults with autism in the US. *Autism: The International Journal of Research & Practice*, 13, 285–302.
- *Dotson, W.H., Richman, D.M., Abby, L., Thompson, S., & Plotner, A. (2013). Teaching skills related to self-employment to adults with developmental disabilities: an analog analysis. *Research in Developmental Disabilities*, 34, 2336–2350.
- *Dotto-Fojut, K. M., Reeve, K. F., Townsend, D. B., & Progar, P. R. (2011). Teaching adolescents with autism to describe a problem and request assistance during simulated vocational tasks. *Research in Autism Spectrum Disorders*, 5, 826–833.
- Flynn, L., & Healy, O. (2012). A review of treatments for deficits in social skills and self help skills in autism spectrum disorder. *Research in Autism Spectrum Disorders*, 6, 431–441.

- *García-Villamisar, D., & Hughes, C. (2007). Supported employment improves cognitive performance in adults with autism. *Journal of Intellectual Disability Research*, *51*, 142–150.
- *García-Villamisar, D., Wehman, P., & Navarro, M. D. (2002). Changes in the quality of autistic people's life that work in supported and sheltered employment. A 5-year follow-up study. *Journal of Vocational Rehabilitation*, *17*, 309–312.
- Gerhardt, P. (2007). Notes from the field: effective transition planning for learners with autism spectrum disorders approaching adulthood. *The Journal for Vocational Special Needs Education*, *29*, 35–37.
- Gerhardt, P. F., & Lainer, I. (2011). Addressing the needs of adolescents and adults with autism: a crisis on the horizon. *Journal of Contemporary Psychotherapy*, *41*, 37–45.
- Gottlieb, A., Myhill, W.N., & Blanck, P. (2010). Employment of people with disabilities. *International Encyclopedia of Rehabilitation*. Retrieved from <http://cirrie.buffalo.edu/encyclopedia/en/article/123/>.
- Graetz, J. E. (2010). Autism grows up: opportunities for adults with autism. *Disability and Society*, *25*, 33–47.
- Hendricks, D. R., & Wehman, P. (2009). Transition from school to adulthood for youth with autism spectrum disorders: review and recommendations. *Focus on Autism & Other Developmental Disabilities*, *24*, 77–88.
- *Hillier, A.J., Fish, T., Siegel, J.H., Beversdorf, D.Q. (2011). Social and vocational skills training reduces self-reported anxiety and depression among young adults on the autism spectrum. *Journal of Developmental and Physical Disabilities*, *23*, 267–276.
- Hofvander, B., Delorme, R., Chaste, P., Nydén, A., Wentz, E., Ståhlberg, O., et al. (2009). Psychiatric and psychosocial problems in adults with normal-intelligence autism spectrum disorders. *BMC Psychiatry*, *9*, 35–43.
- Holloway, J., Healy, O., Dwyer, M., & Lydon, S. (2014). Social skills deficits in children with autism spectrum disorder: evidence-based interventions. In V. B. Patel, V. R. Preedy, & C. R. Martin (Eds.), *Comprehensive guide to autism* (pp. 1133–1158). New York: Springer.
- Holwerda, A., van der Klink, J. J. L., Groothoff, J. W., & Brouwer, S. (2012). Predictors for work participation in individuals with an autism spectrum disorder: a systematic review. *Journal of Occupational Rehabilitation*, *22*, 333–352.
- Individuals With Disabilities Education Act, 20 U.S.C. § 1400 (2004).
- *Kellems, R.O., & Morningstar, M.E. (2012). Using video modeling delivered through iPods to teach vocational tasks to young adults with autism spectrum disorders. *Career Development and Transition for Exceptional Individuals*, *35*, 155–167.
- *Lawer, L., Brusilovskiy, E., Salzer, M., & Mandell, D. (2009). Use of vocational rehabilitative services among adults with autism. *Journal of Autism and Developmental Disorders*, *39*, 487–494.
- Lugnegård, T., Hallerbäck, M. U., & Gillberg, C. (2011). Psychiatric comorbidity in young adults with a clinical diagnosis of asperger syndrome. *Research in Developmental Disabilities*, *32*, 1910–1917.
- Matson, J. L., Hattier, M. A., & Belva, B. (2012). Treating adaptive living skills of persons with autism using applied behavior analysis: a review. *Research in Autism Spectrum Disorders*, *6*, 271–276.
- McKee-Ryan, F., Song, Z., Wanberg, C. R., & Kinicki, A. J. (2005). Psychological and physical well-being during unemployment: a meta-analytic study. *Journal of Applied Psychology*, *90*, 53–76.
- *Migliore, A., Timmons, J., Butterworth, J., & Lugas, J. (2012). Predictors of employment and postsecondary education of youth with autism. *Rehabilitation Counseling Bulletin*, *55*, 176–184.
- Migliore, A., Butterworth, J., & Zalewska, A. (2014). Trends in vocational rehabilitation services and outcomes for youth with autism: 2006–2010. *Rehabilitation Counseling Bulletin*, *57*, 80–89.
- Morgan, R. L., & Alexander, M. (2005). The employers perception: employment of individuals with developmental disabilities. *Journal of Vocational Rehabilitation*, *23*, 39–49.
- Mulligan, S., Healy, O., Lydon, S., Moran, L., & Foody, C. (2014). An analysis of treatment efficacy for stereotyped and repetitive behaviors in autism. *Review Journal of Autism and Developmental Disorders*.
- O'Connor, A. B., & Healy, O. (2010). Long-term post-intensive behavioral intervention outcomes for five children with Autism Spectrum Disorder. *Research in Autism Spectrum Disorders*, *4*, 594–604.
- *Pennington, R., Delano, M., & Scott, R. (2014). Improving cover-letter writing skills of individuals with intellectual disabilities. *Journal of Applied Behavior Analysis*, *47*, 1–5.
- *Robinson, K.A., & Smith, V. (2010). A specific vocational training program for an adolescent with autism. *Developmental Disabilities Bulletin*, *38*, 93–109.
- Schall, C. M. (2010). Positive behavior support: supporting adults with autism spectrum disorder in the workplace. *Journal of Vocational Rehabilitation*, *32*, 109–115.
- *Schaller, J., & Yang, N. K. (2005). Competitive employment for people with autism: correlates of successful closure in competitive and supported employment. *Rehabilitation Counseling Bulletin*, *49*, 4–16.
- Sonne, T. (2009). *Ashoka Ireland World Leaders in Social Innovation*. Retrieved from <http://ireland.ashoka.org/fellow/thorkil-sonne>.
- *Strickland, D., Coles, C., & Southern, L. (2013). JobTIPS: a transition to employment program for individuals with autism spectrum disorders. *Journal of Autism & Developmental Disorders*, *43*, 2472–2483.
- Vogeley, K., Krichner, J. C., Gawronski, A., Tebartz van Elst, L., & Dziobak, I. (2013). Towards the development of a supported employment program for individuals with high-functioning autism in Germany. *European Archives of Psychiatry and Clinical Neuroscience*, *263*, 197–203.
- Wilczynski, S. M., Trammell, B., & Clarke, L. S. (2013). Improving employment outcomes among adolescents and adults on the autism spectrum. *Psychology in the Schools*, *50*, 876–887.
- *Yokotani, K. (2011). Avoidant attachment style indicates job adaptation of people with high functioning autistic spectrum disorder. *Education and Training in Autism and Developmental Disabilities*, *46*, 291–296.