



Vocational Outcomes in ASD: An Examination of Work Readiness Skills as well as Barriers and Facilitators to Employment Identified by Autistic Adults

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Accepted: 16 October 2022 / Published online: 17 November 2022

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Abstract

Little is known about work readiness skills among autistic adults. This study sought to address this by examining work readiness skills and their relation to vocational outcomes among 281 autistic young adults. It also examined perceived barriers and facilitators to employment as articulated by a subset of autistic adults. Results revealed a variegated work readiness profile. Stronger work readiness skills (particularly work style/adaptability) were associated with more favorable vocational outcomes. Autistic participants articulated both barriers and facilitators to employment related to the autism phenotype, job search/work readiness, and workplace education. These findings indicate the need for research on phenotype-driven vocational rehabilitation strategies as well as workplace psychoeducation/accommodations to support vocational outcomes for autistic adults.

Keywords Employment · Adult outcomes · Vocational soft skills · Behavioral flexibility · Workplace accommodations

Autism spectrum disorder (ASD) impacts greater than 2% of children and adults in the United States (Dietz et al., 2020; Maenner et al., 2021). It is a lifelong neurodevelopmental disorder associated with significant underemployment/unemployment and high rates of income assistance (Anderson et al., 2020; Esbensen et al., 2010; Harvery et al., 2021; Taylor & Seltzer, 2011). Despite the fact that the majority of autistic high school students are on the diploma track in the United States (U.S. Department of Education, 2017), post-secondary outcomes, including employment, are poor. For example, according to the National Longitudinal Transition Study—2 (NLTS2), which followed students with disabilities up to 8 years following high school graduation, only 37% of autistic young adults were employed at the time of their

interview (Newman et al., 2011), a rate that was lower than not only peers in the general population (U.S. Department of Commerce, 2009) but also peers from other disability groups (Roux et al., 2013). These findings from the NLST2 converge with numerous other reports in the literature documenting poor vocational outcomes among autistic adults (e.g., Anderson et al., 2020; Mason et al., 2021; Taylor & DaWalt, 2017; Taylor & Mailick, 2014; Taylor et al., 2015).

Despite evidence pointing to poor vocational outcomes, we know remarkably little about aspects of cognition and behavior that predict more favorable vocational outcomes among autistic young adults. Existing research on this topic has tended to focus on blunt measures of cognition and behavior and/or include individuals with widely varying intellectual abilities. For example, several studies have documented that having a lower IQ in childhood is associated with poorer employment outcomes (Howlin et al., 2004; Lord et al., 2020). Similarly, conversational difficulties (probed via a single question on a survey) have been linked to poorer employment outcomes (Roux et al., 2013; Wei et al., 2015) as have difficulties with daily living or ‘functional’ skills (Chan et al., 2021; Roux et al., 2013; Taylor & Mailick, 2014) and academics (Wong et al., 2021).

These studies provide evidence that individual characteristics are meaningfully related to vocational outcomes

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in ASD. However, the metrics used in most studies do not provide fine-grained targets for vocational rehabilitation (VR) activities, particularly for autistic adults *without* co-occurring intellectual disability who comprise ~70% of autistic individuals (Baio et al., 2018; Rydzewska et al., 2018). In order to inform VR services, there is a need to measure finer grained aspects of cognition and behavior and relate these to vocational outcomes. The current research focuses on a set of skills relevant to vocational outcomes, namely work readiness skills.

Work readiness skills are qualities that make an individual ready for success in the workforce (Caballero et al., 2011; Cunningham and Villaseñor, 2016; Deming, 2017; Heckman & Kautz, 2012). These so-called soft-skills (i.e., non-job specific interpersonal, metacognitive, and behavioral characteristics): (a) are foundational components of employability, (b) can be measured and targeted before autistic adults enter the workforce, and (c) may represent a key gateway to achieving employment success. According to the Office of Disability Employment Policy (2019), examples of work readiness skills include communication, teamwork, problem solving/critical thinking, and professionalism. These skills have been noted in surveys of employers to be among the most important characteristics they are seeking in job candidates (National Association of Colleges & Employers, 2018). Moreover, research on other clinical populations has linked work readiness skills to more favorable employment outcomes (for review, see Hergenrather et al., 2018).

Among autistic adults, there is a small body of research focused on work readiness skills regardless of employment status. This work has largely been conducted in Israel by Gal and colleagues using a questionnaire developed for autistic adults called the Autism Work Skills Questionnaire (AWSQ; Ben Meir et al., 2010). On the AWSQ, autistic young adults were found to demonstrate poorer work readiness skills relative to their same age neurotypical peers (Gal et al., 2015) and also to present with a variegated work readiness profile (Gal et al., 2013), with relative strengths in some skill areas (e.g., persistence in work) and relative weaknesses in others (e.g., work-related independence and adaptability).

The current research sought to extend the work of Gal and colleagues by describing work readiness skill profiles among a large American cohort ($n = 281$) of autistic young adults. In addition, novel to the current investigation, this research sought to examine relations between work readiness skills and vocational outcomes in order to identify skill domains that are most strongly associated with more favorable employment outcomes. To complement these study aims, written responses of autistic adults to open-ended questions about barriers to and facilitators of employment were examined using

qualitative methods to highlight possible intervention targets.

Method

Participants

Participants included 281 autistic young adults (22–39 years) recruited via the Simons Powering Autism Research—SPARK—Research Match service for a larger study of adult outcomes in ASD. To qualify for inclusion in the larger study, a self-reported community-based diagnosis of an ASD as evaluated by a medical/clinical professional was required. Although SPARK does not confirm diagnoses, they partner with autism clinical sites for recruitment, greatly increasing the probability of the participant having a professionally ascertained diagnosis (SPARK Consortium, 2018). Support for this comes from a study demonstrating that 98.8% of a sample of SPARK participants had a confirmed ASD diagnosis as ascertained via electronic medical records (Fombonne et al., 2022). Consistent with the findings of Fombonne et al. (2022), ~94% of the current study's sample met autism screening criteria (total score of > 65) on the Autism Spectrum Quotient-28 (AQ-28; Hoekstra et al., 2011). See Table 1.

The current study's sample was drawn from SPARK's "independent" adult cohort. These individuals are ≥ 18 years old, do not have a court-appointed legal guardian, and are able to consent to research participation independently. Given (a) SPARK's designation of "independent adult" status, (b) the demands of the study (i.e., completing self-ratings probing medical and psychosocial functioning), and (c) no self-report of intellectual disability in the study's medical history form, participants in the current sample are very unlikely to have co-occurring intellectual disability.

The 281 participants in the current investigation were drawn from a sample of 362 participants in the targeted age range of 22–39 years of age. The lower age limit of 22 was chosen to ensure that participants were out of high school, given the study's focus on vocational outcomes. The upper age limit was chosen to focus this investigation on young adulthood, as developmental conceptualizations of adult life generally consider the late 30s as the end of this developmental period (e.g., Erikson, 1982). In addition to the professionally ascertained ASD diagnosis, inclusion criteria for the current study required participants to (a) not be enrolled in a post-secondary education program, given the study's focus on employment and work readiness skills ($n = 56$ excluded), (b) have complete data on measures of vocational activities and work readiness skills ($n = 6$ excluded); and (c) be free of

Table 1 Demographic Characteristics of Complete Sample (n = 281)

	White, non-hispanic* [^]	Birth sex: Female	Participant Ed: BA/BS [†]	Household Income: Below US median [‡]	AQ28: above cutoff	History of special ed receipt	Receipt of VR services	Receipt of SSI	Age
N	224 ^a	172	106	195 ^b	263	155	22 ^c	38 ^d	M 31.17
%	81.16	61.21	37.72	77.1	93.6	55.16	7.86	13.82	SD 4.73

^{a-d}Missing data from n = 281 total: ^an = 5 ^bn = 28 [due to participants selecting = ‘don’t know’ or ‘prefer not to say’]; ^cn = 1; ^dn = 6

*Racial breakdown: Unknown: n = 1 (0.4%); Asian: n = 5 (1.8%); Black/African American: n = 3 (1.1%); Native America/Alaskan Native: n = 2 (0.7%); White/Caucasian: n = 237 (84.3%); More Than One Race: n = 27 (9.6%); Other: n = 6 (2.1%)

[^]Ethnic breakdown: Hispanic: n = 20 (7.1%); Non-Hispanic: n = 255 (90.7%); Unknown: n = 5; (1.8%); Missing: n = 1 (0.4%)

[†]Educational breakdown: Some high school: n = 6 (2.1%); GED: n = 17 (6.0%); High school: n = 49 (17.4%); Trade School: n = 22 (7.8%); Some college: n = 50 (17.8%); Associates degree: n = 31 (11%); Bachelor’s degree: n = 65 (23.1%); Graduate or professional degree: n = 41 (14.6%)

[‡]Per US Census Bureau (2021), median household income in the US in 2020 was \$67,521

[§]Income breakdown: <\$20,000: n = 87 (31.0%); \$21,000-\$35,000: n = 53 (18.9%); \$36,000-\$50,000: n = 35 (12.5%); \$51,000-\$65,000: n = 20 (7.1%); \$66,000-\$80,000: n = 17 (6.0%); \$81,000-\$100,000: n = 16 (5.7%); \$101,000-\$130,000: n = 12 (4.3%); \$131,000-\$160,000: n = 4 (1.4%); Over \$160,000: n = 9 (3.2%); Don’t Know: n = 22 (7.8%); Prefer not to answer: n = 6 (2.1%)

medical conditions likely to adversely impact employment prospects [exclusionary medical conditions: brain injury resulting in hospitalization (n = 13); stroke (n = 4); cerebral palsy (n = 1); Becker Muscular Dystrophy (n = 1)]. Note that we included participants with epilepsy (n = 11), given its increased prevalence among autistic individuals (Lukmanji et al., 2019). In addition, participants with multiple sclerosis (n = 1), narcolepsy (n = 1), and visual impairment (n = 1) were included in the sample. Analyses were run with and without these individuals and results were substantively unchanged. Thus, to be more inclusive, the analyses presented in the manuscript include these 14 individuals.

Demographic characteristics can be found in Table 1. Briefly, the sample was predominantly (a) assigned female sex at birth and (b) both white and non-Hispanic. The ethno-racial breakdown of the sample along with information about annual household income, education, and the receipt of special education (i.e., receipt of an Individualized Education Plan [IEP] via the United States public school system, in which specialized supports and/or instruction are provided to students with documented disabilities), job support/VR services, and supplemental security income (SSI) are provided in Table 1.

Procedures

The current research was approved by The George Washington University Institutional Review Board following guidelines from the Declaration of Helsinki. Data collection was completed between December 2019 and January 2020, prior to the major shutdowns that occurred in the United States (where the current study was completed) due to the COVID-19 pandemic. After participants provided

informed consent, they completed all study questionnaires online via a secure web platform.

Measures

Autistic Traits

Participants completed the AQ-28 (Hoekstra et al., 2011). See Supplementary Material for details.

Vocational Outcomes

Participants were queried about their current employment status as well as the receipt of employment services in order to rank vocational activities from most to least independent, consistent with the Taylor Vocational Index (TVI; Taylor & Seltzer, 2012). Using the TVI as a guide, a modified scoring system, with ranks of 1 through 6, was utilized. Specifically, based on available information, scores consistent with the original TVI rankings of 1, 2, 6, 7, 8, and 9 were assigned (see Table 2). Because questions related to sheltered employment settings were not included in the current study’s questionnaires, we were unable to assign TVI scores of 3, 4, or 5. As a result, ordinal ranks of 1 (least independent) to 6 (most independent) were assigned using the rubric summarized in Table 2.

Work Readiness Skills

Participants completed the Autism Work Skills Questionnaire (AWSQ; Ben Meir et al., 2010). It is composed of 74 items assessing work skills (across five domains) and 14 items assessing sensory challenges (one domain). The five work skills scales are Work Habits, Work Style, Level of Independence, Routine Daily Activities, and Interpersonal

Table 2 Vocational ranking system—modification of the Taylor Vocational Index (TVI)

Rank	Description
6	Employed for > 10 h per week and is <i>not</i> receiving employment assistance or job support, such as vocational rehabilitation (consistent with TVI rank 9)
5	Employed for ≤ 10 h per week and is <i>not</i> receiving employment assistance or job support, such as vocational rehabilitation (consistent with TVI rank 8)
4	Employed for > 10 h per week and <i>is</i> receiving employment assistance or job support, such as vocational rehabilitation (consistent with TVI rank 7)
3	Employed for ≤ 10 h per week and <i>is</i> receiving employment assistance or job support, such as vocational rehabilitation (consistent with TVI rank 6)
2	Completing unpaid employment (i.e., volunteering; consistent with TVI rank 2)
1	No vocational activities (consistent with TVI rank 1)

Table 3 Description of Autism Work Skills Questionnaire (AWSQ) scales

Scale	# of Items	Description
Work readiness skills ^a		
Work habits	12	Assesses work habits like adhering to rules and regulations including attendance and timeliness, work quality, material organization, and precision
Work style	13	Assesses the ability to adjust to the work environment and cope with different demands; being aware of errors; attending to detail; preferring routine and repetitive versus complex work
Level of independence	11	Assesses the need for written and oral instructions and for supervision and approval as well as the ability to complete work-related tasks independently
Routine daily activities	22	Assesses activities of daily living such as attending to hygiene, navigating with a map or GPS, using public transport or driving, and completing computer-related tasks
Interpersonal skills	16	Assesses skills related to following supervisor instructions, receiving feedback, cooperation, asking for help when needed, and coping with stressful work situations
Sensory difficulties ^b		
Environmental sensory needs and challenges	14	Assesses the degree to which an individual is bothered by touching different materials or being exposed to different sounds or smells; also evaluates ability to cope with different types of lighting

^aLikert scale; rankings of 1 ('Never') to 5 ('Always'); higher scores = stronger skills

^bLikert scale; rankings of 1 ('Very Low') to 5 ('Very High'); higher scores = greater challenges

Skills. The Environmental Sensory Needs and Challenges scale assesses sensory challenges that impact one's ability to work. See Table 3 for details. The AWSQ has acceptable to excellent internal consistency reliability ($\alpha \sim 0.64\text{--}0.90$) and validity (Gal et al., 2013, 2015). For the current study, the primary variables of interest were the mean item ratings on the five work skills scales, which were used to characterize the work readiness profile of the sample and to predict vocational outcomes. Data are also provided on the Environmental Sensory Needs and Challenges scale for descriptive purposes only.

Co-occurring Psychiatric Symptomatology

In order to assess three of the most commonly co-occurring forms of psychopathology in ASD across adulthood (Croen et al., 2015; Hand et al., 2020), the following measures were used to probe symptomatology associated with anxiety, depression, and attention-deficit/hyperactivity disorder

(ADHD), respectively: the Generalized Anxiety Disorder questionnaire (GAD-7; Spitzer et al., 2006), the 9-item Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001), and the Adult ADHD Self-Report Scale (A-ASRS; Ustun et al., 2017). See Supplementary Material for details.

Demographic Characteristics

Participant demographic characteristics, including age, race/ethnicity, sex assigned at birth, household income, and educational achievement were all probed via a background questionnaire. Additionally, participants were asked about the receipt of VR services, SSI, and a history of special education (i.e., receipt of an Individualized Education Plan [IEP] via the United States public school system, in which specialized supports and/or instruction are provided to students with documented disabilities).

Perceived Barriers and Facilitators to Job Attainment

To understand factors that may contribute to difficulties obtaining employment in those participants with relatively strong work readiness skills but poor employment outcomes, written responses to two open-ended items from the Learning Needs Screening Tool (LNST; Payne, 1997) were probed. Although the LNST was created to screen for possible learning difficulties in job seekers receiving VR supports, the current study did not utilize the scale for this purpose. Rather, open-ended, written responses to two job-related questions from the LNST were examined to identify possible barriers to (“What makes it hard for you to get or keep this [desired] kind of job?”) and facilitators of (“What would help?”) employment in the words of autistic adults themselves.

Analytic Plan

Quantitative Analyses

Preliminary Analyses to Characterize the Sample Prior to conducting analyses to answer primary study questions, descriptive statistics about the employment outcomes of participants were completed using a modified version of the TVI. Details about hours worked and the participants’ longest held jobs were also evaluated. Finally, demographic characteristics, ASD traits, and psychiatric symptomatology for those who obtained the most versus least independent vocational rankings were contrasted. These results are briefly summarized in the Results section and elaborated upon in the Supplementary Material.

Characterizing the AWSQ Profile Work readiness profiles as assessed via the AWSQ were evaluated using repeated measures ANOVA and paired samples *t*-tests [with false discovery rate (FDR) correction (Benjamini & Hochberg, 1995) for multiple comparisons] to identify relative strengths and weaknesses among work skill domains. Prior to conducting these analyses, data from the primary measure, the AWSQ, were examined for outliers and violations of normality for ANOVA analyses. Data were normally distributed. Outliers were not observed on the Work Style, Level of Independence, Routine Daily Activities, and Interpersonal Skills scales. However, three outliers (i.e., scores > 3 SDs from the mean) were identified on the Work Habits scale. Primary analyses were run with and without these cases and results were the same. Thus, study findings reported here include these participants.

Using the AWSQ to Predict Vocational Outcomes To evaluate relations between work readiness (measured via the five AWSQ work-focused subscales) and vocational attainment (measured via an adapted version of the TVI), logistic

regression was implemented (with the adapted TVI score as the dependent variable, and the AWSQ work-focused subscales as the independent variables). Prior to conducting logistic regression analyses, fit parameters were evaluated and were deemed acceptable.

As a follow-up to logistic regression analyses, an examination of work readiness profiles for autistic adults engaged in full-time work (> 30 h per week), part-time work (\leq 30 h per week), and no vocational activities was completed using a mixed model ANOVA in order to ascertain if work readiness profiles varied as a function of full- versus part-time employment. Specifically, multiple choice responses to the survey question ‘How many hours per week do you work?’ were used to group participants into three categories to be compared via mixed model ANOVA: (a) those who were unemployed ($n = 122$), (b) those who worked part-time (30 h per week or less; $n = 45$), and (c) those who were engaged in full-time employment [31 h per week or more, which is broadly in line with the IRS definition of full-time employment being at least 30 h per week (Internal Revenue Service, 2021); $n = 114$].

Qualitative Analyses

Participants’ written responses to two open field questions from the Learning Needs Screening Tool about facilitators and barriers to obtaining their desired job were examined: (a) “What makes it hard for you to get or keep this [desired] kind of job?” and (b) “What would help?” Specifically, two independent coders reviewed written responses to these two questions serially (i.e., first responses to question (a) were coded and then responses to question (b) were coded) following the steps outlined by Braun and Clarke (2012). In order to ensure that the voices of autistic adults fueled the thematic analysis (consistent with recommendations for qualitative research on autism; van Schalkwyk & Dewinter, 2020), the two raters employed an inductive (i.e., data driven) approach to code responses (rather than evaluating responses with hypothesized themes in mind). Following completion of the steps recommended by Braun and Clarke, an additional step was taken, that of convening a consensus meeting to generate the names of agreed-upon themes yielded from the independent coding/theme identification process. These agreed-upon themes are presented in the Results section.

Results

Preliminary Descriptive Statistics about Vocational Outcomes

Prior to conducting primary analyses, an examination of the vocational activities of the study participants was completed

and activities were ranked using a modified version of the TVI. This revealed that 49% (n = 138) of participants were currently employed for > 10 h per week and not receiving employment assistance or job support (vocational ranking of 6: most independent) while 43% (n = 122) were not engaged in any vocational activities (vocational ranking of 1: least independent). Just 8% (n = 21) of study participants received intermediate rankings. Further details about the participants’ vocational outcomes are provided in the Supplementary Material (text and Figure S1).

Following this initial characterization of the sample, factors associated with less versus more independent vocational outcomes were probed by comparing those who received vocational rankings of 6 (most independent) versus 1 (least independent) on background characteristics, ASD symptomatology, and co-occurring depression, anxiety, and ADHD symptomatology. These findings are detailed in the Supplementary Material (Table S1). Briefly, we note that at a nominal $p < 0.05$ level, the most independent group had proportionally fewer females, lower rates of SSI receipt, higher rates of bachelor’s degree completion, lower ASD traits, and fewer symptoms of depression, anxiety, and ADHD symptomatology than the least independent group. When FDR correction was applied for multiple comparisons, all results except for the difference in sex ratio remained statistically significant.

Work Readiness Profile

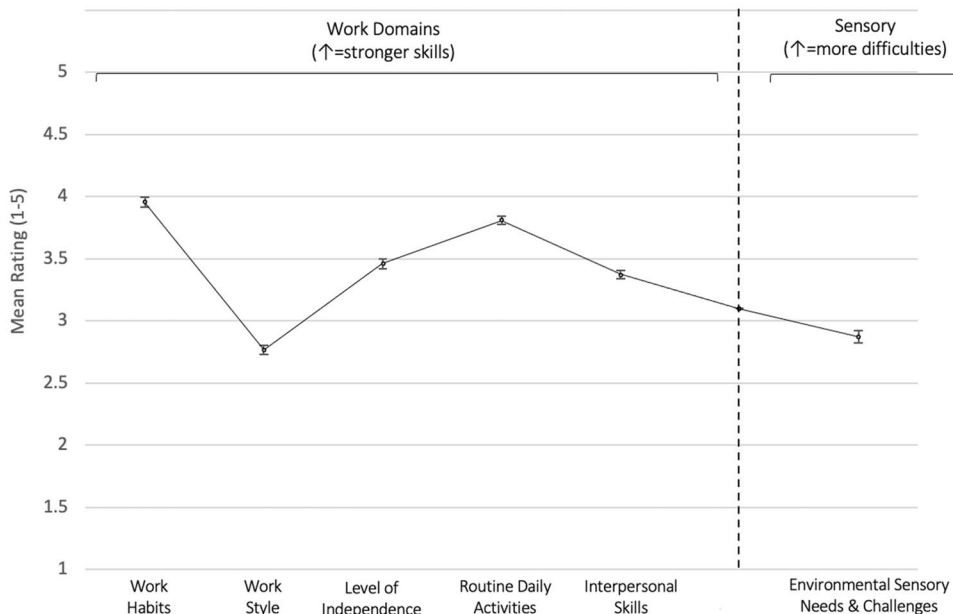
Results of the repeated measures ANOVA with the five work skills scales of the AWSQ as the within-subjects

factor revealed a significant main effect of scale ($F[4, 1029] = 268.26, p < 0.001$; note: Greenhouse Geisser adjustment applied), indicating a variegated work readiness profile. See Fig. 1. To identify relative strengths and weaknesses among these work skills, follow-up paired samples t -tests with FDR correction for multiple comparisons were completed and revealed that all five work skills scales of the AWSQ differed significantly from one another except for the Interpersonal Skills and Level of Independence scales which did not differ significantly from one another. An evaluation of mean item ratings on the different scales indicated that the Work Habits scale (assessing items related to adhering to rules and regulations, organization, work efficiency) was an area of relative strength (i.e., higher than all other scales) and the Work Style scale (assessing adjustment to the work environment and coping with work-related challenges) was an area of relative weakness (i.e., lower than all other scales).

Associations between Work Readiness Domains and Vocational Outcomes

As 92% of participants (n = 260) received vocational rankings corresponding to the least versus most independent categories, logistic regression was used to predict vocational group membership in these two categories using the five AWSQ scores. Overall model accuracy was 72.2%. The model that included the five AWSQ scale scores represented an almost 20% increase from the baseline model’s prediction accuracy of 52.9% (which is based on the rate of scores of 6—most independent category—in the model). The overall model was associated with Cox and Snell r^2 value of 0.25

Fig. 1 Mean item ratings on the AWSQ scales



Note: Errors bars represent the standard error of the mean

Table 4 Prediction accuracy (for vocational group membership) of logistic regression model including the five AWSQ scales

Observed Group	Predicted Group		% Correct
	1	6	
1	n=81	n=41	66.40%
6	n=31	n=107	77.50%
			Overall: 72.30%

Group 1=No vocational activities; Group 6=Employed for > 10 h per week with no employment assistance or job support

and Nagelkerke r^2 value of 0.34. See Table 4 for prediction accuracy.

An evaluation of both the beta coefficients and odds ratio values (with associated confidence intervals) in the model revealed that Work Style, Level of Independence, and Routine Daily Activities added significant unique variance to the prediction of vocational group membership after FDR correction for multiple comparisons. See Table 5.

To be conservative, the logistic regression described above was run a second time to include variables that differed between the most and least independent groups as probed in preliminary analyses and documented in the Supplementary Material, Table S1. These covariates included sex assigned at birth, receipt of a bachelor's degree, receipt of SSI, and measures of ASD traits and co-occurring depressive, anxious, and ADHD symptomatology. When covariates were included, the model's overall prediction accuracy was quite similar to the model without covariates. Specifically, 77% of variance was explained by the complete model. The addition of the covariates in Step 1 increased the variance explained by just under 17% (from a baseline accuracy of 53.9% to 70.6%). An evaluation of the beta coefficients for this model indicated that higher ADHD symptomatology, lower educational achievement (i.e., less than a bachelor's degree), and receipt of SSI were associated with less independent vocational outcomes. When the five AWSQ subscale scores were added to the model in Step 2, the predicted variance increased by an additional 6.5%. When the beta coefficients for the final model were considered, the

following were significant predictors (at a nominal $p < 0.05$): having earned a bachelor's degree, receipt of SSI, and the AWSQ Work Style scale. See Table 6.

As the TVI's highest tier of vocational independence involves working greater than 10 h per week without supports, it cannot be used to ascertain whether those who work full-time have a different work readiness profile than those who engage in part-time employment. Thus, to complement logistic regression analyses, AWSQ profiles for participants engaged in full-time (> 30 h per week), part-time (30 h per week or less), and no vocational activities were compared using a 3×5 mixed model ANOVA with one between-subjects factor (group) and one within-subjects factor (AWSQ scale). Results revealed a main effect of scale ($F[4, 1020] = 221.22, p < 0.001$; Greenhouse–Geisser adjustment applied), indicating variation in work readiness skills across domains (consistent with study findings for the whole sample considered together). See Supplementary Material (Figure S2). A main effect of group was also found ($F[2, 278] = 43.17, p < 0.001$), such that those who were employed full-time had the highest AWSQ scores overall ($M = 3.71$), followed by those who were employed part-time ($M = 3.52$), and followed by those who were unemployed ($M = 3.23$). No group \times scale interaction was evidenced, indicating that profiles of scores did not differ by group. However, to be thorough, tests of simple effects were completed to examine which scales differed among the three groups. These findings are summarized in Supplemental Fig. 2. As can be seen, after implementing FDR-correction for multiple comparisons, groups differed on all scales ($q < 0.05$) in the direction described above (full-time > part-time > unemployed) with two exceptions. Specifically, those engaged in part-time versus full-time work did not differ significantly from one another on Work Habits and Interpersonal Skills.

Barriers to and Facilitators of Desired Vocational Outcomes as Articulated by Autistic Adults

To complement quantitative analyses and begin to understand why some participants with relatively strong work readiness skills were not employed, open-ended, written

Table 5 Logistic regression results for AWSQ scales predicting (concurrent) vocational outcomes

	B	SE B	p-value	Odds ratio	95% CI of odds ratio
Work habits	0.45	0.27	0.1	1.57	0.93–2.65
Work style	1.05	0.34	0.002*	2.85	1.46–5.57
Level of independence	0.64	0.28	0.02*	1.90	1.11–3.26
Routine daily activities	0.72	0.32	0.024*	2.05	1.10–3.82
Interpersonal skills	0.06	0.31	0.86	1.06	0.58–1.94

Bold values indicate statistically significant at $p < .05$

*Survives FDR correction

Table 6 Logistic regression results predicting (concurrent) vocational outcomes using AWSQ scales and covariates

	B	SE B	p-value	Odds ratio	95% CI of odds ratio
Model 1 (covariates only):					
Sex-Female	0.49	0.31	0.12	1.64	0.89–3.03
ASD traits	– 0.01	0.01	0.33	0.99	0.96–1.01
Anxiety symptoms	0.03	0.04	0.40	1.03	0.96–1.11
Depression symptoms	– 0.02	0.03	0.61	0.99	0.93–1.04
ADHD symptoms	– 0.07	0.03	0.04	0.93	0.87–1.00
Bachelor's received	1.41	0.32	< .001	4.10	2.20–7.63
SSI receipt	– 2.24	0.65	< .001	0.11	0.03–0.38
Model 2 (all predictors):					
Sex-Female	0.55	0.34	0.11	1.72	0.89–3.35
ASD traits	0.01	0.02	0.71	1.01	0.97–1.04
Anxiety symptoms	0.03	0.04	0.47	1.03	0.95–1.12
Depression symptoms	– 0.01	0.03	0.82	0.99	0.93–1.06
ADHD symptoms	0.00	0.04	0.99	1.00	0.92–1.09
Bachelor's received	0.94	0.35	0.01	2.56	1.29–5.09
SSI Receipt	– 1.91	0.67	0.01	0.15	0.04–0.55
Work habits	0.41	0.31	0.18	1.51	0.83–2.74
Work style	0.93	0.39	0.02	2.52	1.19–5.37
Level of independence	0.42	0.32	0.18	1.52	0.82–2.82
Routine daily activities	0.50	0.37	0.18	1.65	0.80–3.41
Interpersonal skills	0.19	0.40	0.64	1.21	0.55–2.65

Bold values indicate statistically significant at $p < .05$

responses of participants who were misidentified by the logistic regression as being engaged in the most independent vocational pursuits (category 6) when they were, in fact, not engaged in any vocational activities (category 1; $n = 41$; Table 4, upper right quadrant) were analyzed using qualitative methods. Specifically, written responses to open-ended questions about barriers and facilitators to employment (see Statistical Analysis section for questions) were probed for participants in this subsample who answered ‘yes’ to the question “Do you have difficulty finding or keeping a job you like?” Of the 31 participants who answered ‘yes,’ 28 participants provided open-ended responses that were evaluated for themes in order to document the lived experience of the autistic adults in this subgroup.

Regarding barriers to employment, themes that emerged via consensus from the two raters are summarized in Fig. 2. As can be seen, three themes emerged: (a) intrapersonal factors related to the ASD phenotype (e.g., physical and mental health, cognitive/affective difficulties, and sensory challenges), (b) difficulties with finding/securing the right job, and (c) lack of an autism friendly workplace and its sequelae, namely burnout. Regarding facilitators, themes that emerged via consensus are summarized in Fig. 3 and were as follows: (a) psychoeducation for employers/supervisors about the ASD phenotype, (b) the need for career and job training supports, and (c) suggested accommodations to create a more autism-friendly work environment. Lastly, it should

be noted that there were a few additional, low frequency responses related to barriers (and facilitators) to employment that fell under an umbrella that we refer to as ‘structural or systems level challenges’ (or ‘accommodations’ in the case of facilitators). Examples of items in this category included challenges/facilitators related to transportation, racial/gender discrimination, challenges with childcare, etc.

Discussion

The current study characterized work readiness skills (as assessed using the AWSQ; Ben Meir et al., 2010) of a large sample of autistic young adults (ages 22 to 39 years) without significant cognitive impairment living in the United States. It also examined relations between work readiness skills and postsecondary vocational outcomes (as assessed using a modified version of the TVI; Taylor & Seltzer, 2012), as this relationship has not been formally evaluated among autistic adults to the best of our knowledge. Finally, it examined barriers and facilitators to employment as articulated by autistic adults.

Consistent with other reports (Anderson et al., 2020; Taylor & DaWalt, 2017; Taylor & Mailick, 2014; Taylor & Seltzer, 2011; Taylor et al., 2015), a large proportion of autistic adults enrolled in the current study did not engage in any daytime vocational activities (43%). Although

Intrapersonal Factors Related to Autism Phenotype	Difficulties Finding/Securing the Right Job	Lack of Autism-Friendly Workplace & its Sequelae including Burnout
Subthemes related to physical & mental health, cognitive/affective challenges, and sensory difficulties	Subthemes related to finding work, job history, not having requisite skills, interviewing, and a mismatch between skills & interests	Subthemes related to supervisors and colleagues being unsupportive and unaccommodating and burnout that results from work in these environments
<p>Physical/Mental Health: “I have a lot of unpredictable health and mental health problems that interfere with attendance...” “Usually depression creeps up and I start missing too much work.” “I become easily stressed out and talk myself out of getting up and going to work.” “I can’t handle the stress. I also have physical limits with migraine and body pain and severe fatigue.”</p> <p>Cognitive/Affective: “I also get tired and overwhelmed before eight hours and my brain stops working....slow processing”</p> <p>Sensory: “Difficulty maintaining...” jobs “...with loud and/or busy work environments.” “I can’t handle sensory issues.”</p>	<p>Finding Work: “...the complexity of finding job positions and managing the unspoken rules of the job application process.”</p> <p>Job History: “I have no experience with any job.” “Having a job history with many large gaps.”</p> <p>Skills: “Finding positions that I meet all the requirements for.” “The jobs I want require more schooling than I have.”</p> <p>Interviews: “I struggle with interviews despite learning interview techniques”</p> <p>Mismatch: “I’ve been forced to get the best available job at the time instead of searching for a job I really like.”</p>	<p>Supervisor & Colleague Challenges: “My bosses have not been willing to accommodate my sensory issues and work limits.” “A non-supportive supervisor or one who plays into office politics is impossible for me to deal with. I can’t understand what they want and have in the past been made to feel needy/demanding/ like I’m faking it when I ask for accommodations.” “I’m treated unfairly and don’t see it at first, so when I do, I will leave the job.” Constantly ‘...having to explain my differences. People are scared of me because...’ I’m “different.”</p> <p>Burnout: “I kept the last job for 2 years but it took ALL my time up so I couldn’t even keep up with hygiene and eating regularly and sleep and exercise. Let alone a social life or dating or other skills and experiences I desire.” “I become burnt out easily, I lose my motivation, I become easily stressed out and talk myself out of getting up and going to work.”</p>

Fig. 2 Themes about barriers to employment

we utilized a 6-point ranking system (a modification of the 9-point TVI) to describe variability in the degree of vocational independence experienced by participants, the vast majority of the sample fell into the extreme categories of no daytime activities or engaged in work in the community without supports for greater than 10 h per week (49%). Only 8% of the sample received intermediate rankings.

Adding to the small literature on work readiness skills in ASD, the current research provides the first large-scale description of work readiness skills among autistic adults living in the United States. Consistent with the work of Gal and colleagues conducted in Israel (Gal et al., 2013), Work Habits, a scale that measures skills related to adhering to rules and regulations in the workplace (e.g., attendance, timeliness, following safety guidelines) and work quality (e.g., precision, efficiency, error monitoring) was a relative strength. Also consistent with this prior research, Work Style, a scale that assesses flexibility in the workplace (e.g., adjusting to changes and coping with simultaneous requests) and the types of tasks completed (e.g., predefined, repetitive

work versus self-generated, complex tasks) was a relative weakness. This profile is consistent with the long-standing research on the autism behavioral phenotype in which flexibility is noted as a prominent challenge (Kenworthy et al., 2008; Wallace et al., 2016). In many ways, the strength in Work Habits and weakness in Working Style represent two sides of the same coin—i.e., adherence to rules and expectations about work behavior versus the flexibility and fluidity in work behavior that permit the completion of varied tasks in a changing environment.

Turning to relations between work readiness and vocational outcomes, this is the first study to document relations between soft-skills necessary for success in the workplace and vocational outcomes among autistic adults. Although this may seem like an intuitive finding (i.e., those who are more prepared for work have better work outcomes—or—those who are working have stronger work-related soft skills), no studies have examined this directly and sought to identify which aspects of work readiness are associated with more favorable vocational outcomes in autistic adults. The current study identified a positive

Psychoeducation Related to Autism Phenotype	Career or Job Training Opportunities	Autism-Friendly Workplace Accommodations
Subthemes related to workplace/supervisor understanding and acceptance of challenges for autistic employees	Subthemes related to finding work, career paths, recruitment and networking help, and interview feedback	Subthemes related to flexible work schedules, hours, and environments, and a match between skills & role
<p>Understanding in Workplace/from Supervisors: “Feeling like I can be up front about my needs during the interview process...” “Frank, straight forward supervisors who understand that I may not socialize or appear to be a “team player” by normal standards...” “An understanding between my supervisor and myself that my needs ... won't impact my performance reviews so long as I meet deadlines and excellence standards.”</p> <p>Acceptance: “...finding the rare employers who will accept my quirky behaviors.” “[even though I may not be like the other employees]...my work will be great.” “An incentive for bosses to accommodate autistic people or people with health problems.”</p>	<p>Finding Work: “Support in finding and getting jobs that actually match my interests.” “Having someone that could help me organize the process of applying for jobs...”</p> <p>Career Paths: “A clear pathway to finding a job...” “More entry level jobs... that don't involve customer service.”</p> <p>Recruitment & Networking: “More recruitment and networking help...”</p> <p>Interview training/feedback: “Training in how to deal with interviews...” “Feedback from companies on why I wasn't selected.”</p>	<p>Flexible Hours & Schedules: “More breaks...” “Part time work...” “Shorter work days...” “I would love to be able to work 6 hours a day instead of 8 ... I could “work” for 10 hours a day with more breaks in between the hours.” “Many autistics, including me, have insomnia, and flexible hours would allow us to work at times that are more natural for us to be working.” “Genuinely flexible schedule...”</p> <p>Work Environment: “Working alone or with my earbuds.” “Solitary working space...” “Working at home helped SO much with being on time.”</p> <p>Match: “Finding something I really loved with an ideal work environment...”</p>

Fig. 3 Themes about facilitators of employment

association between vocational outcomes and the following work readiness domains: Work Style, Level of Independence, and Routine Daily Activities (the last of which is consistent with prior work documenting relations between daily living skills and vocational outcomes in ASD; Chan et al., 2021; Roux et al., 2013; Taylor & Mailick, 2014). Of these three work readiness domains, only Work Style persisted as a significant predictor of vocational outcomes after we conservatively included covariates (sex assigned at birth, receipt of a bachelor's degree, receipt of SSI, and measures of ASD traits and co-occurring depressive, anxious, and ADHD symptomatology) in the model, suggesting that this may be a work readiness domain to target in future research.

In order to understand the perspectives of autistic individuals on barriers and facilitators to employment, written, open-ended responses to one question about each of these topics were analyzed for thematic content. Barriers that emerged highlighted intrapersonal factors related to the autism phenotype, challenges with the job search and training, and a lack of an autism-friendly workplace and its sequelae, namely burnout. These themes are consistent with prior qualitative research. For example, intrapersonal factors

such as physical and mental health difficulties (Hayward et al., 2018) and sensory challenges (Waisman-Nitzan et al., 2021) have been noted as barriers to workplace success in prior studies of autistic adults. Turning to other barriers, an area of concern that emerged from this study and was identified in one other study (Dreaver et al., 2020) was that of ‘match’ between desired and actual job. For example, one participant noted “I've been forced to get the best available job at the time instead of search for a job I really like.” Although the need for supports related to job training is well-documented in prior research (e.g., Ogawa et al., 2021; Wehman et al., 2013), less is written about the importance of job fit within the context of VR services for autistic adults. Thus, this is an area that warrants further attention, as part of vocational training for autistic adults may need to focus not only on work readiness skills but also self-exploration of vocational interests to aid in the identification of jobs that individuals will find fulfilling.

Finally, consistent with one prior investigation (Raymaker et al., 2022), occupational or job burnout was identified as a barrier to vocational success by several participants. Job burnout is a construct from the field of industrial/

organizational psychology that describes a phenomenon that involves feelings of exhaustion, detachment from one's job, and being ineffective or unsuccessful at work (Salvagioni et al., 2017). The accounts of job burnout provided by the autistic adults in our study primarily emphasized exhaustion resulting from the excessive energy needed to satisfy job expectations. This vocational experience likely overlaps with the broader construct of 'autistic burnout' described in the ASD literature (Raymaker et al., 2020). However, the current study was not designed to disentangle this construct from the broader construct of autistic burnout. Moreover, we are unable to ascertain whether the experience of occupational burnout for autistic adults is similar to that experienced by neurotypical individuals in the workforce. Thus, these topics should be the focus of future research.

With regard to facilitators, themes mirrored those of barriers—namely the need for tailored job training (including as it applies to finding work), psychoeducation of employers/supervisors about the autism phenotype, and accommodations in the work environment, including flexibility with hours and place of work. Interestingly, the latter two facilitators, which focused on modifications within the work environment that support success, were identified as 'reasonable' workplace accommodations by employers and autistic employees who participated in a qualitative study focused on workplace adjustments for autistic adults conducted in the United Kingdom (Petty et al., 2022). Despite multiple studies citing the need for workplace accommodations (for a review, see Khalifa et al., 2020), research by Davies and colleagues (Davies et al., 2022) has raised the concern that autistic adults feel that the onus falls to them to determine the nature of these accommodations and the manner in which they are to be implemented. This additional burden could contribute to feelings of occupational burnout and should be investigated in future research.

Prior to discussing the implications of this research and directions for future research, we turn to our study's limitations. First, verification of ASD diagnosis was not feasible with the current sample, given the online study design. However, three factors mitigate this limitation: (a) individuals were recruited from an autism participant registry (SPARK) which partners with ASD clinics, (b) independent research on the SPARK sample has demonstrated strong convergence between participant reports of medical diagnoses of ASD and documented ASD diagnoses in medical records (Fombonne et al., 2022), and (c) 94% of the sample screened positive on the AQ-28. Second, the study's cross-sectional design did not permit an evaluation of a directional hypothesis about relations between work readiness skills and vocational outcomes. Thus, we cannot argue that stronger work readiness skills drive vocational outcomes. Rather, the reverse may be

true—that is, individuals who are employed have better work readiness skills due to practicing these skills in the workplace. Third, the study relied solely on self-report of work readiness skills. Although this could be construed as a limitation, and future research should include complementary objective assessments of this construct, taking this approach permitted the examination of relations between these skills and vocational outcomes that may include *unemployment*. More specifically, because existing informant report measures of work skills are designed exclusively for individuals who are *currently employed* (e.g., Becker, 2005), they preclude the ability to examine relations between vocational soft-skills and actual success in *securing employment*. Thus, by using a self-report measure, we were able to include individuals who were and were not employed, allowing the ability to link work skills to varied vocational outcomes. Fourth, although we did control for the possible contributions of three of the most commonly occurring psychiatric conditions associated with ASD during adulthood (anxiety, depression, and ADHD; Croen et al., 2015; Hand et al., 2020) to vocational outcomes, we were unable to more comprehensively evaluate co-occurring psychopathology beyond these conditions. Thus, future research should seek to evaluate this using a measure that taps psychiatric functioning more generally in order to augment our understanding of the relations between different types of psychiatric symptomatology and vocational outcomes. Finally, it is important to note that the vast majority of participants included in the current research were white and non-Hispanic. Thus, we are limited in the generalizations we can make about these findings. Given that individuals with more than one minority identity (in this case, identifying as neurodivergent and as belonging to a minority ethnic or racial group) may face discrimination and experience marginalization in a unique way (Crenshaw, 1989), it will be crucial for future studies of work readiness and vocational outcomes to target participants from historically underrepresented groups in research.

In addition to the need for more diverse study samples, future research should seek to employ longitudinal research designs in order to examine factors that *predict* more favorable employment outcomes. Although longitudinal investigations such as the NLST2 exist, many of these studies have used blunt measures to predict outcomes without identifying more refined cognitive-behavioral skills to target in VR settings or transition services in high school. Another area for future research is to examine whether the vocational strengths and challenges identified by a measure such as the AWSQ can be used to guide more personalized vocational counseling for autistic adults that includes an emphasis on job fit. As job fit was identified by the autistic participants included in this study and others (e.g., Pfeiffer et al., 2018) as an area of challenge,

this suggests that more attention should be paid to helping individuals identify occupations and particular job opportunities that may be best suited to their strengths. In particular, it has been suggested that approaches that incorporate individual differences (Bury et al., 2020) and that are personalized (Harmuth et al., 2018), such as the *Person-Environment-Occupation-Performance Model* (Baum et al., 2015), may be helpful when assisting autistic adults with identifying and obtaining jobs. Although this is not a new idea, the current study provides new information about skill areas to consider when identifying such jobs or developing VR interventions tailored for autistic adults. As the Work Style scale of the AWSQ, which assesses flexibility in the work environment and comfort with fluidity in job expectations, was the scale most associated with more favorable employment outcomes, VR techniques aimed at bolstering behavioral flexibility may be beneficial. Moreover, as suggested by the autistic participants in our study, employer psychoeducation alongside accommodations are important to consider when identifying methods to promote more favorable work outcomes for autistic adults. Educating neurotypical employers/employees would be consistent with efforts to address the so-called ‘double empathy problem’ discussed by Milton (2012) in which challenges in an autistic individual’s social environment—in this case, the workplace—involve difficulties in perspective taking by *both* neurotypical and autistic individuals. This may help to reduce the onus on the autistic person to modify their behavior and instead draw attention to the mutual need to adjust behavior and attitudes by fellow employers/employees to accommodate differences in the workplace. Such accommodations hold promise to improve vocational outcomes, and consequently, independence and quality of life for autistic adults.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s10803-022-05804-8>.

Acknowledgements We wish to express our gratitude to the autistic adults who participated via SPARK. We also wish to express our gratitude to the SPARK clinical sites and SPARK staff. We appreciate obtaining access to recruit participants through SPARK research match on SFARI Base.

Author Contributions All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by GLW, GAM, and NRL. Qualitative analyses were completed by NRL and HG. The first draft of the manuscript was written by NRL, and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Funding The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by start-up funds from The George Washington University to G.L.W. and an Autism Speaks Postdoctoral Fellowship (Grant ID 11808) to G.A.M.

Declarations

Conflict of interest The authors have no conflicts to disclose.

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