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Parent Expectations Mediate Outcomes for Young Adults with Autism Spectrum Disorder

Anne V. Kirby[1,2]

Abstract Understanding the complex relationships among factors that may predict the outcomes of young adults with autism spectrum disorder (ASD) is of utmost importance given the increasing population undergoing and anticipating the transition to adulthood. With a sample of youth with ASD ($n = 1170$) from the National Longitudinal Transition Study-2, structural equation modeling techniques were used to test parent expectations as a mediator of young adult outcomes (i.e., employment, residential independence, social participation) in a longitudinal analysis. The mediation hypothesis was confirmed; family background and functional performance variables significantly predicted parent expectations which significantly predicted outcomes. These findings add context to previous studies examining the role of parent expectations on young adult outcomes and inform directions for family-centered interventions and future research.

Keywords Autism spectrum disorder · Transition · Adult outcomes · Parent expectations · Structural equation modeling

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Introduction

The transition to adulthood for individuals with autism spectrum disorder (ASD) has become a topic of great interest, importance, and immediacy within the interdisciplinary autism field in response to growing concern in the community (Interagency Autism Coordinating Committee 2013). Extant research suggests individuals with ASD often experience difficulty with the transition to adulthood and have numerous needs unmet by current educational and community support services (Howlin and Moss 2012; Levy and Perry 2011). Specifically, adults with ASD are reported to struggle in multiple domains of adult functioning including employment, residential independence, and social participation. Furthermore, there is an expected increase of over 120 % in individuals with ASD aging out of the secondary education system this decade (based on available estimates from Centers for Disease Control and Prevention 2014; United States Census Bureau 2012), placing additional stress on an already burdened adult services system and leaving many individuals and their families with limited resources to support success in adulthood (Eaves and Ho 2008; Henninger and Taylor 2013; Howlin and Moss 2012; Taylor and Seltzer 2011). Thus, there is a great need to understand factors that influence outcomes of adults with ASD—and complex relationships among those factors—to enable the promotion of improved outcomes.

Adult Outcomes

Three key areas of adult functioning have been explored repeatedly in the autism literature: employment, residential independence, and social relationships (Taylor 2009). Often these domains are combined or merged to create an

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overall criterion-based rating to broadly categorize the outcomes of study participants (Henninger and Taylor 2013). Early literature from Lockyer and Rutter (1969) suggested the vast majority (75 %) of adults with ASD had poor outcomes across these areas and most studies up to the present day continue to report positive outcomes for only a minority of participants (∼0–48 %; Cederlund et al. 2008; Eaves and Ho 2008; Farley et al. 2009; Gillespie-Lynch et al. 2012; Howlin et al. 2000, 2004). Of note, a number of publications on outcomes for individuals with ASD derive from one large U.S. dataset (i.e., the National Longitudinal Transition Study-2), which was also used in the current study. To maximize transparency about what previous work derives from this dataset, asterisks (*) are placed next to all NLTS2-derived citations (see "Discussion" section for further consideration).

Employment

Employment is the most heavily studied outcome for adults with ASD and studies continually suggest that individuals with ASD have low rates of employment (e.g., Carter et al. 2012; Holwerda et al. 2012; Shattuck et al. 2012). They are also reported to work in segregated settings (*Carter et al. 2012), at menial jobs (Taylor and Seltzer 2011), and for low wages and hours (Taylor and Seltzer 2011), even when compared to individuals with other disabilities (Cimera and Cowan 2009; *Roux et al. 2013). *Shattuck et al. (2012) suggested that individuals with ASD may be particularly at risk for employment struggles within the first 2 years after leaving high school. However, a long-term follow-up study by Howlin et al. (2013) suggested that limited employment may persist long-term and a longitudinal trajectory analysis by Taylor and Mailick (2014) identified a significant decreasing trajectory of vocational participation over a 10-year period for adults with ASD.

Residential Independence

Numerous outcome studies report that the vast majority of adults with ASD live with their parents or in other supported situations, with very few attaining complete residential independence (Farley et al. 2009; Henninger and Taylor 2013; Howlin et al. 2000, 2004, 2013; Levy and Perry 2011; Taylor and Seltzer 2011). Comparative studies have suggested that individuals with ASD had less residential independence than adults with Down syndrome (Esbensen et al. 2010) and youth with other educational classifications including intellectual disabilities, traumatic brain injury, learning disabilities, speech-language impairments, sensory impairments, or emotional disturbances (*Newman et al. 2011). Related to residential independence, daily living skill independence was shown

to increase in adolescence and early adulthood, but level-off and then begin to decline around 30 years of age in a longitudinal trajectory analysis (Smith et al. 2012). Because many adults with ASD live in supported settings and have limited engagement in employment, they may have minimal motivation or need to expand or even maintain their skills and independence over time.

Social Participation

Social participation outcomes reported across studies point to poor social integration among young people with ASD. Specifically, a number of studies have reported that a large proportion of the individuals they studied were described to have no friendships (e.g., Billstedt et al. 2011; Orsmond et al. 2004) and to be socially isolated (*Liptak et al. 2011). Lack of friendships in this population has been associated with loneliness, which is also related to increased levels of depression and anxiety (Mazurek 2014). Their participation in social activities with peers is typically limited, especially regarding group activities, and when they do participate, it is typically restricted within groups of people with disabilities (*Shattuck et al. 2011). Comparison studies have demonstrated that youth with ASD have significantly less social participation than youth with Down Syndrome (Esbensen et al. 2010) and other classifications such as intellectual disability, learning disability, and emotional and behavioral problems (*Orsmond et al. 2013).

Factors that Predict Outcomes

Despite the apparent consistency in identifying poor outcomes, review authors have highlighted that there is in fact some variability in outcomes and some adults with ASD do attain successful employment, residential independence, and social relationships (Hendricks and Wehman 2009; Howlin and Moss 2012; Levy and Perry 2011; Seltzer et al. 2004). Thus it is also important to closely examine factors that contribute to adult outcomes in order to inform efforts to improve positive outcomes for more individuals. Extant literature has identified numerous predictors of outcomes for adults with ASD including: cognition (Anderson et al. 2014; Farley et al. 2009; Howlin et al. 2004, 2013), language/communication skills (Gillespie-Lynch et al. 2012; Howlin et al. 2013; Liptak et al. 2011), diagnostic severity (Eaves and Ho 2008; Howlin et al. 2013), household income (*Liptak et al. 2011), parent education (*Liptak et al. 2011), parent expectations (*Chiang et al. 2013), race (*Liptak et al. 2011), gender (*Chiang et al. 2013; *Liptak et al. 2011; Migliore et al. 2012; Taylor and Mailick 2014), participation in postsecondary education (Migliore et al. 2012), and receipt of services (*Chiang et al. 2013; Esbensen et al. 2010; *Liptak et al. 2011; Migliore et al.

2012; Orsmond et al. 2004). Three key categories of predictors were central to the hypothesis in the current study: functional performance, family background, and parent expectations.

Functional Performance

By far the most commonly studied predictors, the functioning level of individuals with ASD has repeatedly been shown to predict adult outcome. Specifically, functioning of individuals with ASD related to cognition, language/communication skills, diagnostic severity, and self-care skills have been found to predict to employment, residential independence, and social participation. Review publications have often cited cognition/intelligence quotient (IQ) as the most common and important predictor of outcomes (Levy and Perry 2011; Seltzer et al. 2004). Increases in IQ, as well as the lack of a co-morbid intellectual disability diagnosis, have been found to positively predict employment outcomes (*Chiang et al. 2013; Howlin et al. 2004; *Liptak et al. 2011), friendships (Howlin et al. 2004), daily living independence (Gillespie-Lynch et al. 2012), and overall outcomes (Farley et al. 2009; Howlin et al. 2013). However, Howlin et al. (2004) suggested that there may be a maximum IQ (i.e., 100) for which this relationship holds, and Gillespie-Lynch et al. (2012) suggested that malleability of cognitive status (i.e., change over time) may be more relevant than early scores. Similarly, greater language, communication, or social skills have been associated with positive outcomes related to employment (*Liptak et al. 2011; *Roux et al. 2013), friendships (*Liptak et al. 2011; *Orsmond et al. 2013; Orsmond et al. 2004), daily living independence (Gillespie-Lynch et al. 2012), and overall outcomes (Gillespie-Lynch et al. 2012; Howlin et al. 2000, 2013). Autism severity has also been identified as a predictor of overall outcome (Eaves and Ho 2008; Howlin et al. 2013). Finally, greater self-care skills have been suggested to positively predict employment (*Roux et al. 2013), friendships (*Liptak et al. 2011), and overall outcome (Esbensen et al. 2010) for adults with ASD.

Family Background

Though inconsistent, family background variables such as race, parent education, and household income have been identified to predict outcomes of adults with ASD and other developmental disabilities. Studies have shown race can predict differential outcomes of youth with ASD (e.g., black youth have more negative social outcomes and white youth more residential independence; *Liptak et al. 2011). Additionally, parent education is suggested to have an influence on social participation (*Liptak et al. 2011) and household income on employment of adults with ASD (*Chiang et al. 2013; *Liptak et al. 2011; *Roux et al. 2013). Household income has also been suggested to be related to career decision making among youth with disabilities (Lindstrom et al. 2007). Furthermore, it is well-documented in child development literature that family background variables can predict children's functional performance (e.g., McLoyd 1998); thus, given the consistent findings between functional performance and outcomes described in the previous section, family background variables warrant consideration as factors related to adult outcomes.

Parent Expectations

The Expectancy-Value Theory of Achievement Motivation (Eccles and Wigfield 2002) highlights individuals' expectations as key contributors to their decision-making about the future and thus to their outcomes. Because parents are highly involved in the transition planning process for youth with disabilities (Hogan and Astone 1986; Lindstrom et al. 2007), this theory is proposed to be extended to incorporate parent expectations as contributors to outcomes via the decision making processes central to the dynamic transition-to-adulthood period. Using data from the National Longitudinal Transition Study-2 (NLTS2), *Doren et al. (2012) identified parent expectations of future employment (i.e., paid job: definitely will, probably will, probably will not, definitely will not) as a significant predictor of later employment for youth combined across multiple disability categories and *Carter et al. (2012) had similar findings specific to youth with severe disabilities. Parent expectations of future employment were also found to significantly differentiate individuals with ASD who were later employed versus unemployed; however, this variable was not significant when in a multivariate logistic regression model (*Chiang et al. 2013). Parent expectations variables, though commonly explored as independent predictors, have been shown to be related to both family background variables (e.g., income level; *Doren et al. 2012) and disability groups (with inherent functional performance differences; Blacher et al. 2010; *Doren et al. 2012; Grigal and Neubert 2004). Since family background and functional performance variables have also been frequently cited to predict outcomes for adults with ASD, the current study aimed to test parent expectations as a mediator of these relationships. As is the case with many variables, there is a temporal component to parent expectations; specifically, the measurement of parent expectations captures reported expectations at a particular moment in time rather than representing a static construct.

Study Purpose

The complexity of predicting outcomes of adults with ASD is evident throughout the literature and the field needs increased clarity about what broad factors influence outcomes in a consistent and generalizable way. The intention of the present study was to, first, extend previous work by utilizing existing empirical evidence on relationships between individual variables and incorporating the use of latent variables to explore longitudinal relationships among broader constructs. Furthermore, wave one parent expectations was tested as a mediator of outcomes, rather than as an independent predictor; this approach was hypothesized with support from the Expectancy-Value Theory of Achievement Motivation (Eccles and Wigfield 2002) to be a more accurate portrayal of the role expectations can have on outcomes and allowed for examination of both direct and indirect influences on young adult outcomes in ASD. Accordingly, two main research aims are explored in this study: (1) confirm predictive relationships from family background to functional performance, and family background and functional performance variables to young adult outcomes using latent variable modeling; and (2) test the hypothesis that wave one parent expectations functioned as a significant mediator of the predictive relationships from family background and functional performance to young adult outcomes. Addressing these aims holds potential to expand current understanding of the role of parent expectations on the outcomes of adults with ASD which may be a factor malleable through intervention.

Methods

NLTS2 Dataset

The National Longitudinal Transition Study-2 (NLTS2; Institute for Education Sciences n.d.) involved five data collection waves, each 2 years apart, with a nationally-representative cohort of students enrolled in special education services in the U.S. when the study began in 2000. Sampling occurred through a multi-stage process in which school districts were selected at random based on geography, size, and demographic characteristics, and then students enrolled in special education were randomly selected based on age and disability classification (Institute for Education Sciences n.d.). The project was funded by the U.S. Department of Education with data collection beginning when youth were ages 13–16 and concluding when they were 21–25 years of age (Institute for Education Sciences n.d.). The entire NLTS2 sample totaled over 11,000 youth from throughout the country and included data collected from parents, youth, and schools. Access to

the dataset was granted through an Institute of Education Sciences Restricted-use Dataset Agreement, and the project was approved by a university institutional review board. In accordance with the data-use agreement, data were stored and analyzed in a secure room on a non-networked computer and all reported sample sizes are rounded to the nearest 10 to reduce risks of disclosure.

Sample

The present analysis included only individuals from the dataset who at the first wave had a district-provided primary disability classification of autism and/or parent confirmation of an autism diagnosis ($n = 1170$), and involved using wave one variables to predict to wave five outcomes (i.e., longitudinal analysis across an 8-year span). The majority (about 90 %) of parent/caregiver respondents completing the parent survey identified themselves as mothers of the youth. All 1170 cases were included in the portions of the models for which their data were available; however, about 400 individuals in this group were lost to follow-up by the fifth/final wave and that group significantly differed from those with wave five data at wave one on race/ethnicity ($\chi^2 = 17.7$, $p < 0.001$), household income ($\chi^2 = 41.5$, $p < 0.001$), and mother's education ($\chi^2 = 30.4$, $p < 0.001$), with the group lost to follow-up most likely to be non-white and from families with less household income and lower levels of mother's education. Those included at wave five versus those lost to follow-up did not significantly differ by age, gender, academic performance, self-care skills, social skills, or parent expectations at wave one (all $ps > 0.20$). Models were run twice to determine differences with attritters removed; participants lost to follow-up were retained in the final reported models to maximize sample size and representation for tested relationships between wave one variables.

Variables

From the NLTS2 database, variables were selected which aligned with the hypothesized model and were maximally complete for the available sample (<20 % missing). For the purposes of the current analysis, variables available in the NLTS2 database were re-coded (e.g., merging response options or creation of a new variable with data from multiple existing variables) as needed to align with the hypothesized model and to improve distribution normality. Table 1 displays descriptions of the included variables and their distributions within the included sample; Table 2 presents simple correlations among the variables. Variable measurement is indicated in Table 1. The 20-point social skills scale was calculated in the dataset based on 10 parent survey items rated from 0 (never) to 2 (very often),

Table 1 Sample description on all included variables

Variable	Sample distribution[a]	Data source
Age in years—mean (SD)	14.7 (1.2)	Wave 1 (school district)
Male gender	970 (83 %)	Wave 1 (school district)
Race/ethnicity		Wave 1 (school district, supplemented with parent survey)
White/non-Hispanic	660 (56 %)	
African American	280 (24 %)	
Hispanic	100 (9 %)	
Asian or Pacific Islander	40 (3 %)	
Other or multiple	10 (0.01 %)	
Household income		Wave 1 (parent survey)
≤$25,000	270 (23 %)	
$25,001–50,000	270 (23 %)	
>$50,000	450 (39 %)	
Mother's education		Wave 1 (parent survey)
High school or less	350 (30 %)	
Some post-secondary education	320 (27 %)	
Bachelor's degree or higher	340 (29 %)	
High school academic performance		Wave 1 (teacher survey, supplemented with parent survey)
Failing (e.g., Ds and Fs)	120 (10 %)	
Below average (e.g., Cs and Ds)	260 (22 %)	
Average (e.g., Bs and Cs)	290 (25 %)	
Above average (e.g., As and Bs)	400 (34 %)	
Self-care skills [8 point scale]		Wave 1 (parent survey)
1–5 points	140 (12 %)	
6 points	160 (14 %)	
7 points	210 (18 %)	
8 points (high)	570 (49 %)	
Social skills [20 point scale]—mean (SD)	10.1 (3.5)	Wave 1 (parent survey)
Parent expects youth will have paid job in the future		Wave 1 (parent survey)
Definitely will not	70 (6 %)	
Probably will not	100 (9 %)	
Probably will	400 (34 %)	
Definitely will	460 (39 %)	
Parent expects youth will live independently in the future		Wave 1 (parent survey)
Definitely will not	370 (32 %)	
Probably will not	290 (25 %)	
Probably will	250 (21 %)	
Definitely will	110 (9 %)	
Paid work outcome		Wave 5 (parent survey)
No current or past paid employment	390 (51 %)	
Past employment, none current	110 (14 %)	
≤20 h of current employment	130 (17 %)	
>20 h of current employment	110 (14 %)	
Independent living outcome		Wave 5 (parent survey)
Does not live independently	690 (90 %)	
Lives independently	60 (8 %)	
Social participation outcome		Wave 5 (parent survey)
Never gets together with friends	270 (35 %)	
Gets together with friends once per week or less	220 (29 %)	
Gets together with friends two or more times per week	170 (22 %)	

[a] Sample sizes are rounded to the nearest 10—with percentages based on rounded numbers—in accordance with the data-use agreement with the Institute for Education Sciences. Percentages for wave one variables are based on the full included sample ($n = 1170$) and for wave five variables on the sample with successful follow-up ($n = 770$)

Table 2 Simple correlations of study variables

	Family background variables			Functional performance variables			Parent expectations		Young adult outcome variables		
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. White race	1.0 ($n = 1090$)										
2. Household income	0.38*** ($n = 980$)	1.0 ($n = 1010$)									
3. Mother's education	0.18*** ($n = 1010$)	0.41*** ($n = 930$)	1.0 ($n = 980$)								
4. Academic performance	0.02 ($n = 1010$)	0.09** ($n = 940$)	0.10** ($n = 920$)	1.0 ($n = 1070$)							
5. Self-care skills	−0.01 ($n = 1080$)	0.02 ($n = 1010$)	0.07* ($n = 980$)	0.22*** ($n = 1000$)	1.0 ($n = 1080$)						
6. Social skills	−0.01 ($n = 1070$)	0.00 ($n = 1000$)	0.03 ($n = 970$)	0.23*** ($n = 990$)	0.23*** ($n = 1060$)	1.0 ($n = 1070$)					
7. Parent exp. (paid job)	0.22*** ($n = 1030$)	0.16*** ($n = 970$)	0.21*** ($n = 950$)	0.23*** ($n = 960$)	0.39*** ($n = 1030$)	0.25*** ($n = 1020$)	1.0 ($n = 1030$)				
8. Parent exp. (live on own)	0.06* ($n = 1020$)	0.17*** ($n = 960$)	0.15*** ($n = 940$)	0.23*** ($n = 950$)	0.38*** ($n = 1020$)	0.28*** ($n = 1010$)	0.51*** ($n = 990$)	1.0 ($n = 1020$)			
9. Work outcome	0.17*** ($n = 720$)	0.11** ($n = 670$)	0.18*** ($n = 660$)	0.17*** ($n = 680$)	0.21*** ($n = 720$)	0.13*** ($n = 710$)	0.33*** ($n = 700$)	0.29*** ($n = 690$)	1.0 ($n = 740$)		
10. Ind. living outcome	0.15*** ($n = 730$)	0.11** ($n = 690$)	0.02 ($n = 680$)	−0.00 ($n = 700$)	0.13*** ($n = 730$)	0.03 ($n = 720$)	0.20*** ($n = 710$)	0.29*** ($n = 700$)	0.18*** ($n = 740$)	1.0 ($n = 760$)	
11. Social outcome	0.07 ($n = 640$)	0.08* ($n = 600$)	0.04 ($n = 590$)	0.06 ($n = 610$)	0.13*** ($n = 640$)	0.21*** ($n = 640$)	0.20*** ($n = 620$)	0.27*** ($n = 610$)	0.23*** ($n = 640$)	0.24*** ($n = 650$)	1.0 ($n = 660$)

Sample sizes are rounded to the nearest 10 in accordance with the data-use agreement with the Institute for Education Sciences

Exp expectations, *Ind* independent

* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$

targeting the youths' social behaviors including, for example, how often they join group activities, make friends easily, start conversations, and control their temper when arguing. The 8-point self-care skills scale was calculated in the dataset based on 2 parent survey items rated from 1 (not well at all) to 4 (very well) asking how well youths dress and feed themselves completely without assistance.

Using the observed variables, four latent variables were created for the purposes of the present analysis: (1) *family background* included race/ethnicity (white/non-Hispanic vs. other), household income, and mother's education; (2) *functional level* included academic performance, social skills, and self-care skills; (3) *parent expectations* included expectation that youth will have a paid job in the future and expectation that youth will live independently in the future; and (4) *young adult outcome* included employment, residential independence, and social participation. Gender and age were included in the models as covariates to account for potential related variations that have been previously reported (e.g., *Chiang et al. 2013; *Liptak et al. 2011; *Orsmond et al. 2004; *Roux et al. 2013; Taylor and Mailick 2014).

Data Analysis

Data management and descriptive analyses (i.e., distributions and simple correlations) were conducted using the Statistical Package for Social Sciences, Version 22 (SPSS; IBM 2013) and modeling was conducted using Mplus, Version 7 (Muthén and Muthén 2012). Structural equation modeling techniques were used in this analysis to test a hypothesized model using mediation to measure both direct and indirect relationships (Bowen and Guo 2012; Kline 2011). The size of the available sample was sufficient to run the hypothesized models (Kelloway 2015; Kline 2011). The models were estimated using a weighted least squares estimator with a diagonal weight matrix (i.e., WLSMV in Mplus), which is recommended for models including categorical, dichotomous, and continuous variables (Muthén 1984). Indicator parameters were freed and latent variables were standardized (variances fixed to one and means to zero) to produce more consistent and correct estimates (Kline 2011). The WLSMV estimator addresses missingness using pairwise present data, which allows for use of all available correlations (Muthén and Muthén 2012) and is considered superior over listwise approaches (Asparouhov and Muthén 2010).

Two structural equation models were fit to align with the two research aims. The first, addressing aim 1 (i.e., *confirm predictive relationships from family background and functional performance variables to young adult outcomes using latent variable modeling*), tested the base model which excluded parent expectations. This was run as a preliminary

step to explore relationships among latent variables and confirm consistency with extant literature. The second addressed aim 2 (i.e., *test the hypothesis that parent expectations function as a significant mediator of the predictive relationships from family background and functional performance to young adult outcomes*), which incorporated parent expectations and tested the primary hypothesis that parent expectations would significantly mediate the relationships to adult outcomes. Both models included age and gender as covariates for all endogenous variables.

Appropriateness of model fit was assessed using multiple fit indices: Chi Square Test of Model Fit (χ^2), Comparative Fit Index (CFI), Tucker Lewis Index (TLI), and Root Mean Square Error of Approximation (RMSEA). Chi square parameter and significance were considered; however, a significant (undesirable) χ^2 statistic is common with sample sizes above 200 (Kelloway 2015; Kline 2011). In large sample sizes, a ratio less than 2 or 3 of the statistic to its degrees of freedom (*df*) can provide an alternate estimate of acceptability of model fit (i.e., normed Chi square; Schreiber et al. 2006; Tabachnick and Fidell 2013). CFI and TLI values >0.95 and RMSEA values of <0.05 or <0.06 are considered to indicate good fit (Kelloway 2015; Tabachnick and Fidell 2013). Model trimming and respecification were considered (Kelloway 2015; Kline 2011), but no adjustments were deemed necessary.

Results

Figure 1 displays the first tested structural equation model (Model 1), which was run as a preliminary step toward testing the primary hypothesis (Model 2). Model 1 demonstrated adequate overall model fit [$\chi^2(38) = 88.37$, $p < 0.001$, ratio = 2.3; RMSEA = 0.034 (90 % CI 0.025–0.043); CFI = 0.95; TLI = 0.92] and justified the use of latent variables to model the relationships of interest. Furthermore, as expected, significant direct pathways were confirmed from family background to functional performance and young adult outcome, and from functional performance to young adult outcome. Thus, the model demonstrates the effective use of the created latent variables to confirm relationships identified in previous literature. Regarding the covariates, age did not significantly predict functional performance or young adult outcome, and gender only had a significant direct relationship to functional performance (male gender related to improved performance; *Estimate* = 0.14, $p < 0.001$) and not to young adult outcome. Table 3 lists the unstandardized estimates and standard errors for all tested pathways, including direct, total, and indirect effects in both models.

Figure 2 displays Model 2—the full model testing the primary hypothesis—which demonstrated good fit with the
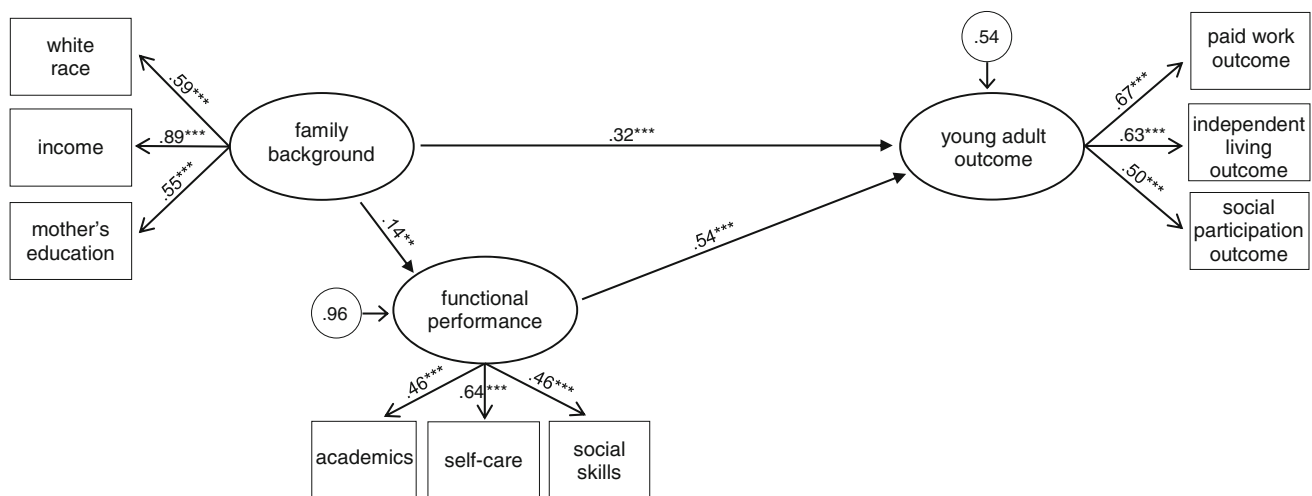
Fig. 1 Model 1: preliminary structural equation model without parent expectations. Standardized estimates are listed for displayed model paths. Direct paths were also included from covariates (age and gender) to all

endogenous variables in the model but are not shown. *$p \leq 0.05$; **$p \leq 0.01$; ***$p \leq 0.001$. Model fit: $\chi^2(38) = 88.37^{***}$, ratio = 2.3; RMSEA = 0.034 (90 % CI 0.025–0.043); CFI = 0.95; TLI = 0.92

data [$\chi^2(54) = 134.96$, $p < 0.001$, ratio = 2.5; RMSEA = 0.036 (90 % CI 0.028–0.043); CFI = 0.97; TLI = 0.95]. Model 2 reveals parent expectations was the only included variable with a significant direct pathway to young adult outcome. In contrast to the relationships seen in Model 1, with parent expectations added, pathways from family background and functional performance to young adult outcome are no longer significant. Rather, the model supports the hypothesis by identifying parent expectations as a significant mediator of the relationships from family background and functional performance to young adult outcome. The direct relationship from family background to functional performance persisted. This model also tests predictors of parent expectations; significant direct relationships were identified from both family background and functional performance to parent expectations. The significant covariate relationships were consistent from Model 1 to Model 2, despite the addition of parent expectations; the only significant direct covariate relationship was from gender to functional performance ($\beta = 0.14$, $p < 0.001$). Age did not significantly predict functional performance, parent expectations, or young adult outcome, and gender did not significantly predict parent expectations or young adult outcome. A significant total indirect effect of gender to young adult outcomes was identified (significant specific indirect effect through functional performance via parent expectations) and from gender to parent expectations through functional performance.

Both models were then re-run with the sample reduced to only those with wave five data ($n = 770$). Direction, significance, and magnitude remained consistent with the previously-reported models, except that significance was lost for the wave one relationships between family

background and functional performance in both models, which is most likely due to the lessened variability in family background variables in this sample.

Discussion

In the present analysis, structural equation modeling was used to test parent expectations as a mediator of outcomes for young adults with ASD. Without the inclusion of parent expectations (i.e., Model 1), both family background and functional performance were significant and direct predictors of young adult outcome. However, in Model 2, these effects were found to be significantly mediated through parent expectations and lost their significant direct prediction to outcomes. These analyses complement and extend previous literature on outcomes of adults with ASD in three key ways: (1) by providing evidence for the feasible application of latent variables to models predicting outcomes; (2) by identifying cross-sectional predictors of parent expectations; and (3) by expanding understanding of the role of parent expectations in longitudinal prediction of outcomes.

The majority of the extant literature exploring outcomes of young adults with ASD has taken one of two broad approaches to outcome measurement, either using an overall outcome rating or focusing on prediction to singular variables (Henninger and Taylor 2013). Furthermore, singular variables or composite scores have also most commonly been used as predictors of outcomes. The present project involved testing the use of four latent variables (i.e., family background, functional performance, parent expectations, and young adult outcome) to fit models predicting

Table 3 Unstandardized estimates and standard errors of direct, total, and indirect effects

	Model 1		Model 2	
	Estimate	SE	Estimate	SE
Direct → functional performance				
Family background	0.15**	0.06	0.14*	0.06
Age	0.06	0.04	0.06	0.04
Male gender	0.37***	0.11	0.37***	0.11
Direct → parent expectations				
Family background	–	–	0.54***	0.12
Functional performance	–	–	1.54***	0.27
Age	–	–	−0.07	0.06
Male gender	–	–	0.24	0.18
Direct → young adult outcome (Out)				
Family background (FB)	0.44***	0.11	0.16	0.18
Functional performance (FP)	0.72***	0.15	−0.37	0.50
Parent expectations (PE)	–	–	0.86**	0.32
Age	0.07	0.06	0.15	0.09
Male gender	0.21	0.20	0.10	0.27
Total FB → parent expectations	–	–	0.75***	0.14
Indirect FB → FP → PE	–	–	0.22*	0.09
Total age → parent expectations	–	–	0.01	0.06
Indirect age → FP → PE	–	–	0.09	0.06
Total gender → parent expectations	–	–	0.81***	0.22
Indirect gender → FP → PE	–	–	0.57**	0.20
Total FB → young adult outcome	0.54***	0.12	0.75***	0.20
Indirect FB → Out	0.11*	0.04	0.59**	0.22
FB → FP → Out	0.11*	0.04	−0.05	0.07
FB → FP → PE → Out	–	–	0.18	0.11
FB → PE → Out	–	–	0.46*	0.20
Total FP → young adult outcome	–	–	0.95***	0.21
Indirect FP → PE → Out	–	–	1.32*	0.57
Total age → young adult outcome	0.11	0.06	0.14	0.09
Indirect age → Out	0.04	0.03	−0.01	0.05
Age → FP → Out	0.04	0.03	−0.02	0.03
Age → FP → PE → Out	–	–	0.07	0.06
Age → PE → Out	–	–	−0.06	0.06
Total gender → young adult outcome	0.48*	0.21	0.65*	0.30
Indirect gender → Out	0.26**	0.10	0.55**	0.20
Gender → FP → Out	0.26**	0.10	−0.14	0.19
Gender → FP → PE → Out	–	–	0.49*	0.25
Gender → PE → Out	–	–	0.20	0.17

−, pathway not tested in model

* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$

young adult outcome longitudinally; the variables demonstrated appropriate measurement fit and utility in the models. A benefit of using a latent variable approach is the acknowledgement that the theoretical construct of interest is not entirely observable; observable indicators are utilized but measurement error is taken into consideration in the analysis (Kline 2011). Although limited in this study by the variables available in the NLTS2 dataset, this approach offers vast possibilities for exploration of more complex theorized relationships among constructs in future research.

In addition to interest in predicting young adult outcomes, this project allowed testing the extent to which
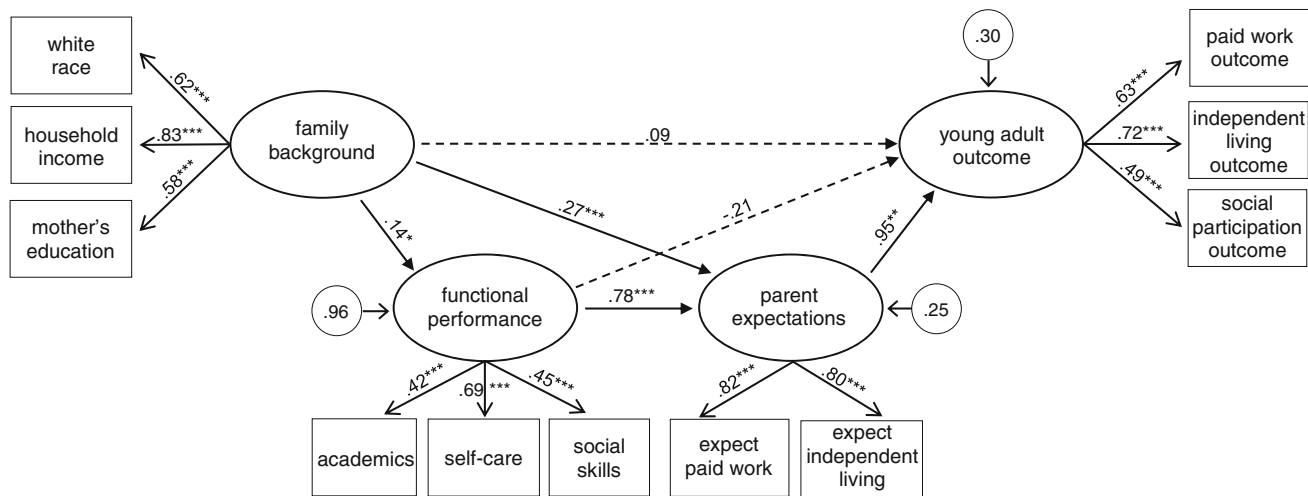
Fig. 2 Model 2: full structural equation model. Standardized estimates are listed for displayed model paths and *dashed arrows* represent nonsignificant paths. Direct paths were also included from covariates (age and gender) to all endogenous variables in the model but are not shown. *$p \leq 0.05$; **$p \leq 0.01$; ***$p \leq 0.001$. Model fit: $\chi^2(54) = 134.96$***, ratio = 2.5; RMSEA = 0.036 (90 % CI 0.028–0.043); CFI = 0.97; TLI = 0.95

family background and functional performance variables predicted parent expectations. Previous research has explored parent expectations as a predictor of outcomes (*Carter et al. 2012; *Chiang et al. 2013; *Doren et al. 2012) and influences on parent expectations including family background variables (*Doren et al. 2012) as well as diagnostic group (Blacher et al. 2010; Grigal and Neubert 2004). The present analysis provided evidence that both family background (e.g., race/ethnicity, household income, mother's education) and the youths' functional performance (e.g., academic performance, self-care skills, and social skills) significantly and directly predict what parents expect for their children's futures (e.g., if they will get a paid job and live independently). Understanding the roles that both youth- and family-level variables play in the development of parent expectations can provide context for professionals working with parents to help them prepare for the future. However, additional work is warranted to uncover more about what contributes to the development of parent expectations; both qualitative and quantitative approaches could enhance what is currently known and further inform clinical practice with youth with ASD and their families.

Most notably, the current analysis confirmed the primary hypothesis that parent expectations mediate the relationships from family background and functional performance to young adult outcomes. In fact, when added to the model, parent expectations was the only variable with a significant direct relationship with outcome. This extends previous literature that has emphasized the importance of youths' level of functioning (e.g., cognitive status, language skills) and, to a lesser extent, family background in predicting

longitudinal outcomes (e.g., Levy and Perry 2011; *Liptak et al. 2011; Seltzer et al. 2004). Additionally, studies have previously looked at parent expectations only as a predictor of outcomes without considering what may have influenced the outcomes. Shifting the perception of parent expectations from being a predictor (i.e., an independent belief parents may hold) to acting as a mediator (i.e., influenced by family and youth characteristics) should help practitioners and researchers to better understand, account for, and address parent expectations.

There do, however, remain unanswered questions about parent expectations. For example, an important question for consideration is whether or not parent expectations are malleable factors and if adjustment of expectations could have a positive influence on outcomes. It is assumed that parents' expectations play an important role in decision making about the future (Lindstrom et al. 2007); thus, once expectations are in place, options and experiences may be limited as a result of decisions that have been made. If that is the case, explicitly addressing parent expectations through education, counseling, or coaching methods during transition planning could result in more available opportunities for youths. However, it is also reasonable to consider alternately that the strong relationship from expectations to outcomes may be related to a nuanced understanding parents have about their child's future potential and that these are their 'realistic' expectations, which Kraemer and Blacher (2001) found were significantly different and less ambitious than their 'ideal' expectations for the future of their children. In this case, it is unlikely that working with parents to try to adjust their expectations would make a meaningful difference and,

rather, would emphasize the important role parents can play in understanding the most realistic expectations for youth with ASD. Considering the complexity of the transition planning process, it seems likely that it is a combination of these ideas. Thus, the most appropriate approaches may involve addressing parent expectations (and even youth's expectations for themselves) in conjunction with other interventions to support transition success (e.g., skill building, real-world experiences).

The relationships between the covariates (age and gender) and the other model variables in this study also warrant discussion. Gender has been inconsistently identified as related to outcomes in previous studies (Billstedt et al. 2005; *Chiang et al. 2013; *Liptak et al. 2011; Seltzer et al. 2004; Taylor and Mailick 2014). In the models tested in the current analysis, gender only had a significant direct pathway to functional performance, with male gender related to increased performance. In Model 1, gender had a significant indirect relationship to outcome through functional performance and, in Model 2, through functional performance via parent expectations to outcome. National monitoring sites report higher proportions of intellectual disability diagnoses among females with ASD than males (Centers for Disease Control and Prevention 2014), which may contribute to explaining the current finding of increased functional performance in adolescent males. Prior research suggests, however, that although gender may not directly influence outcomes, females with ASD may have more difficulty maintaining employment over time as compared with males (Taylor and Mailick 2014). There continues to be a substantial need for research to better understand the transition to adulthood and experiences in adulthood for females with ASD, including analyses involving the testing of gender interactions. The age of the included participants (spanning 4 years in early adulthood; 21–25) did not significantly predict any of the variables in the current models. This contrasts some previous work that has suggested employment may increase (*Shattuck et al. 2012) or decrease (Taylor and Mailick 2014) over time in adulthood.

It is important to also look at the findings of the current study in the context of other literature which has been published from studies utilizing the same dataset (NLTS2). For example, some existing NLTS2 studies supported a positive relationship between parent expectations and outcomes (e.g., Carter et al. 2012; Doren et al. 2012); however, the findings of Chiang et al. (2013) suggested parent expectations did not independently predict employment outcomes. Variations in findings using the same large dataset may be the result of utilization of different waves and variables, as well as different types of analyses. For example, the analysis conducted by Chiang et al. (2013) differed from the current study in a number of ways (i.e.,

waves 1–4 used, dichotomous outcome using repeated logistic regression techniques, and sample included only those with primary educational classification of ASD). The use of structural equation modeling techniques in the current study demonstrate a possible rationale for this difference in findings (i.e., mediation vs. independent prediction). Interpretation of findings should always take into account the sample and type of analysis.

Limitations and Future Directions

The primary limitations in this study are related to the constraints of the NLTS2 dataset. First, the NLTS2 was a descriptive longitudinal study but was not experimental, thus, it cannot prove causality. However, by tracking a cohort of individuals across an 8 year period, causal relationships can begin to be inferred using structural equation modeling techniques (Kline 2011). Second, the study design and variables available in the dataset limited the development of hypothesized latent constructs and prediction models (e.g., academic performance was used because IQ was unavailable, parent- and school-reported diagnoses used rather than researcher-administered diagnostic confirmation). Furthermore, how parent expectations were defined and measured was constrained by the study design. In particular, this study only looked at parent expectations at one time point, and it is possible that earlier expectations had already influenced youth performance and parent expectations before measurement at wave 1. There was also a substantial portion of the sample (34 %) lost to follow-up by the final wave of data collection and this group differed on family background variables which may slightly limit the generalizability of the findings to the full sample. Finally, the 21–25 age range of participants at the final wave is a limitation; some youth were still eligible for special education services and thus remained in school. An additional follow-up when youth were in their mid-to-late twenties would have allowed for more complete analysis of young adult outcomes for this population. However, despite the limitations of using the NLTS2 dataset, there are substantial benefits this dataset afforded (i.e., access to a large, diverse, and widely representative sample spanning 8 years of data collection) that would be otherwise unattainable.

The focus in the current paper was individuals with ASD, whose young adult outcomes and parent expectations are reported to be distinct and more limited than those with other diagnoses. However, the hypothesized model explored in the current study could be expanded to include other diagnoses to both test if parent expectations mediate outcomes within other groups and discover if the processes differ as a function of group. Furthermore, as described above, there is a need for expanded understanding of what

influences parents' expectations as well as if their expectations are malleable. Future work should investigate the extent to which improvements in outcome could be made using education, counseling, or coaching approaches with parents to adjust their expectations, both in isolation and in conjunction with skills-based interventions with youth with ASD.

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