



RESEARCH ARTICLE

Job loss predicts worsening depressive symptoms for young adults with autism: A COVID-19 natural experiment

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Abstract

Adults with autism spectrum disorder (ASD) experience high rates of both unemployment and depression. Though job loss predicts increased risk of depression in the general population, studies have yet to directly examine this relationship among individuals with ASD. With the backdrop of rising unemployment due to COVID-19, we used a longitudinal design to examine whether employment changes predicted increasing depressive symptoms among young adults with ASD. Online surveys were collected from young adults with ASD at two times: just before widespread social distancing measures were adopted in the United States, and again 10 weeks later. Both time points included measurement of depressive symptoms (Beck Depression Inventory-2). At Time 2, COVID-related employment changes and the perceived impact of those changes on well-being were collected. Of the young adults who were employed at Time 1 ($n = 144$), over one-third (37.5%) reported employment changes during the first 2 months of COVID-19. Most of this change was job loss or reductions in hours or pay ("job loss/reduction"). Controlling for Time 1 depressive symptoms, young adults who experienced job loss/reduction had significantly higher depressive symptoms at Time 2 than those without an employment change. Individuals' perceived impact of employment change also predicted depressive symptoms. These findings suggest that losing a job or experiencing reductions in hours or pay leads to worsening depressive symptoms among adults with ASD. Better supporting autistic adults in the workplace may not only decrease the likelihood of job loss, but also combat the exceedingly high rates of depression in this group.

Lay Summary

Though unemployment has been linked to mental health problems in the general population, this relationship is seldom considered among adults with autism. In this study, we found that adults on the autism spectrum who lost their jobs or experienced reductions in pay or hours during the first 2 months of COVID-19 had worsening depression compared to adults who did not have job changes. Our findings suggest that increasing access to employment may help alleviate poor mental health among autistic adults.

KEYWORDS

adults, autism spectrum disorder, depression, COVID-19, employment

INTRODUCTION

Employment is an area of significant challenge for many adults with autism spectrum disorder (ASD). Most of the extant research has focused on difficulties gaining

employment, with results suggesting exceptionally high rates of unemployment and underemployment for these adults (Ballaban-Gil et al., 1996; Eaves & Ho, 2008; Howlin et al., 2004; Shattuck et al., 2012; Taylor et al., 2019; Taylor & Seltzer, 2012). Further, there is

evidence to suggest that maintaining employment over time may be even more challenging than obtaining those positions in the first place (Taylor et al., 2015; Wei et al., 2018). For example, in a small study of young adults with ASD, within the first 3 years after leaving high school, 50% experienced a disruption in their job or postsecondary education such as being fired, leaving their job under difficult circumstances, or dropping out of a college program (Taylor & DaWalt, 2017).

An important question is whether these high levels of unemployment and employment instability contribute to increased risk for depression. Young adults with ASD have significantly elevated rates of depression (Au-Yeung et al., 2019; Fombonne et al., 2020; Hollocks et al., 2019; Lai et al., 2019), with one recent meta-analysis suggesting that they are four times more likely than their typically developing peers to experience depression throughout their lifetime (Hudson et al., 2019). In the general population, competency in work activities is one of the strongest predictors of psychological well-being, stronger than financial autonomy, romantic and peer relationships, or educational competency (Schulenberg et al., 2004). Being laid off or fired from one's job places adults at increased risk for a host of personal, psychological, and familial problems (Blustein, 2008; Hansen, 2005; McKee-Ryan et al., 2005; Murphy & Athanasou, 1999; Paul & Moser, 2009). Though there is strong evidence from the general population that unemployment contributes to elevated depression rates, the relationship between employment and mental health in ASD has been under-researched. Adults with ASD are much less likely than adults in the general population to be upwardly mobile in their employment trajectories (Taylor & Mailick, 2014) and many receive income supports (e.g., SSI); for these and other reasons, job loss may have a different meaning in this group. The present study investigated this issue, by testing whether employment instability predicted increasing depressive symptoms among young adults with ASD.

To draw meaningful conclusions about the associations between employment instability and mental health, it is necessary to move beyond an examination of whether a job change has occurred and consider the type of job change. Losing a job is only one type of employment instability; there are many other ways that jobs can change that might (or might not) impact mental health. For example, adults may keep their job but have the number of hours they are working cut back. Their job duties could be significantly altered, they could receive a decrease in pay, or the job supports available to them may change. Job instability can also reflect upward mobility, such as leaving for a better job, increases in the number of hours, or increases in pay. The impact of employment changes on mental health is almost certainly obscured by examining change as one homogenous construct; instead, it is necessary to consider the types of change. In the present study, we focus on indicators of downward mobility (e.g., losing a job, reduction in hours,

or pay), drawing from extant research suggesting that these types of job changes are particularly impactful to mental health in the general population (Blustein, 2008; Hansen, 2005; McKee-Ryan et al., 2005; Murphy & Athanasou, 1999; Paul & Moser, 2009) and among those with ASD (Goldfarb et al., 2021).

To understand the impact of job instability, it is also important to consider how adults with ASD perceive employment changes. In this population, the perception of events may be just as important to mental health, if not more so, than whether the events occurred (Bishop-Fitzpatrick et al., 2017; Taylor & Gotham, 2016). For example, in a study examining the impact of adverse life events on the mental health of youth with ASD, it was not the presence/absence or number of events that were most closely related to mental health, but rather the occurrence of at least one event that the youth experienced as traumatic (even if the event would not typically be considered as such; Taylor & Gotham, 2016). Differences in social perceptions or challenges in adaptive skills or insight (common among individuals with ASD) could cause a benign event to be experienced as negative, or a negative event to be experienced as positive or neutral (Kerns et al., 2015; Martorell & Tsakanikos, 2008). Extrapolating to the employment context, getting a promotion that resulted in more hours or different responsibilities (which would likely be viewed by most as positive or benign) might be perceived as having a negative impact if the new responsibilities are not compatible with the adult's skills or interest. Job loss might be perceived positively if the job was a source of distress. Examining perceptions of employment changes, in addition to the nature of the change, can provide multiple perspectives from which to understand the impact of employment changes on depression for young adults with ASD.

The present study

In this study, we fill an important gap in the literature by comparing, for the first time, changes in depressive symptoms for adults with ASD who experienced employment changes to those who did not. We investigated this question in the context of the COVID-19 pandemic. The pandemic and its associated mitigation strategies have resulted in substantial unemployment and job changes (such as moving to virtual work or reduced hours) among the general population. Rates of change, including job loss, are likely higher for individuals with disabilities, such as those with ASD, who have greater challenges than adults in the general population obtaining employment and are often the first to lose employment during economic downturns (U.S. Bureau of Labor Statistics, 2020).

The present study used a natural experiment design, in which data were collected from young adults with ASD weeks before COVID-19-related wide-spread social distancing measures went into effect, and then again

10 weeks later. Using these two time points of data, we investigated the impact of employment changes on depressive symptoms for young adults with ASD, including potential differential impacts due to the type of employment change (job loss or reduction in hours/pay vs. other employment changes) and the perceived impact of that change on well-being. The following research questions were examined:

1. What changes in employment activities were experienced by adults with ASD during the first 2 months of the COVID-19 pandemic? How frequently did adults with ASD experience job loss or reduction in work hours or pay (hereafter called job loss/reduction)? How frequently did adults with ASD experience other types of employment changes, such as moving to virtual work or changes in duties?
2. Compared to those who did not experience an employment change, do adults with ASD who experienced job loss/reduction report higher depressive symptoms after the change? Do adults with ASD who reported other employment changes (e.g., change in duties, move to virtual work) report higher depressive symptoms after the change?
3. Among those who had an employment change, is the perception of that change (positive, negative, or neutral) associated with depressive symptoms?

Based on current trends in the general population and literature on individuals with disabilities, we expected to observe significant employment change during the study period, with most of that change accounted for by job loss or reduction of hours/pay. We hypothesized that adults with ASD who experienced job loss/reduction would have a worsening of their depressive symptoms after the job change, relative to those who had no employment changes. Finally, we hypothesized that among those who experienced employment change, individuals who reported that the change had a negative impact on them would show greater worsening of their depressive symptoms compared to those who reported the change had no impact or a positive impact.

METHODS

Participants and study design

Young adults with ASD were recruited through the Simons Foundation Powering Autism Research for Knowledge (SPARK) research match registry (Feliciano et al., 2018) for a larger study on life experiences and mental health. Email invitations were sent to 700 eligible SPARK registrants who met the following inclusion criteria: (1) independent adults who are able to complete self-report surveys and consent for themselves; (2) age between 18 and 35 years old; (3) received an ASD

diagnosis from a professional before age 18 years; and (4) completed the Background History Questionnaire when registered at SPARK. We focused on adults who could self-report as individuals' own perceptions were a key aspect of the study. The current study had a recruitment goal of 300 participants. Typically, SPARK allots a 16-day recruitment period, but we exceeded our goal of 300 in only 8 days. Thus, recruitment was closed at that time: 322 participants consented and 315 completed the online surveys at Time 1, between March 11 and March 20, 2020. Written informed consent was obtained from all participants.

COVID-19 restrictions were implemented across the United States just days after the initial survey closed. We immediately sought permission to launch a follow-up survey, creating a natural experiment to evaluate the initial impact of the COVID-19 pandemic on young adults with ASD. All adults who completed Time 1 surveys were invited to complete a second survey (Time 2) that focused on changes in relationships, daily activities, and mental health. Time 2 surveys were completed between May 18 and May 27, 2020, and over 85% of the Time 1 sample ($n = 275$; 87.3% retention rate) completed the Time 2 survey and thus had information on changes in employment and depressive symptoms. Characteristics of those who responded to the Time 2 survey are presented in Table S1. There were no statistically significant differences between those who did versus did not complete the Time 2 survey on any of the Time 1 variables we examined including demographic variables, employment variables, and depressive symptoms (analyses available upon request).

For this analysis, we restricted the sample to those who were working at Time 1 so that we could examine how COVID-19 impacted their current employment. Just over one-half (52.4%) of those who completed the Time 2 survey were working at Time 1, resulting in a sample size of 144 young adults. Participant characteristics are presented in Table 1.

All procedures involving human subjects were approved by the Institutional Review Boards at each of the authors' institutions.

Measures

Time 1 survey. The Time 1 survey is a questionnaire designed by the study team to gather data on current life circumstances (e.g., relationship and employment status, education, and living situation) and information related to depressive symptoms, diagnosis, and treatment. In this survey, participants were asked: "Do you currently have paid employment?" to which they could response "yes" or "no." Those who responded "yes" were asked to choose the type(s) of current employment from the following list (which included explanations for each type of employment): regular employment (i.e., competitive employment); supported employment; sheltered workshop;

TABLE 1 Demographics for the full analytic sample and comparisons by employment change group

	Descriptive statistics – <i>n</i> (%) or <i>M</i> (SD)				Test statistic χ^2 or <i>F</i> -test
	Employment change groups				
	Full analytic sample (<i>n</i> = 144)	No employment change (<i>n</i> = 90)	Job loss/ reduction (<i>n</i> = 38)	Other employment change (<i>n</i> = 16)	
Age	26.83 (4.69)	27.00 (4.67)	26.53 (4.92)	26.63 (4.49)	0.15
Gender ^a					2.91
Male	68 (47.6%)	43 (48.3%)	17 (44.7%)	8 (50%)	
Female	67 (46.9%)	42 (47.2%)	17 (44.7%)	8 (50%)	
Other	8 (5.6%)	4 (4.5%)	4 (10.5%)	0 (0%)	
Race					9.13
White	116 (80.6%)	72 (80.0%)	31 (81.6%)	13 (81.3%)	
Multiracial	20 (13.9%)	15 (16.7%)	2 (5.3%)	3 (18.8%)	
African American or Black	4 (2.8%)	1 (1.1%)	3 (7.9%)	0	
Asian	2 (1.4%)	1 (1.1%)	1 (2.6%)	0	
Other	2 (1.4%)	1 (1.1%)	1 (2.6%)	0	
Ethnicity					3.86
Hispanic	14 (9.7%)	10 (11.1%)	1 (2.6%)	3 (18.8%)	
Non-hispanic	130 (90.3%)	80 (88.9%)	37 (97.4%)	13 (81.3%)	
Living with parents					6.40*
Yes	57 (39.6%)	37 (41.1%)	10 (26.3%)	10 (62.5%)	
No	87 (60.4%)	53 (58.9%)	28 (73.7%)	6 (37.5%)	
Married					6.22*
Yes	21 (14.6%)	18 (20%)	3 (7.9%)	0	
No	123 (85.4%)	72 (80%)	35 (92.1%)	16 (100%)	
Children					7.07*
Yes	19 (13.2%)	17 (18.9%)	2 (5.3%)	0	
No	125 (86.8%)	73 (81.1%)	36 (94.7%)	16 (100%)	
Currently in school					1.73
Yes	38 (26.4%)	26 (28.9%)	7 (18.4%)	5 (31.3%)	
No	106 (73.6%)	64 (71.1%)	31 (81.6%)	11 (68.8%)	
Education					3.91
High school diploma or less	36 (25.0%)	18 (20%)	13 (34.2%)	5 (31.3%)	
Some college but not a bachelor's degree	57 (39.6%)	40 (44.4%)	12 (31.6%)	5 (31.3%)	
Bachelor's degree or greater	51 (35.4%)	32 (35.6%)	13 (34.2%)	6 (37.5%)	
Type of current employment ^b					
Competitive employment	107 (74.3%)	69 (76.7%)	26 (68.4%)	12 (75.0%)	0.96
Supported employment	28 (19.4%)	15 (16.7%)	10 (26.3%)	3 (18.8%)	1.59
Sheltered employment	3 (2.1%)	3 (3.3%)	0	0	1.84
Internship	9 (6.3%)	5 (5.6%)	1 (2.6%)	3 (18.8%)	5.19
Other	11 (7.6%)	6 (6.7%)	4 (10.5%)	1 (6.3%)	0.61
Number of hours employed per week					4.95
Part-time (Less than 40 h)	54 (37.5%)	40 (44.4%)	10 (26.3%)	4 (25.0%)	
Full-time (40 h or more)	90 (62.5%)	50 (55.6%)	28 (73.7%)	12 (75.0%)	
Time 1 depressive symptoms scores	17.42 (13.47)	18.17 (13.23)	17.97 (14.90)	11.94 (10.46)	1.51
No or minimal depression ^c	52 (36.1%)	31 (34.4%)	8 (50%)	13 (34.2%)	
Mild to moderate depression	31 (21.5%)	20 (22.2%)	2 (12.5%)	9 (23.7%)	

(Continues)

TABLE 1 (Continued)

	Descriptive statistics – <i>n</i> (%) or <i>M</i> (SD)				Test statistic χ^2 or <i>F</i> -test
	Employment change groups				
	Full analytic sample (<i>n</i> = 144)	No employment change (<i>n</i> = 90)	Job loss/reduction (<i>n</i> = 38)	Other employment change (<i>n</i> = 16)	
Moderate to severe depression	34 (23.6%)	19 (21.1%)	6 (37.5%)	9 (23.7%)	
Severe depression	27 (18.8%)	21 (22.2%)	0	7 (18.4%)	

^aOne participant in the “no employment change” group chose not to answer the question about gender.

^bParticipants could endorse more than one type of current employment. Because of this, percentages do not equal 100 and chi-squares were run separately for each type of employment.

^cDepressive symptoms categories are based on Beck et al. (1996) and scores for each category are as follows: 0–9 = no or minimal depression; 10–18 = mild to moderate depression; 19–29 = moderate to severe depression; 30–63 = severe depression.

**p* < 0.05.

enclave employment; day program that includes work activities; internship or work study program; and other. Because they occur in sheltered settings and were infrequent in this sample, sheltered workshop, enclave employment, and day programs were combined into one indicator of sheltered employment. Participants were also asked how many hours per week they worked; 0 = 1–9 h; 1 = 10–19 h; 2 = 20–29 h; 3 = 30–39 h; 4 = 40 or more. Categories were combined to reflect full-time work (40 or more) versus part-time work (less than 40 h).

Demographic information from this survey was used in analyses, including age, gender (male, female, and other), race (White, African American or Black, Asian, Native American, multiracial, and other), ethnicity (Hispanic, and non-Hispanic), whether the adult was living with parents (living with parents and not living with parents), marital status (married and not married), whether they had children (children and no children), current school status (currently in school and not currently in school), and educational attainment (high school diploma or less, some college but less than a bachelor’s degree, and bachelor’s degree or greater).

Depressive symptoms. The Beck Depression Inventory, Second Edition (BDI-II; Beck et al., 1996) was used at Times 1 and 2. This 21-item self-report instrument assesses mood and depressive symptoms, such as sadness, loss of interest, and tiredness, in the most recent two-week period. Items are scored on a scale of 0–3, with higher scores indicating greater depression symptom severity. The BDI-II has good reliability (e.g., one-week test-retest reliability = 0.93) and internal validity ($\alpha = 0.92$ – 0.94) in the general population (Beck et al., 1996). It also has good psychometric properties among adults with ASD; in a study of 947 adults with ASD ages 18–45, the BDI-II accurately distinguished depressed from nondepressed adults. Adults with ASD responded to items in the same manner as neurotypical adults, suggesting that the same latent constructs can be measured in the general population and in the ASD population (Williams et al., 2021). In our sample, the BDI-II showed good internal consistency (0.95).

Employment changes. At Time 2, participants were asked: “Have there been any changes with your employment since the last survey in mid-March?” Responses were coded as yes/no. For those who responded “yes,” they were asked “What are the changes?” and instructed to check all that apply from the following list: reduced hours, increased hours, reduced hourly pay, increased hourly pay, temporarily lost job, permanently lost job, working virtually, changes in regular duties, got a new job, change in work-related support, and other. Participants who said they had an employment change and responded affirmatively to any of the following items were coded as having a “job loss/reduction”: reduced hours, reduced hourly pay, temporarily lost job, and permanently lost job. We combined these items into one category for analysis as they are all indicative of downward mobility in the workplace. Participants who said that they had an employment change but did not respond affirmatively to any of the four items above were coded as having an “other employment change.” Participants who responded “no” to the question about employment change were coded as having “no employment change.” The three employment change categories (job loss/reduction, other employment change, and no employment change) were mutually exclusive, with each participant receiving only one of the codes.

Perceived impact of employment change on well-being. All participants who responded affirmatively to the question about employment change were asked the following question: “What impact, if any, have these changes with your employment had on your overall well-being?” Participants responded on a five-point Likert scale: 0 = very negative impact; 1 = some negative impact; 2 = no impact; 3 = some positive impact; and 4 = very positive impact.

Data analysis

Frequencies were used to address Research Question 1, which examined the percentages of adults with ASD

who experienced any employment change as well as the percentage who experienced each type of change.

Research Question 2 examined associations between employment change and depressive symptoms at Time 2. Preliminary analyses tested for demographic differences between the employment change groups (no change, job loss/reduction, and other employment change) in Time 1 variables including age, gender, race, ethnicity, living arrangement, marital status, whether they had children, current school status, education, type of employment, whether they worked full-time, and depressive symptoms, using analysis of variance (ANOVA) and chi-square. Tukey's HSD follow-up tests were conducted when the omnibus ANOVA was statistically significant. Next, linear regression analysis was performed with Time 2 depressive symptoms as the dependent variable. Independent variables included Time 1 depressive symptoms, demographic variables that differed between groups, and two dummy variables for employment change category: job loss/reduction versus no change; and other employment change versus no change.

Linear regression models were also used to test Research Question 3, which focused on associations between the perceived impact of employment change and depressive symptoms for the subset of those who had an employment change. Inspection of scatterplots suggested that this relationship might not be linear. Thus, in the regression model we included both linear and quadratic terms of perceived impact of employment change as independent variables, in addition to Time 1 depressive symptoms and type of employment change (job loss/reduction vs. other employment changes). The dependent variable was Time 2 depressive symptoms.

RESULTS

Research question 1: Describing employment changes

Of the 144 adults with ASD who were working at Time 1, 54 (37.5%) reported an employment change during the first 2 months of COVID-19. The frequency and percentage of each type of change are presented in Table 2. The three most frequent types of employment changes were reduced hours (37.0% of those who experienced a change), temporary job loss (31.5%), and permanent job loss (18.5%). When combining across categories of job loss/reduction (i.e., reduced hours, reduced pay, temporary job loss, and permanent job loss), 26.4% ($n = 38$) of all adults with ASD who were working at Time 1 experienced job loss or reduction during this 10-week period. Of those who experienced an employment change, in 70.4% of cases that change was job loss or reduction. The remaining 30% ($n = 16$) was comprised of a diverse set of changes including getting a new job, working virtually, changes in duties, increased hours, and changes in supports (see Table 2).

Research question 2: Associations between employment changes and depressive symptoms

Preliminary analyses for Aim 2 tested for demographic differences between the employment change groups (i.e., no employment change, job loss/reduction, and other employment change); descriptive and test statistics are presented in Table 1. The three groups did not significantly differ in age, gender, race, ethnicity, whether they were currently in school, the highest level of education completed, work characteristics (type of employment, whether the work was full-time), or Time 1 depressive symptoms (measured prior to the employment change). Three demographic variables differed between groups; whether the adult lived with their parents, whether they were married, and whether they had children. Specifically, those who experienced a job loss/reduction were least likely to be living with their parents relative to the other two groups. Those who did not have an employment change were most likely to be married and to have children.

A linear regression model examined whether employment changes were associated with Time 2 depressive symptoms scores, controlling for Time 1 depressive symptoms and demographic covariates that differed between groups (i.e., whether the adult with ASD was living with their parents, whether they were married, whether they had children). Estimates from the model are presented in Table 3. Controlling for Time 1 depressive symptoms and relevant covariates, adults with ASD who experienced a job loss or reduction had depressive symptoms scores at Time 2 that were an average of 3.76 points higher than adults who did not experience employment change—a difference that was statistically significant. The difference in Time 2 depressive symptoms scores between those who experienced other employment changes and those who experienced no change ($B = 0.52$) was not statistically significant (see Table 3). Thus, relative to adults with ASD who had no employment changes, job loss or reduction during COVID-19 was related to greater worsening of depressive symptoms.

To enhance interpretation of these findings, supplemental analyses examined changes from Time 1 to Time 2 in depressive symptom categories (Beck et al., 1996) for those who had no job change versus those who experienced job loss/reduction. See Figure S1.

Research question 3: Associations between perceived impact of employment changes and depressive symptoms

Supplemental analyses for Research Question 3 involved: examining the percentages of those who reported very positive, positive, negative, very negative, or no impact of the job change on their well-being within each type of employment change (all changes, job loss/reduction,

TABLE 2 Percentage of adults with ASD who reported each type of employment change over 10 weeks

Type of change	<i>N</i>	% of those with a change	% of those employed at Time 1
Temporary job loss	20	37.0	13.9
Reduced hours	17	31.5	11.8
Permanent job loss	10	18.5	6.9
New job	8	14.8	5.6%
Working virtually	7	13.0	4.9
Change in duties	5	9.3	3.5
Increased hours	4	7.4	2.8
Reduced pay	3	5.6	2.1
Increased pay	3	5.6	3.1
Changes in supports	2	3.7	1.4
Other	5	9.3	3.5

Note: Percentages are not additive, as participants could endorse more than one type of employment change.
Abbreviation: ASD, autism spectrum disorder.

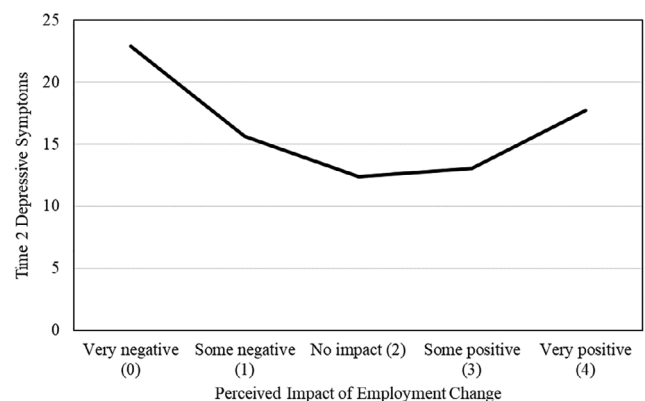
TABLE 3 Estimates from regression equation examining associations between employment change and Time 2 depressive symptoms, controlling for Time 1 depressive symptoms and covariates ($n = 144$)

Independent variable	<i>B</i> (SE)	β	95% CI for <i>B</i>	
			Lower	Upper
Time 1 depressive symptoms	0.78 (0.06)	0.76**	0.66	0.89
Lives with parents (1 = yes)	0.97 (1.69)	0.04	-2.37	4.32
Married (1 = yes)	-0.72 (2.50)	-0.02	-5.66	4.23
Has children (1 = yes)	-0.82 (2.51)	-0.02	-5.79	4.15
Reference category = no employment change				
Job loss/reduction	3.76 (1.82)	0.12*	0.16	7.27
Other employment change	0.52 (2.54)	0.01	-4.49	5.54

Note: Covariates included in the regression model were demographic variables that differed between groups.
* $p < 0.05$; ** $p < 0.01$.

other employment changes); and examining bivariate correlations between depressive symptoms at both time points and perceived impact (see Figure S2).

Among the 54 adults with ASD who experienced employment changes, we examined whether their perceived impact of that change was associated with Time 2 depressive symptoms, controlling for Time 1 depressive symptoms. In the regression model, the type of employment change (job loss/reduction vs. other) and linear trend of perceived impact did not significantly predict Time 2 depressive symptoms, $B_s = 3.18$ (SE = 3.33, 95% CI = -3.52-9.87) and -0.92 (SE = 1.04, 95% CI = -3.00-1.16), respectively, $ps = ns$. There was, however, a statistically significant association between the quadratic term of perceived impact and Time 2 depressive symptoms, $B = 2.14$ (SE = 0.85, 95% CI = 0.42-3.85), $p < 0.05$; this relationship is depicted in Figure 1. Time 2 depressive symptoms increased as adults reported greater negative impact and greater positive impact of the employment change; the lowest scores were for adults who reported no perceived impact of the employment change on their well-being.

**FIGURE 1** Estimates from regression model testing association between perceived impact of employment change and Time 2 depressive symptoms (controlling for Time 1 depressive symptoms)

DISCUSSION

Results from this study suggest a high rate of employment changes among adults with ASD during the first

2 months of COVID-19. Over one-third of our sample experienced a change in their employment *over just a 10-week period*, and most of that change was accounted for by job loss or reduction in hours or pay. The rate of job loss/reduction in this sample—26% of those employed before the pandemic—is consistent with COVID-19-related job loss among adults with ASD in other countries (Goldfarb et al., 2021), but lower than that reported by adults in the general population over a similar period (36%; Parker et al., 2020).

The rate of job loss/reduction found in this study becomes particularly troubling, however, when considering the low base rates of employment for adults with ASD during non-COVID times; in this sample, just over 50% of adults with ASD were working prior to COVID-19. Thus, for many of these adults, getting into the workforce in the first place was a significant challenge and regaining losses due to COVID-19 will almost certainly be more difficult than for adults in the general population. It is important that services and supports are targeted toward adults with ASD who experience significant employment changes (especially job loss or reduction) so that they can return to their pre-COVID-19 level of productivity.

Despite numerous studies showing high rates of employment challenges among adults with ASD (e.g., Ballaban-Gil et al., 1996; Eaves & Ho, 2008; Howlin et al., 2004; Shattuck et al., 2012; Taylor et al., 2019; Taylor & Seltzer, 2012), the impacts of unemployment in this group are mostly unknown. Our study is the first to find that employment changes—particularly job loss or reduction—had a significant negative effect on the mental health of young adults with ASD compared to stable employment. This association suggests important directions for future research and practice—both as the economy recovers from COVID-19 and likely beyond. Better supporting adults with ASD in the workplace may not only decrease the likelihood of job loss, but also combat the exceedingly high rates of depression in this group. Interventions focused on improving employment may want to also consider measuring depressive symptoms and other indicators of mental health, to test whether improving employment leads to improved mental health. These findings also have potential implications for treatment of depression. Currently, depression treatments in ASD focus almost exclusively on psychotropic medications or cognitive behavioral therapy (White et al., 2018)—the role of day-to-day experiences such as unemployment are rarely taken into account. Findings from this study suggest that employment changes (and likely other daily experiences) may need to be considered when treating depression in this population.

It is also important to note that not all employment changes are the same, and they did not have a uniform effect on depressive symptoms in this sample. Though the majority of young adults with ASD who experienced

employment changes reported a job loss or reduction, there were many other types of reported employment changes, such as getting a new job, working remotely, increasing the number of hours worked, or changes in supports or duties. Overall, adults were nearly as likely to report their work change as having a positive impact on their well-being as having a negative impact (see Figure S2). Some of these changes may be indicative of upward mobility, which would be typical of the type of employment changes commonly experienced by young adults in the general population (Arnett, 2000). In our analyses, it was only job loss and hours/pay reduction that predicted increased depressive symptoms, and not these other types of employment changes. This is similar to findings from a recent small-sample study of adults with ASD in Israel, which suggested that those who lost their jobs during the pandemic may be at risk for increasing psychological distress (Goldfarb et al., 2021). Thus, in future work examining employment instability and its effects on adults with ASD, it will be important to consider the circumstances surrounding that change (and not just change itself) to appropriately inform intervention and services (Taylor & DaWalt, 2017).

Consistent with our hypothesis and with previous work (Adler et al., 2000; Helbling & Kanji, 2018; Solomon et al., 1987; Taylor & Gotham, 2016), the way that adults with ASD perceived the impact of employment changes on their well-being was associated with depressive symptoms. However, counter to our hypotheses, we observed that perceived negative impact *and* perceived positive impact were associated with higher depressive symptoms, relative to those who perceived that the employment change had no impact on their well-being. Though results should be interpreted with some caution given the smaller sample size in this analysis, we may need to be careful about relying on perceptions of how adults with ASD are impacted by the changes going in their lives. It may be that any perceived impact of change is cause for concern for increased risk of depression. If so, it will be important to monitor the mental health of all young adults with ASD who experience job loss or reduction, regardless of how they initially perceive that change to be impacting their psychological health.

Importantly, employment changes in this study were studied during a specific point in time—at the start of the COVID-19 pandemic. Further research is needed to examine whether job loss/reduction impacts depression during non-COVID times and whether the strength of the associations differ. It may be that COVID-19 amplified the mental health impacts of job loss/reduction, given the concurrent restrictions to social and other activities due to social distancing. Alternatively, the effects of job change on depression may have been dampened due to general social upheaval and normalization of job loss across a large swath of the population. Given the ample evidence for the impact of unemployment and downward mobility on the mental health of adults in the general

population (Blustein, 2008; Hansen, 2005; McKee-Ryan et al., 2005; Murphy & Athanasou, 1999; Paul & Moser, 2009), we expect that employment changes will continue to impact depression for adults with ASD post-pandemic, but this should be systematically examined.

There are limitations of this study worth noting. Though the sample was large to begin with, the group sizes became smaller when we focused only on those who had employment changes. There may be differences we were underpowered to detect. Further, we were unable to examine the effects of specific types of job changes (e.g., virtual work vs. reduction in hours). Future research with larger samples is needed to understand which specific types of job changes are most likely to lead to higher depressive symptoms. Second, though it is notable that we observed so much job change over a short period of time, it is important to remember that we were only examining a 10-week interval. It will be important to examine the long-term effects of job loss and of COVID-19 more generally.

Further, other constructs not included in our study—such as COVID-related illness or changes in social contact—may explain the associations observed and should not be ruled out as alternative explanations for the findings. There was some indication from our analysis that adults who experienced job loss/reduction may have had fewer financial and social supports available to them relative to those with no employment changes (i.e., they were less likely to be living with parents, to be married, or have children; see Table 1); though these factors were controlled in our regression analyses, they may be indicative of other differences that were not controlled. Finally, the findings from this study are not generalizable to the population of adults with ASD. Our sample lacked racial and ethnic diversity, and only included adults with ASD who could consent for their own research participation and answer an internet survey. Findings should be interpreted in the context of this subgroup of adults with ASD, and may not apply to those adults who have greater support needs, who do not have access to technology, or who are from racial or ethnic minority groups. Future research should examine employment change and its impacts on mental health in these other ASD populations.

The limitations mentioned above are offset by important strengths. The sample that was recruited was a relatively large one for autism research, and many of the participants were retained over time. The size of the sample allowed us to ask questions about types of employment change and the perceived impact that would not be possible in a smaller sample. Perhaps the greatest strength of this study, however, is its natural experiment design. Collecting measures of employment and depressive symptoms just prior to COVID-19 allowed us to draw more rigorous conclusions about directions of effects between employment and depressive symptoms than would be possible in a cross-sectional design.

CONCLUSIONS

In sum, findings from this study suggested that employment changes during the first 2 months of COVID-19—particularly losing a job or experiencing reductions in hours or pay—predicted increased depressive symptoms among adults with ASD. Mental health interventions or surveillance may need to be targeted toward young adults who experienced job loss or reduction during the COVID-19 pandemic. Further, targeting the employment situations of adults with ASD may represent a critical avenue for improving their psychological health.

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CONFLICT OF INTEREST

The authors declare no potential conflict of interest.

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