Predictors of employment status among adults with Autism Spectrum Disorder

Alisha Ohl[a,*], Mira Grice Sheff[b], Sarah Small[c], Jamie Nguyen[d], Kelly Paskor[e] and Aliza Zanjirian[e]
[a]*Occupational Therapy, Clarkson University, Potsdam, NY, USA*
[b]*Minnesota Department of Health, Maternal & Child Health Section, MN, USA*
[c]*Holy Name Medical Center, Teaneck, NJ, USA*
[d]*NYU Hospital for Joint Diseases, New York, NY, USA*
[e]*NYC Department of Education, New York, NY, USA*

Abstract.

BACKGROUND: In the United States, adults with Autism Spectrum Disorder (ASD) experience high rates of unemployment and underemployment in relation to adults with other disabilities and the general population. Yet there is little research examining their employment experiences and the predictors of employment status.

OBJECTIVE: The purpose of this study was to examine the employment characteristics and histories of both employed and unemployed adults with ASD, and the factors that contributed to their employment status.

METHODS: This cross-sectional study used an online survey and the Short Effort Reward Imbalance (ERI) Scale to gather data. Multivariate logistic regression analyses were used to examine predictors of employment status and self-reported health.

RESULTS: Of the 254 adults with ASD who participated in this study, 61.42% were employed and 38.58% were unemployed. Over half of the participants reported job imbalance on the Short ERI Scale and the vast majority did not receive any job assistance. Participants who disclosed their ASD diagnosis to their employer were more than three times as likely to be employed than those who did not disclose. Education level was also a significant predictor of employment status.

CONCLUSIONS: This study suggests disability disclosure and education level are factors that contribute to employment status.

Keywords: Competitive employment, disability disclosure, organizations, Asperger's disorder

1. Introduction

In the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5), Autism Spectrum Disorder (ASD) is a new diagnostic classification that subsumes most individuals previously diagnosed with one of four pervasive developmental disorders: Asperger's disorder, autistic disorder, childhood disintegrative disorder, and pervasive developmental disorder not otherwise specified [1]. The presentation of ASD differs from person to person in severity and combination of symptoms and comorbidity. ASD is hallmarked by communication deficits across multiple contexts and restricted, repetitive patterns of behavior, interests, or activities [2]. Furthermore, people with ASD often struggle with misreading nonverbal interactions, building age appropriate friendships, and adapting to changes in their environment [1]. Like areas of difficulties, the strengths associated with ASD are specific to the person; however, numerous commonalities exist [3]. For instance, many individuals with ASD exhibit detailed thinking,

---

*Address for correspondence: Alisha Ohl, Ph.D., OTR/L, Assistant Professor, Occupational Therapy, Clarkson University, 8 Clarkson Avenue, Potsdam, NY 13699, USA. Tel.: +315 268 4412; E-mail: aohl@clarkson.edu.

expansive long-term memories, comfort with rules and guidelines, and an affinity for analyzing complex patterns [3].

The symptoms of ASD fall on a continuum, with some individuals showing mild symptoms, while others have more severe symptoms and require extensive support [1]. In the current study, we delimited our sample to individuals on the mild end of the spectrum who were previously diagnosed with Asperger's disorder (AD). It should be noted that AD is characterized by typical or above average intelligence [4] and the same communication deficits associated with ASD. In the literature, AD is often referred to as a non-obvious or hidden disability, because individuals with AD may not appear obviously different, but also don't quite fit in [5]. Frith [6] noted with high intellectual abilities and good environmental supports, the symptoms of AD may go unnoticed by others during short casual conversations; however, when the contextual social skill requirements become overwhelming, the individual with AD will fail to adapt to the new social challenge. Because AD is subsumed under the diagnostic criteria for ASD, we will refer to our study participants as adults with ASD throughout this paper.

In the United States, the prevalence of ASD has increased over the past decade from 1 in 150 children in 2000, to 1 in 68 children in 2010 [7]. For most children who receive an ASD diagnosis, it is a lifelong developmental disorder that continues into adulthood [8]. In their analysis of the age of participants with ASD in 146 intervention research studies, Edwards et al. [9] found the majority of research efforts had focused on young children, with relatively little attention given to adults. While the authors note these findings may be justified given the documented value of early interventions and the rising incidence of ASD [9], Shattuck et al. [10] found as the ASD population ages, they require continued assistance and training to function in their daily lives. An area of particular concern cited throughout the adult ASD literature, is employment [11–15].

1.1. State of employment

Despite having the ability and desire to work [12], it is estimated that approximately half of adults with ASD are unemployed [16, 17], which is significantly higher than the national unemployment rate (5.0% in November 2015) [18]. Additionally, comparing data from wave four of the national longitudinal transition study (NLTS2) to survey data on young adults with ASD, Shattuck et al. [17] found the employment rate of adults with ASD to be significantly lower than adults with mental retardation, learning disabilities, and speech impairments.

1.2. Barriers to obtaining employment

Personal factors and symptoms associated with ASD have been found to adversely impact employment. In a systematic literature review examining the predictors of work participation in individuals with ASD, Holwerda et al. [19] found limited cognitive ability to be the only significant predictor to hinder employment across fifteen studies. Although the findings were mixed, eight other factors were found to hinder employment in several studies: (1) severity of the disorder, (2) comorbidity with psychiatric disorders, oppositional personality or epilepsy, (3) gender with females being more likely to have poor outcomes in two out of three studies, (4) lower speech and language abilities, (5) the presence of maladaptive behaviors, (6) the presence of social impairments and lack of empathy, (7) lack of drive, and (8) prior institutionalization (i.e., hospitalization) [19].

Organization and interactional difficulties are also known to impact employment. In their interviews with eighteen adults representing a wide range of the ASD spectrum, Muller et al. [20] found several aspects of the job seeking process to be problematic. This included organizing the job process as a whole, with a number of adults describing difficulties knowing how to look for a job, initiating job contact, and following-up once contact was made [20]. Participants also reported struggling with developing succinct resumes that included pertinent experiences and skills, knowing what type of information to provide on the job application, and how much detail to give during the interview [20]. In their interviews with six adults on the mild end of the ASD spectrum (i.e., AD), Hurlbutt and Chalmers [13] also found the interview process to be an area of difficulty, with one participant reporting the need to practice how to say things during the interview (i.e., delivering social niceties) [13]. In addition to these barriers, frequent job terminations and long periods of unemployment between jobs are noted in the literature [13, 20], creating a checkered work history that is difficult to account for during the job hiring process [20].

1.3. Facilitators to obtaining employment

Studies suggest external supports and some personal factors can facilitate employment. In their

systematic review, Holwerda et al. [19], found two factors facilitated employment: (1) education, and (2) family support. In a more recent study using the RSA911 database for 2008, Migliore et al. [21] examined the predictors of employment for young adults (aged 16 to 26 years) with ASD who had received vocational rehabilitation (VR) services, finding the odds of employment were the highest for participants who had received job placement services. Roux et al. [16] also examined the employment experiences of young adults (aged 21 to 25 years) with ASD; however, their sample had not received VR services. They found participants were more likely to find paid employment if they were: (1) older, (2) from a higher income household, and (3) had higher functional skills.

1.4. Underemployment

For adults with ASD who are able to obtain employment, underemployment is common. People may be considered underemployed if they involuntarily work less than full-time, work full-time but don't receive a livable wage, when their job does not afford the opportunity to use their skills, and when their job provides less status than expected on the basis of their background [22]. Several studies have found adults with ASD are typically employed part-time, working less than thirty hours per week on average [21, 23, 24]. However, whether or not these participants chose to work less than full-time is unknown.

Muller et al. [20] found several of their participants with ASD had prepared themselves for professional careers by completing graduate level coursework, yet found themselves working in food-services or low-level administrative or customer service positions for which they were over-qualified. Hurlbutt and Chalmers [13] reported similar experiences of underemployment. The participants with ASD in their study, for the most part, were not able to find jobs in the fields they had been trained in [13]. Moreover, several of the participants described only being able to obtain "menial" or entry-level jobs, such as renting out beach umbrellas and cleaning cat cages (p. 214).

Findings of underemployment are also highlighted in larger scale studies. In their analysis of data from wave five of the National Longitudinal Transition Study (NLST2), Roux et al. [16] found most of the employed adults with ASD made significantly less money than adults with other disabilities and worked in jobs that could largely be considered entry-level (e.g., administrative support, transportation and materials moving, production work involving assembly, food preparation, and grounds cleaning and maintenance). Taking a different tack, studying a sample of high functioning adults with ASD in Australia, Baldwin, Costley, and Warren [23] examined the match between their participants' highest education level and the education level required of their job. They found almost half (45%) of the employed adults with ASD in their study were working in jobs for which they were overqualified.

1.5. Difficulties on the Job

Hurlbutt and Chalmers [13] found a number of their participants attributed their job difficulties to the social demands of the work environment, rather than the job itself. One interviewee reported that the most important rule of work was to get along with others because, "jobs usually are 80% social (conversation, lunch, breaks, chit-chat) and 20% work" (p. 219). Other interviewees reported numerous social struggles, which included being too blunt, obsessing over the meaning of something a co-worker said, and not knowing how many questions to ask when they needed clarification from their boss. Muller et al. [20] also found the inability to master the social demands of the workplace to be the most frequently mentioned obstacle to vocational success. While some adults with ASD were able to tolerate being socially different, the majority reported that their social deficits led to isolation and alienation in the workplace [20].

Continuous vocational failures have both negative financial and emotional effects on adults with ASD. When describing their inability to obtain work and frequent job terminations, a number of adults with ASD have reported feelings of depression, low self-esteem, and frustration [20]. When asked what they needed for positive employment outcomes, adults with ASD identified finding the appropriate job match with the help from a VR counselor or a job coach was essential because they could provide individualized ASD specific support on the job [20].

Disclosure was also reported to be beneficial because it allowed for job accommodations under the Americans with Disabilities Act [13]. However, there is still stigma attached to disclosure [25], and fear that it will not only prevent hiring, but also lead to the employer finding an excuse to terminate [13]. For those who choose to disclose their disability, other barriers related to ASD may prevent successful disclosure. Initially, adults with ASD may struggle with deciding whom to disclose their disability to

within the workplace [26]. Furthermore, the act of disclosing often requires a complex, emotional, and socially demanding conversation that may be particularly difficult, given the communication deficits and social anxieties often experienced by individuals with ASD [27].

1.6. Purpose

The existing ASD employment literature is rich with evidence from qualitative studies that capture the lived experiences of adults with ASD in their own words and several larger scale studies focusing on young adults' post secondary transition and adults receiving VR services. Due to the research emphasis on adults receiving services, Chen et al. [28] recommend further study of the employment outcomes of adults with ASD outside of the service system. Furthermore, they recommend using reliable outcome measures to examine aspects of employment, such as job satisfaction [28].

The purpose of this study was to examine the employment characteristics and histories of both employed and unemployed adults with ASD, and the factors contributing to employment status. To fill the proposed research gaps, this study included a general population of adults with ASD, receiving various levels of job support. This study also adds to the literature by examining the effect of disability disclosure on employment status and by using the Short Effort Reward Imbalance (ERI) Scale [29] to examine the participants' perceived job imbalance at work.

The model of ERI is based upon the premise that the beneficial effects of work are contingent upon a balance between efforts (demands and obligations) and rewards (money, esteem, and status control) [30]. According to the model, an imbalance, or lack of reciprocity between costs and gains (i.e., high effort/low reward conditions at work) contributes to a state of sustained emotional distress, which in turn is thought to activate the autonomic nervous system and contribute to adverse physical and psychological health effects [30, 31]. Additionally, individuals who display excessive work related commitment and a high need for approval (over-commitment), are thought to be at an increased risk for strain [31]. A review of forty-five empirical studies supports that effort reward imbalance in the workplace is associated with increased risk of cardiovascular disease, increased smoking and alcohol consumption, and high emotional exhaustion or burnout [32].

Because adults with ASD spend significant effort trying to understand and fit into the social milieu of their jobs (high effort), and their work is often low reward (i.e., part-time, low paying, and entry-level), we hypothesized they would experience a high rate work imbalance on the Short ERI Scale [29]. The relationship between job imbalance and self-reported health was also examined.

2. Methods

In this cross-sectional study, we used multivariate logistic regressions to test the relationship between predictor variables, employment outcomes, and self-rated health of adults with ASD living in the United States. Data were gathered from the ASD Employment Questionnaire (ASDEQ), developed by the authors of this study, and the Short ERI Scale [29]. The web link to the online ASDEQ, which also contained the Short ERI Scale [29], was sent to agencies serving adults listed on the Autism Speaks Resource Guide. Our advertisement specified that we were looking for adults previously diagnosed with AD. The sample was self-selecting, with adults responding to recruitment notices issued by participating agencies through emails, flyer postings, and their websites. Data were gathered from June 2013 through June 2014.

2.1. Sample

To be included in this study, participants were required to meet the following criteria: (a) be 18 years of age or older, and (b) have a previous diagnosis of Asperger's disorder (AD). Participants who did not identify having a diagnosis of AD, who did not complete at least 80% of the questionnaire, and were unemployed due to retirement or enrollment in higher education, were excluded from data analysis. The SUNY Downstate Medical Center Internal Review Board approved this study.

Because the ASDEQ relied on self-report, the authors of the study had no way of verifying participant diagnosis or intellectual ability. To ensure the integrity of the sample, we asked participants if they had been diagnosed with AD. After analyzing participant demographics, we felt their education level (86.45% had some level of post-secondary education) was a strong indicator that the participants should be considered high functioning.

2.2. Measures

We developed the ASDEQ to examine the employment characteristics and histories of adults with ASD. We pilot tested the final questionnaire with four individuals with content expertise in ASD and work, to assess whether the questions adequately measured employment characteristics (face validity). The pilot participants also provided feedback on the clarity and comprehensiveness of the questionnaire, which resulted in minor revisions throughout. The ASDEQ contains three sections: 1) Participant Characteristics, 2) Employment Characteristics, and 3) Employment History.

2.3. Participant characteristics

Participants were asked to identify their age, gender, race, co-occurring diagnoses, highest level of education, living status, marital status, and self-reported health on a Likert scale (*Poor, fair, good, very good*).

2.4. Employment characteristics

Participants were asked to identify their current job title, the number of years employed at their current job, job satisfaction measured on a Likert scale (*Very dissatisfied, dissatisfied, satisfied, and very satisfie*d), hours worked per week (Full-time or Part-time), shift (1st - 8:00–4:00 p.m. or 9:00 until 5:00 p.m., 2nd - 4 or 5:00 p.m. until midnight, 3rd - 10:00 to midnight until early morning, or Flexible/varied), level of job support (Job coach at work, Job coach outside of work, or No assistance), and if they had disclosed their ASD diagnosis to their employer. Unemployed participants were asked to identify their reason for unemployment (Unable to find a job, Quit, Fired, Laid off, Injury/Illness, Other) and to answer the same questions as the employed participants, regarding their last paid job.

2.5. Employment history

Participants were asked to identify the job titles for their last five jobs, number of paid jobs held in the past five years, and the longest period of time they held a job.

2.6. Short ERI Scale

The Short ERI scale [29] was used to assess effort, reward and the effort reward ratio. Effort was measured using three Likert scaled items (s*trongly disagree, disagree, agree, strongly agree*) with a total possible score ranging between 3 and 12. Reward was calculated using seven items, also on the same Likert scale. The total possible score on the seven items measuring reward varied between 7 to 28 points. The Effort Reward ratio (ER-ratio) represents the potential imbalance between efforts and rewards. This ratio is calculated using the total effort score in the numerator, the reward score in the denominator and weighed by the number of items. An ER-ratio less than 1 indicates less effort for each reward; a score greater than 1 represents more effort for each reward and a high-risk condition for imbalance [29]. The Short ERI Scale [29] also measures over-commitment with six items. The over-commitment portion of the scale was not used in this study. The Short ERI Scale [29] has adequate internal consistency, with all Cronbach's alpha coefficients equal to or higher than 0.74 across two studies [33, 34], and adequate structural validity [34].

The Short ERI Scale [29] was given to both employed and unemployed participants. The employed participants were asked to complete the Short ERI Scale [29] with their current job in mind. The unemployed participants were asked to complete the Short ERI Scale [29] thinking about their last paid job, and the questions were changed to the past tense.

2.7. Data analysis

SPSS version 21.0 was used to analyze all data. Data were first analyzed with descriptive statistics (mean, standard deviation, standard error). Independent *t*-tests and Chi square tests were used to examine differences between employed and unemployed participants. A multivariate logistic regression model was calculated to estimate the relationship between employment status (measured as employed or unemployed) and the following predictors: age (measured in years), gender, disability disclosure, education (measured in years), comorbidity (measured as a binary yes/no), and ERI ratio. A second multivariate logistic regression model was calculated to estimate the relationship between self-reported health (measured as good versus bad) and the ERI ratio. The regression model adjusted for potential confounders including age, employment status, disclosure status, gender, education in years and marital status.

To examine the fit between the participant's highest level of education and their job (job-match),

we researched each participant's job title using the Bureau of Labor Statistics Occupational Outlook Handbook, which provides job descriptions, including required entry-level educational requirements. Based on the participants' reported highest level of education and the entry-level educational requirements for their reported job title, we then determined if they were over qualified (i.e., held a higher degree than required for the job) or were appropriately matched to their job (i.e., held the appropriate degree for the job). Job titles that did not provide enough information or were not found in the BLS database were excluded from analysis.

3. Results

3.1. Participant characteristics

Four hundred twenty questionnaires were initiated on Survey Monkey. After excluding the questionnaires that did not meet the inclusion criteria for this study ($n = 166$), we were left with 254 questionnaires completed by adults with ASD living in the United States.

The gender profile of the total participant group was 43.31% female and 55.12% male (1.57% did not report their gender). Participants ranged in age from 18 to 68 years ($M = 38.11$, $SD = 13.02$), were primarily White (86.64%), single (74.50%), held a university degree (64.54%), and had one or more co-occurring disorder(s) (84.25%). Participants were also geographically diverse, representing 41 States. Table 1 provides additional demographics by employment status.

Comparisons between employed and unemployed participants indicated the groups were well matched by age [$t (244) = –1.14$, $p = 0.255$], gender ($X^2 = 2.40$, $p = 0.121$), ethnicity ($X^2 = 6.62$, $p = 0.250$), and marital status ($X^2 = 11.21$, $p = 0.190$). There were some significant differences between the two groups, indicating fewer incidences of co-occurring disorders ($X^2 = 5.182$, $p = 0.023$) among employed participants (80.13%) than unemployed participants (90.82%). On average, employed participants ($M = 16.28$ years, $SD = 2.65$) also had more years of education [$t (249) = –2.42$, $p = 0.016$] than unemployed participants ($M = 15.47$ years, $SD = 2.52$). There were also significant differences in the self-rated health of the two groups ($X^2 = 4.02$, $p = 0.045$), where employed participants indicated good health (72.90%)

more frequently than unemployed participants (60.82%).

3.2. Current employment characteristics and work history

Descriptive analysis revealed of the 254 adults with ASD who participated in the study, 156 (61.42%) were employed and 98 (38.58%) were unemployed at the time of questionnaire completion. Among the unemployed participants, 29.59% were unable to find a job, 13.27% quit their last job, 21.43% were fired, 16.33% were laid off, and 16.33% could no longer work due to an injury or illness (3.05% did not report their reason for unemployment).

Together, participants held jobs in 35 different fields. The top six fields listed by employed participants ($N = 154$) included: information technology (10.39%), education and teaching (9.74%), retail (9.09%), healthcare (8.44%), restaurant and food services (5.84%), and government (4.55%). When considering their last job, unemployed participants ($N = 85$) worked in fields that were similarly matched to their employed counterparts: education and teaching (15.29%), customer service (11.76%), government (10.59%), retail (9.41%), information technology (9.41%), and restaurant and food services (7.06%).

On average, both employed ($M = 4.17$ years, $SD = 4.31$) and unemployed participants ($M = 4.83$, $SD = 5.48$) held a similar number of jobs over the past five years ($t [229] = 1.00$, $p = 0.316$). However, there was a significant difference in the length of the longest job they had ever held ($t [245] = – 4.61$, $p = <0.001$), indicating that employed participants ($M = 8.26$, $SD = 5.85$) had held jobs significantly longer than the unemployed participants ($M = 5.03$, $SD = 4.40$).

Table 2 provides additional descriptive statistics for years employed at the current or most recent job, job satisfaction, hours worked, shift, level of job support, and disability disclosure. Comparisons between employed and unemployed participants indicated several significant differences between the groups. Employed participants held their current job significantly longer than unemployed participants held their last job ($X^2 = 24.33$, $p = 0.001$). Employed participants also had significantly higher work satisfaction ($X^2 = 13.20$, $p = 0.004$) and rates of disability disclosure ($X^2 = 28.18$, $p < 0.001$). There were also significant differences in shift ($X^2 = 23.66$, $p < 0.001$)

Table 1
Personal characteristics of employed and unemployed adults with ASD (*N* = 254)

Characteristic	Employed (*n* = 156)	Unemployed (*n* = 98)
Age *M (SD)*	*M* = 38.87, *SD* = 12.97	*M* = 36.93, *SD* = 13.07
Gender *n(%)*		
Female	62 (40.52)	48 (49.48)
Male	91 (59.48)	49 (50.52)
Not reported	3	1
Race *n(%)*		
White	132 (84.62)	82 (90.11)
Black or African American	3 (1.92)	2 (2.20)
Asian	12 (7.69)	1 (1.10)
Hispanic, Latino, or Spanish origin	1 (0.64)	—
American Indian or Alaskan Native	1 (0.64)	—
Two or more, or other	7 (4.49)	6 (6.59)
Not reported	—	7
Co-occurring Diagnoses* *n(%)*		
ADHD/ADD	41 (26.28)	34 (34.69)
OCD	25 (16.03)	25 (25.51)
Learning Disability	30 (19.23)	27 (27.55)
Tourette's syndrome	3 (1.92)	2 (2.04)
Depression	68 (43.59)	55 (56.12)
Anxiety Disorder	61 (39.10)	52 (53.06)
Highest Level of Education *n(%)*		
High School or Less	21 (13.55)	13 (13.54)
Some College	27 (17.42)	28 (29.17)
2 year degree (A.D. or Certificate)	25 (16.13)	14 (14.58)
4 year bachelor's degree	43 (27.74)	28 (29.17)
Graduate school	39 (25.16)	13 (13.54)
Not reported	1	2
Marital Status *n(%)*		
Married/Living with Partner	45 (29.03)	19 (19.79)
Separated/Divorced/Widowed	18 (11.61)	15 (15.63)
Single/Other	92 (59.35)	62 (65.58)
Not reported	1	2
Living Situation *n(%)*		
Lives alone	55 (35.48)	28 (31.46)
Lives with spouse or partner	46 (29.68)	17 (19.10)
Lives with parent or family member	47 (30.32)	43 (48.31)
Lives in a group home	5 (3.23)	1 (1.12)
Lives with a roommate	2 (1.29)	—
Not reported	1	9
Self-reported Health		
Bad	42 (27.10)	38 (39.18)
Good	113 (72.90)	59 (60.82)
Not reported	1	1

The provided percentages do not include missing cases (valid percent). *Because participants may report more than one co-occurring diagnosis, column numbers do not add up to the total *N*.

and job support (X^2 = 4.67, *p* = 0.031) between the two groups.

3.3. Underemployment

Almost half of the total participant group reported working part-time (46.64%). When compared by employment status, there was no significant difference in the rate of part-time work between employed (44.23%) and unemployed (50.52%) participants (X^2 = 0.949, *p* = 0.330). The majority of employed

(82.69%) and unemployed (85.40%) participants had education levels on parity with their job title.

3.4. ERI

On average, employed participants had significantly lower ERI ratios (*M* = 1.21, SD = 0.68) than unemployed participants (*M* = 1.53, SD = 0.87), *t* (235) = 3.17, *p* = 0.002, indicating less job imbalance. Table 2 provides statistics for the ERI ratio computed as a binary variable (<1 and >1).

Table 2
Employment characteristics of employed and unemployed adults with ASD ($N = 254$)

Characteristic	Employed ($n = 156$)	Unemployed ($n = 98$)	X^2 (*p-value*)
Years employed			24.33 (0.001)
<1 year	45 (28.85)	51 (53.13)	
1–3 years	45 (28.85)	22 (22.92)	
3–5 years	15 (9.62)	12 (12.50)	
5–7 years	16 (10.26)	6 (6.25)	
7–10 years	12 (7.69)	2 (2.08)	
10–13 years	7 (4.49)	—	
13–15 years	1 (0.64)	1 (1.04)	
>15 years	15 (9.62)	2 (2.08)	
Not reported	—	2	
Work Satisfaction			13.20 (0.004)
Very Dissatisfied	17 (10.90)	21 (21.43)	
Dissatisfied	35 (22.44)	34 (34.69)	
Satisfied	72 (46.15)	30 (30.61)	
Very Satisfied	32 (20.51)	13 (13.27)	
Hours worked per week			0.949 (0.330)
Part-time (<35 hours)	69 (44.23)	49 (52.00)	
Full-time (>35 hours)	87 (55.77)	48 (48.00)	
Not reported	—	1	
Shift			23.66 (<0.001)
1st	106 (70.20)	56 (64.37)	
2nd	23 (15.23)	28 (32.18)	
3rd	5 (3.31)	3 (3.45)	
Varied/Flexible	17 (11.26)	—	
Not reported	5	11	
Job Support			4.67 (0.031)
Job coach/other	42 (26.92)	15 (15.31)	
None	114 (73.08)	83 (84.69)	
Disability disclosure			28.18 (<0.001)
Yes	98 (63.23)	28 (28.87)	
No	57 (36.77)	69 (71.13)	
Not reported	1	1	
ERI Ratio			6.93 (0.008)
<1 *n*(%)	71 (47.33)	26 (29.89)	
>1 *n*(%)	79 (52.67)	61 (70.11)	
Not reported	6	11	

The provided percentages do not include missing cases (valid percent).

3.5. Predictors of employment status

Results from the multivariate logistic regression assessing the relationship between six predictor variables and employment status are provided in Table 3. Adults with ASD were three times more likely to be employed if they disclosed their ASD disability to their employer (OR = 3.618, 95% CI 1.93–6.80) than if they did not disclose. They also had greater odds of employment if they had a higher level of education (OR = 1.205, 95% CI 1.05–1.38). Comorbidity, age, gender, and ERI ratio were not significant predictors of employment outcome.

Table 3
Multivariate logistic regression analysis for employment status ($N = 254$)

Variable	Odds Ratio	95% CI
Disability Disclosure	3.618***	1.93–6.80
Education (Years)	1.205**	1.05–1.38
Comorbidity	0.439	0.17–1.11
ERI Ratio	0.668	0.45–0.99
Gender	0.667	0.37–1.22
Age	1.00	0.98–1.03

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

Table 4
Multivariate logistic regression analysis for self-reported health ($N = 254$)

Variable	Odds Ratio	95% CI
ERI	0.45*	0.23–0.89
Age	0.99	0.95–1.01
Employment	1.45	0.36–1.41
Disclosure	0.96	0.53–1.95
Gender	0.66	0.42–1.45
Education (Years)	1.05	0.92–1.19
Marital Status		
Married/living with partner	Ref.	
Separated, divorced, widow	1.14	0.44–2.96
Single/other	1.38	0.64–2.95

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

3.6. Relationship of predictors with self-reported health

Results from the multivariate logistic regression assessing the relationship between self-reported health and ERI scores are provided in Table 4. After adjustment for potential confounders (i.e., age, employment status, disclosure status, gender, education in years and marital status), participants who reported less effort for each reward (an ERI ratio less than 1) were also more likely to report better health (OR = 0.45; 95% CI 0.23–0.89).

4. Discussion

This study contributes to our knowledge of the employment characteristics and histories of adults with ASD, as well as the factors that both hinder and facilitate employment. Our sample had widespread geographic representation and an unexpectedly large representation from female participants (43.31%) given that ASD is five times more common in males than females [35]. Participants were also predominately white and highly educated, decreasing the ability to generalize the findings.

In general, we found a lower rate of unemployment (38.58%) than reported in previous studies [16, 17]. This finding is likely explained by delimiting the current study sample to adults previously diagnosed with AD, a mild form of ASD, while other employment studies included participants from a larger range of the ASD continuum. It should also be noted that while the unemployment rate of this study is less than previous estimates, it is over seven times the national average, and therefore still an area of immense concern.

Consistent with the ASD employment literature [21, 23, 24], almost half of our participants (46.64%) worked part-time. However, we do not know if they desired full-time employment and therefore, truly meet the criteria for underemployment. Our finding regarding job-match, an indicator of underemployment, differed greatly from the findings presented in previous literature [13, 20, 23]. The vast majority of our participants (>80%) worked in jobs that were on parity with their education level, compared to 25.6% cited by Baldwin et al. [23] in their study of high functioning adults with ASD in Australia. The stark difference in job-match between our studies may be attributed to differences in the method used to determine job-match or differences in the job market between Australia and the United States. It is also important to note that while our participants were largely employed in jobs that matched their educational level, it could be asked whether their jobs were a good fit with regard to their skill level and areas of interest? Further study is needed to examine other indicators of job-match.

This study adds weight to the qualitative literature describing the checkered work histories of adults with ASD [13, 20]. In our sample, both employed and unemployed participants experienced some level of job instability, averaging between four and five different jobs in five years.

Among the unemployed participants, almost one third (29.59%) were unable to find work. It is unclear whether these participants were not able to find jobs that matched their qualifications or if they met the same barriers to employment (e.g., difficulties with resume building, filling out job applications, and interviewing) described in other studies [13, 20]. An additional third (34.70%) of unemployed participants either quit their last job or were fired. When reflecting on their last job while completing the Short ERI Scale [29], more than half (62.2%) of the unemployed participants received ERI ratios greater than 1.0, indicating job imbalance (high effort/low rewards). This

perceived imbalance might have been a contributing factor to their unemployment, or perhaps the participants rated their previous jobs less favorably because they no longer worked in them. Overall, both employed and unemployed participants reported high levels of job imbalance compared to other studies on the general population, which reported job imbalance rates between 4.6% and 24.1% [36–39]. The high rate of perceived job imbalance among adults with ASD is likely the result of numerous factors (e.g., low pay, difficulties adapting to the changing demands of the work environment, and impaired communication with superiors), and requires further examination.

When considering whether ERI ratios contributed to self-reported health, we found participants with ERI ratios less than 1 (less effort more reward) were more likely to report better health than participants with ERI ratios greater than 1 (high effort/low reward). The association between ERI and self-reported health found in this study is supported by a growing body of evidence which suggests that work stress is more likely to occur when the relationship between the efforts invested (e.g., heavy workload, constant time pressure) are high and the rewards received in return (e.g., low wages, poor job security and/or poor promotion prospects) are low [30]. It is this failed reciprocity that, over time, is thought to fuel the stress reactions that negatively affect worker physical and mental health.

When reflecting on their longest held job, on average, employed participants held jobs almost twice as long as the unemployed participants. They also received assistance from a job coach or counselor significantly more (26.92%) than their unemployed counterparts (15.31%). However, the vast majority of participants in both groups reported low levels of job support from a job coach either on the job or off-site. This finding suggests there may be a stigma attached to employment assistance programs or significant barriers for this population, such as poor awareness regarding available services or difficulties qualifying for work assistance services.

Perhaps the starkest contrast between the two groups was in the rate of disability disclosure. Over twice as many employed participants (63.23%) disclosed their ASD diagnosis to their employer than unemployed participants (28.87%). Unfortunately, this finding is not surprising given the stigma and fear surrounding disclosure cited in the literature [13, 25]. We found participants who disclosed their ASD diagnosis to their employer were more than three times as likely to be employed than participants who did not

disclose. While the benefits of disability disclosure are many (e.g., disclosure opens a line of communication between employers and their employees, allows for reasonable workplace accommodations, involves human resources), this study did not explore the causal mechanisms of disclosure. Further study is needed to examine the outcomes and processes associated with disability disclosure among adults with ASD.

Education level was also a significant predictor of employment outcome. Consistent with the findings in the literature review conducted by Holwerda et al. [19], we also found participants with higher levels of education had higher odds of employment. While Roux et al. [16] found age to be a significant predictor of employment outcome; it was not a significant predictor in this study. The role of gender as an employment predictor has mixed findings in the literature [19]. We did not find gender to significantly predict employment status in our sample. Likewise, job imbalance and comorbidity were also not significant predictors.

5. Limitations

As previously discussed in the methods section, a primary weakness of this research is its reliance on self-report for diagnosis without any official diagnostic proof (e.g., professional diagnostic report) or means of measuring functional skill level. Future studies would benefit from IQ testing and social functioning scores to allow for examining differences in employment outcome by relative severity of the ASD. Another limitation is that our sample is not nationally representative (e.g., predominantly white and college educated) and therefore, not generalizable.

6. Conclusions

The findings of this study have implications for practice and research. Based on our findings, we recommend professionals working with the adult ASD population place more emphasis on the importance of disability disclosure. This is also an area that requires further research in the ASD population. Future studies should examine the qualitative outcomes of disability disclosure and the conditions for disclosure among adults with ASD.

In our opinion ERI is a useful lens with which to view employment issues in the ASD population.

Further studies are needed to examine differences in ERI between adults with ASD and neurotypical adults working in the same job field. A better understanding of how workers with ASD experience their job and which aspects of their job lead to job imbalance could be beneficial in helping them maintain employment. Research exploring the relationship between job imbalance and various health outcomes reported in previous studies is warranted.

Acknowledgments

Conflict of interest

None to report.

References

[1]   American Psychiatric Association (APA) [Autism Spectrum Disorder fact sheet on the internet]. [updated 2013; cited 2015 March 6]. Available from: http://www.dsm5.org/

[2]   Centers for Disease Control and Prevention (CDC) [Diagnostic Criteria for 299.00 Autism Spectrum Disorder]. [updated 2015; cited 2015 November 30]. Available from: http://www.cdc.gov/ncbddd/autism/hcp-dsm.html

[3]   Robertson SM. Neurodiversity, quality of life, and autistic adults: Shifting research and professional focuses onto real-life challenges. Disability Studies Quarterly 2010;30(1):27.

[4]   American Psychiatric Association (APA). Diagnostic and statistical manual of mental disorders 4th ed., text revision. Washington (DC); 2000.

[5]   Portway S, Johnson B. Do you know I have Asperger's syndrome? Risks of a nonobvious disability. Health, Risk, & Society 2005;7:73-83.

[6]   Frith U. Emanuel Miller lecture: Confusions and controversies about Asperger syndrome. Journal of Child Psychology and Psychiatry 2004;45(4):672-86.

[7]   Autism Spectrum Disorder [Autism and Developmental Disability Monitoring Network homepage on the internet]. Centers for Disease Control and Prevention [updated 2015 February 26; cited 2015 March 7]. Available from: http://www.cdc.gov/ncbddd/autism/addm.html

[8]   Helt M, Kelley E, Kinsbourne M, Pandey J, Boorstein H, Herbert M, et al. Can children with autism recover? If so, how? Neuropsychology Review 2008;18(4):339-66.

[9]   Edwards TL, Watkins EE, Lotfizadeh AD, Poling A. Intervention research to benefit people with autism: How old are the participants? Research in Autism Spectrum Disorders 2012;6(3):996-99.

[10] Shattuck PT, Seltzer MM, Greenberg JS, Orsmond GI, Bold D, Kring S, Lounds J, Lord C. Change in autism symp-

toms and maladaptive behaviors in adolescents and adults with an autism spectrum disorder. Journal of Autism and Developmental Disabilities 2007;37:1735-47.

[11] Barnhill GP. Outcomes in adults with Asperger syndrome. Focus on Autism and Other Developmental Disabilities 2007;22(2):116-26.

[12] Hendricks D. Employment and adults with autism spectrum disorders: Challenges and strategies for success. Journal of Vocational Rehabilitation 2010;32(2):125-34.

[13] Hurlbutt K, Chalmers L. Employment and adults with Asperger syndrome. Focus on Autism and Other Developmental Disabilities 2004;19(4):215-22.

[14] Romoser M. Malemployment in Autism. Focus on Autism and Other Developmental Disabilities 2000;15(4):246-47.

[15] Taylor JL, Seltzer, MM. Employment and post-secondary educational activities for young adults with autism spectrum disorders during the transition to adulthood. Journal of Autism and Developmental Disorders 2011;41(5):566-74.

[16] Roux AM, Shattuck PT, Cooper BP, Anderson KA, Wagner M, Narendorf SC. Postsecondary employment experiences among young adults with an autism spectrum disorder. Journal of the American Academy of Child & Adolescent Psychiatry 2013;52(9):931-39.

[17] Shattuck PT, Narendorf SC, Cooper B, Sterzing PR, Wagner M, Taylor JL. Postsecondary education and employment among youth with an autism spectrum disorder. Pediatrics 2012;129:1042-49.

[18] Bureau of Labor Statistics (BLS) [Labor force statistics from the current population survey on the Internet]. Washington DC: [updated 2015 December 9; cited 2015 December 9]. Available from: http://data.bls.gov/timeseries/LNS14000000

[19] Holwerda A, van der Klink JJ, Groothoff JW, Brouwer S. Predictors for work participation in individuals with an autism spectrum disorder: A systematic review. Journal of Occupational Rehabilitation 2012;22(3):333-52.

[20] Müller E, Schuler A, Burton BA, Yates GB. Meeting the vocational support needs of individuals with Asperger syndrome and other autism spectrum disabilities. Journal of Vocational Rehabilitation 2003;18(3):163-75.

[21] Migliore A, Timmons J, Butterworth J, Lugas J. Predictors of employment and postsecondary education of youth with autism. Rehabilitation Counseling Bulletin 2012;55(3):176-84.

[22] Friedland DS, Price RH. Underemployment: Consequences for the health and well-being of workers. American Journal of Community Psychology 2003;32(1-2):33-45.

[23] Baldwin S, Costley D, Warren A. Employment activities and experiences of adults with high-functioning autism and Asperger's disorder. Journal of Autism and Developmental Disorders 2014;44(10):2440-49.

[24] Schaller J, Yang NK. Competitive employment for people with autism correlates of successful closure in competitive and supported employment. Rehabilitation Counseling Bulletin 2005;49(1):4-16.

[25] Krieger B, Kinebanian A, Prodinger B, Heigl F. Becoming a member of the work force: Perceptions of adults with Asperger Syndrome. Work: A Journal of Prevention, Assessment and Rehabilitation 2012;43(2):141-57.

[26] Johnson TD, Joshi A. Disclosure on the spectrum: Understanding disclosure among employees on the autism spectrum. Industrial and Organizational Psychology 2014;7(2):278-81.

[27] Neely BH, Hunter ST. In a Discussion on Invisible Disabilities, Let Us Not Lose Sight of Employees on the Autism Spectrum. Industrial and Organizational Psychology 2014;7(2):274-77.

[28] Chen JL, Leader G, Sung C, Leahy M. Trends in employment for individuals with autism spectrum disorder: A review of the research literature. Journal of Autism and Developmental Disorders 2015;2(2):115-27.

[29] Siegrist J, Li J, Montano D. Psychometric properties of the Effort-Reward Imbalance Questionnaire. Department of Medical Sociology, Faculty of Medicine, Dusseldorf University, Germany 2014:1-28.

[30] Siegrist J. Adverse health effects of high-effort/low-reward conditions. Journal of Occupational Health Psychology 1996;1(1):27.

[31] Siegrist J, Starke D, Chandola T, Godin I, Marmot M, Niedhammer I, Peter R. The measurement of effort–reward imbalance at work: European comparisons. Social Science & Medicine 2004;58(8):1483-99.

[32] Van Vegchel N, De Jonge J, Bosma H, Schaufeli W. Reviewing the effort–reward imbalance model: Drawing up the balance of 45 empirical studies. Social Science & Medicine 2005;60(5):1117-31.

[33] Leineweber C, Wege N, Westerlund H, Theorell T, Wahrendorf M, Siegrist J. How Valid is a Short Measure of Effort-Reward Imbalance at Work? A Replication Study from Sweden. Occupational and Environmental Medicine 2010;67:526-31.

[34] Li J, Loerbroks A, Jarczok MN, SchOllgen I, Bosch JA, Mauss D, Siegrist J, Fischer JE. Psychometric Properties and Differential Explanation of a Short Measure of Effort-Reward Imbalance at Work: A Study of Industrial Workers in Germany. American Journal of Industrial Medicine 2012;55(9):808-15.

[35] Centers for Disease Control and Prevention (CDC) [Autism Spectrum Disorder Data and Statistics]. [updated 2015; cited 2015 December 1]. Available from: http://www.cdc.gov/ncbddd/autism/data.html]

[36] de Jonge J, Bosma H, Peter R, Siegrist J. Job strain, effort-reward imbalance and employee well-being: A large-scale cross-sectional study. Social Science & Medicine 2000;50(9):1317-27.

[37] Niedhammer I, Chastang JF, David S, Barouhiel L, Barrandon G. Psychosocial work environment and mental health: Job-strain and effort-reward imbalance models in a context of major organizational changes. International Journal of Occupational and Environmental Health 2006;12(2):111-19.

[38] Kluska KM, Laschinger HS, Kerr MS. Staff nurse empowerment and effort-reward imbalance. Nursing Leadership – Academy of Canadian Executive Nurses 2004;17:112-28.

[39] Niedhammer I, Tek ML, Starke D, Siegrist J. Effort–reward imbalance model and self-reported health: Cross-sectional and prospective findings from the GAZEL cohort. Social Science & Medicine 2004;58(8):1531-41.