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# Daily living skills in adolescents with autism spectrum disorder: Implications for intervention and independence

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## Abstract

**Background—**Challenges in adaptive behaviors are present in individuals with autism spectrum disorder (ASD), while variation in IQ, social skills, and comorbidities are possible influences on adaptive behaviors. However, adaptive behaviors do not consistently map onto cognitive abilities in ASD, as high IQ is not protective against challenges in adaptive behaviors. Additionally, individuals with both ASD and elevated levels of externalizing problem behaviors experience even worse adaptive behaviors. Identifying factors that contribute to the variance in adaptive behaviors, particularly daily living skills (DLS), may inform strategies to improve adaptive behaviors necessary for independence in adulthood.

**Method—**Adolescents with typical cognitive development (TD, n=84), intellectual disability (ID, n=30), or ASD (n=45) were included in this study to examine group differences in adaptive behaviors, identify relations between IQ and DLS, and determine factors that contribute to variance in DLS at youth age 13. The Vineland Adaptive Behavior Scales, 2nd Edition (VABS-II) was used to measure adaptive behaviors.

**Results—**All domains of adaptive behavior were significantly higher in TD groups compared to ASD and ID youth. Significant positive correlations were observed between IQ and DLS in the ASD and ID groups. In the ASD youth group, higher externalizing behavior problems explained the most variance in DLS.

**Conclusions—**DLS are below age-expected levels in young adolescents with ASD, in part because of the higher externalizing behavior problems in this group. Incorporating adaptive skills training and behavior management strategies into current interventions may serve to prepare adolescents and families for the transition to adulthood.

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Author Contributions

BLB and JB were co-Principal Investigators on the work leading up to this paper. EB conceptualized the design of the manuscript and research questions. EB, KKMS, BLB, and JB each contributed in writing the paper; EB performed the data analysis. All authors wrote, read and approved the final manuscript.



Conflicts of Interest

The authors declare no conflict of interest.

**Keywords**

autism spectrum disorder; adaptive behavior; daily living skills; externalizing behavior problems

Lifetime trajectories of individuals with autism spectrum disorder (ASD) are varied, such that only a subset of adults with ASD achieve notably successful outcomes, including independent living and gainful employment (Eaves & Ho, 2008; Howlin & Magiati, 2017). In order to understand gaps in achieving successful outcomes, there is a need to investigate factors related to attaining independence across development. Measures of daily functioning, including adaptive behaviors, should be more closely examined as individuals with ASD mature. Adaptive behaviors include the development of personal independence and social responsibility necessary to care for one's self and interact with others in a variety of environments. Especially important are the domains of socialization, communication, and daily living skills (DLS) (Burger-Caplan et al., 2018; Sparrow & Cicchetti, 1985). Socialization reflects the ability to operate within social situations. Communication skills include the ability to exchange information during interactions with others (Sparrow & Cicchetti, 1985). Daily living skills (DLS), the focus of the present study, include a wide range of behaviors and skills, such as personal hygiene and cleanliness, financial responsibility, meal preparation, and time management.

It remains unclear what factors reliably contribute to the rich heterogeneity of DLS in ASD and the acquisition of independent living skills. Recently, a "two-hit" model has been used to conceptualize why barriers to successful adult outcomes, such as independence, exist (Picci & Scherf, 2015). In this model, the first hit, involving biological occurrences, begins early in life (i.e., prenatally), where aberrant genetic interactions give rise to altered neural structure early in development, which then gives rise to the behavioral expression of ASD symptomatology later in life (Hazlett et al., 2017). The second hit, dominated by social-cognitive barriers, is experienced during adolescence, when youth struggle to meet the social, emotional, mental, hormonal, and other demands of this developmental period (Crone & Dahl, 2012; Dahl, 2004). Thus, a maladaptive additive "two-hit" phenomenon may illustrate the impact of biological and social-cognitive shortcomings on the acquisition and heterogeneity of adaptive behaviors, specifically DLS, in ASD, which may limit the transition into successful adulthood (Picci & Scherf, 2015). Identifying factors that contribute to the variance in DLS, including the quality of social skills and relevant symptomatology (including internalizing and externalizing behaviors), may inform strategies to improve adaptive behaviors necessary for day-to-day functioning and independence.

Prior research reports generalized challenges in adaptive behaviors in ASD (Kanne et al., 2011; Klin et al., 2007; Volkmar et al., 1987); however, variation in individual factors such as cognitive ability, ASD severity, and additional symptomatology contribute to adaptive behavior. For example, adaptive behaviors do not consistently map onto cognitive abilities in individuals with ASD (Kenworthy et al., 2010; Szatmari et al., 1989), such that cognitive strengths for these individuals are not a buffer against challenges in adaptive behavior. More specifically, challenges in adaptive behaviors are present even in individuals with average to high IQs (Charman et al., 2011; Kenworthy et al., 2010; Klin et al., 2007). Thus, adaptive

behavior difficulties are not just a consequence of having both an intellectual disability (ID) and ASD, but instead appear to be a consequence of having ASD regardless of cognitive level. Though overall global difficulties in adaptive behavior exist, relative strengths in domains of adaptive behavior have been reported. As such, an “autism profile” of adaptive behaviors has been observed, where socialization scores are lowest, followed by communication and DLS domains (Carter et al., 1998; Farley et al., 2009; McGovern & Sigman, 2005; Schatz & Hamdan-Allen, 1995; Volkmar et al., 1987). These relative strengths must be interpreted with reservation, as adaptive skills in individuals with ASD still fall below their neurotypical peers (Kenworthy et al., 2010).

Difficulties in domains of communication and socialization are hallmark features of ASD, as the disorder is characterized both by social communication challenges and the presence of restricted interests and repetitive behaviors (American Psychiatric Association, 2013). Interestingly, DLS are consistently impacted in this population despite falling outside of core symptomatology. For example, children with ASD tend to have lower DLS than children with developmental disorders and typically developing (TD) children (Gillham et al., 2000; Kenworthy et al., 2009; Klin et al., 2007; Liss et al., 2001). Such challenges in DLS become exacerbated in ASD youth with high IQs compared to those with lower IQs (Liss et al., 2001). Specifically, IQ and DLS are matched in ASD individuals with low cognitive abilities, such that both IQ and DLS are equally impacted and both fall below age-related expectations. In contrast, individuals with ASD who have adequate cognitive abilities also have DLS scores that fall well below their IQs and are also below age-expected values. Thus, the gap between cognitive ability and DLS is much larger in ASD individuals with higher cognitive abilities.

In longitudinal studies of individuals with ASD from early childhood to adulthood, improvements in DLS have been observed, with a sub-set of individuals showing exponential improvements in DLS during adolescence (Baghdadli et al., 2018; Bal et al., 2015). Developmental quotients in childhood have been found to be a strong predictor of DLS improvements later in life (Baghdadli et al., 2018; Bal et al., 2015). Improvements of DLS continue into the early 20s, with a plateau occurring in the late 20s followed by a decline in skills by the early 30s (Smith et al., 2012). However, Pugliese and colleagues (2016) have also found that DLS decrease during late adolescence and into early adulthood in individuals with ASD with average IQs, such that challenges in inhibition and self-monitoring/goal-directed skills were predictive of lower adaptive behaviors in early adulthood (Pugliese et al., 2016). Thus, a relation between executive functioning and the attainment of adaptive behaviors exists; however, a better understanding of the relations among IQ, core symptoms, and adaptive skills warrants further investigation.

Given that IQ has been found to be a stable indicator of ASD outcomes (Eaves & Ho, 2008), the role of IQ in the attainment of DLS in adolescence is of interest. Moreover, variability in DLS scores, particularly in individuals with higher IQs, may elucidate the heterogeneity of outcomes in adulthood (Farley et al., 2009). Some variance in DLS can be accounted for by symptoms of ASD, though ASD symptomatology is not consistently found to be a predictor across samples and often depends on how symptoms are measured (e.g., through clinical observations, parent report, or parent interview) (Charman et al., 2011; Kanne et al., 2011;

Perry et al., 2009). Of note is an investigation of teens with ASD and average IQs, where more than half of teens demonstrated below-average DLS. Duncan and Bishop (2015) did not find a strong association between their DLS scores and ASD symptomatology, as assessed with the Autism Diagnostic Interview-Revised (ADI-R) (Lord et al., 1994) and Autism Diagnostic Observation Schedule (ADOS) (Lord et al., 1999).

Repetitive behaviors and restricted interests (RRBs), another core feature of ASD, have also been implicated in adaptive behaviors, as sensory issues and preferences, common symptoms of RRBs, influence access to the environment. More specifically, elevated sensory issues, both hyporesponsive and hyperresponsive subtypes, predict lower adaptive skills in later childhood (Ausderau et al., 2016; Williams et al., 2018). This may be due to decreased opportunities for children with ASD to interact with, and learn from, their environment, due to difficulties engaging with their surroundings. Even when controlling for IQ, both sensory avoidance and overreaction are highly correlated with DLS (Jasmin et al., 2009). Such findings offer an opportunity to further examine the role of ASD symptomatology and explore other predictors of DLS, including symptoms that may occur from also having a comorbid disorder or elevated mental health symptoms.

Comorbidities are frequent in the ASD population and become increasingly prevalent during adolescence (Mannion et al., 2013; Muskens et al., 2017). Subclinical symptoms are also common and it is of note that roughly half of children and adolescents with ASD exhibit high levels of internalizing and/or externalizing behavior problems (Bauminger et al., 2010; Gadow et al., 2005). Klin and colleagues (2007) have suggested that future investigations of adaptive behaviors in ASD should consider cognitive ability and comorbidities, including ID. Additionally, research suggests that adaptive behaviors are lower when individuals with ASD have externalizing symptoms and/or co-occurring attention-deficit/hyperactivity disorder (ADHD) compared to individuals with ASD who do not display those behaviors (Ashwood et al., 2015; Rao & Landa, 2013; Sikora et al., 2012). Compounding symptomatology, as well as cognitive ability and social challenges, may place individuals with ASD at higher risk for social and adaptive challenges that also lessen the potential acquisition of DLS.

Our goal in this study was to further contextualize the “second hit” that occurs in adolescents with ASD by examining factors that may contribute to the attainment of DLS. Though investigations of adaptive behaviors have illuminated the progression of skill attainment in relation to adult outcomes (Baghdadli et al., 2018; Bal et al., 2015; Clarke et al., 2020), less is known about the development of DLS skills in early adolescence. Moreover, as the number of transition-age (ages 18-21; (Weiss et al., 2021)) youth with ASD increases (Kogan et al., 2018), it is essential to examine variables that relate to successful outcomes, with an emphasis on the development and acquisition of independent living skills prior to adulthood. Identifying key factors that relate to DLS may inform targets of intervention and impact readiness for the transition to adulthood. Thus, the current study examined the following questions: (1) Are there group differences across adaptive behaviors, particularly DLS, between adolescents with TD, ID, or ASD?, (2) Are IQ and DLS correlated in adolescents within TD, ID, and ASD groups?, and (3) What other factors account for variance in DLS in a sample of early adolescents (age 13) with ASD?

# Methods

## Participants

This investigation utilized data collected from adolescents (n = 198) at the 13-year and 15-year timepoints of a larger longitudinal study focused on emerging psychopathology, family processes, and the transition to adulthood. Typically developing (TD) participants and participants with an intellectual disability (ID) were enrolled from ages 3 to 15 years, across three universities in the United States. An additional sample of youth with ASD were enrolled for ages 13 and 15. For all three groups, measures were collected at the 13-year timepoint, with the exception of the Social Skills Improvement System (SSIS; Gresham & Elliot, 2008), which was collected at the 15-year timepoint.

The present study was limited to 159 participants who completed the a battery of four measures (see Measures section). TD youth (n = 84) had an IQ of 85 or higher on the WISC-IV (Wechsler, 2003), and had no clinical or educational diagnosis of a developmental disability. ID youth (n = 30) had an IQ below 85 and VABS-II (Sparrow et al., 2006) composite score below 86 (one standard deviation below the norm); further, they did not have a diagnosis of ASD or any other neurodevelopmental disorders. Current DSM-5 criteria for ID emphasizes the role of adaptive behaviors and clinical judgment in addition to level of cognitive ability, such that IQ score alone is not sufficient in order to meet criteria for ID. Moreover, prior research has demonstrated similar difficulties faced by those with IQ scores between 70 and 84 and those with IQ scores below 70 (Fenning et al., 2007). Additionally, other previous research has been published with similar classifications of ID, with less emphasis on IQ scores (Moody et al., 2019; Tipton-Fisler et al., 2018; Zeedyk & Blacher, 2017). Thus, the ID group combined those with IQs below or equal to 70 (n = 22) and those with IQs ranging from 71 to 84 ( n = 8). Participants with ASD (n = 45) were diagnosed professionally using multiple indicators of ASD and had a history of receiving services for children with ASD. Current research suggests adolescents with ASD and co-morbid ID do not experience lower levels of functioning or well-being beyond only having a diagnosis of ASD (Baker & Blacher, 2020). Thus, the ASD group included teens with ASD and co-morbid ID. IQs within the ASD group ranged from 46 to 138 (ASD median IQ = 88). See Table 1 for participant characteristics.

## Procedure

The Institutional Review Board of each participating university approved the study procedures; informed consent was obtained from caregivers, and adolescents provided assent. Recruitment was originally done through the targeted placement of study brochures in preschools, daycare programs, and schools when at age three. Teachers were fully informed of proposed study procedures and information was sent home to parents. Interested parents contacted the research center to be enrolled in the study. At the 13-year and 15-year timepoints, center-based assessments were conducted where caregivers and adolescents completed questionnaires, interviews, and assessments. At the 13-year timepoint, the WISC-IV, VABS-II, and CBCL were completed. At the 15-year timepoint, the SSIS was completed. Detailed information about the measures can be found in the Measures section below. Families were paid $75 for their participation in each timepoint.

## Measures

***Wechsler Intelligence Scale for Children, 4th Edition* (WISC-IV; Wechsler, 2003)—**Each adolescent's full-scale IQ (FSIQ) was estimated using three subtests (Vocabulary, Matrix Reasoning, and Arithmetic) at the 13-year timepoint. The FSIQ was used as a measure of cognitive ability in this investigation (Sattler & Dumont, 2004).

***Vineland Adaptive Behavior Scales, Survey Interview Form, 2nd Edition* (VABS-II; Sparrow et al., 2006)—**The VABS-II is a widely used semi-structured interview in which a caregiver reports the child's age-appropriate adaptive behaviors. VABS-II Interviews were completed at the 13-year timepoint. Standardized composite scores are comprised of communication, DLS, and socialization subscales, which make up the VABS-II Adaptive Behavior Composite (VABS-II ABC). Standard scores on the VABS-II have a mean of 100 and a standard deviation of 15. Qualitative descriptors consider standard scores between the range of 86-114 to fall within the Adequate range. The VABS-II DLS subscale was used as a measure of current DLS.

***Child Behavior Checklist for Ages 6–18* (CBCL; Achenbach & Rescorla, 2001)—**Child behavior problems were assessed with the widely used CBCL, completed by mothers at the 13-year timepoint. They rated each of 120 youth problems as "not true," "somewhat or sometimes true," or "very true or often true." The present study used total broadband T-scores for Internalizing Problems and Externalizing Problems subscales. Qualitative descriptors consider Internalizing Problems and Externalizing Problems T-scores under 60 to be in the Normal range, t-scores between 60-63 to fall in the Borderline clinical range, and scores 64 and above to fall within the Clinical range.

***Social Skills Improvement System* (SSIS; Gresham & Elliott, 2008)—**The SSIS yields standard scores of social skills and problem behaviors normed for ages three to 18. The SSIS was the only measure included in the multiple linear regression that was collected at the 15-year timepoint of the study, as a standardized measure of social skills was not available at the 13-year timepoint. The SSIS has adequate measures of stability and test-retest reliability alpha's range from .70 to .80 on the Social Skills standard score subscale (Crosby, 2011; Gresham & Elliott, 2008). The SSIS Social Skills score was used to measure social behaviors.

## Analyses

The current study examined group differences across adaptive behaviors (with particular emphasis on DLS), the relation between IQ and DLS within TD, ID, and ASD groups, and factors contributing to the variance in DLS. All analyses were conducted using SPSS Version 27 (2020). One-way ANOVA analyses were conducted to identify behavioral group differences on VABS-II ABC, VABS-II Socialization, VABS-II Communication, VABS-II DLS, FSIQ, CBCL Internalizing Problems, CBCL Externalizing Problems, SSIS Social Skills, and mother's highest grade completed. Bonferroni post hoc tests were set to .05. A Chi-square test of independence was calculated to compare adolescent race across groups. Pearson correlations were conducted to examine the relation between VABS-II DLS and FSIQ within TD, ID, and ASD groups. Finally, multiple linear regressions were conducted

to identify variables that contributed to the variance in VABS-II DLS scores. Predictive variables included FSIQ, CBCL Internalizing Problems, CBCL Externalizing Problems, SSIS Social Skills, Mother's Highest grade completed and Child Race (White vs. Other).

## Results

### Group Differences

Table 1 shows consistent differences between the TD group and the two disability groups (ID and ASD). Across six skill domains, the TD group was significantly higher than each disability group, and on the two CBCL broadbands, the TD group was significantly lower (with the only exception being that there were no differences between TD and ID groups on the CBCL Internalizing Problems score). Thus, these eight measures indicated better adjustment for youth in the TD group. The ID and ASD groups only differed in 3 domains. The ASD group was higher than ID in FSIQ by definition. The ASD group was also higher on CBCL Internalizing Problems and lower on SSIS social skills.

The ASD and ID groups did not differ on CBCL Externalizing Problems score. Figure 1 shows the percent of participants in each group who fell in the Normal, Borderline clinical, and Clinical ranges on CBCL Externalizing Problems. 40% of the ASD group fell into the Borderline clinical or Clinical range of externalizing problem behaviors compared to 13% of the TD group and 26.7% of the ID group, respectively.

One-way ANOVAs revealed group differences on the VABS-II ABC ($F(2,156) = 99.0$, $p < 0.001$) and subdomains, such that socialization ($F(2,156) = 70.0.0$, $p < 0.001$), communication ($F(2,156) = 56.0$, $p < 0.001$), and DLS domains ($F(2,156) = 68.8$, $p < 0.001$) were significantly lower in the ASD and ID groups compared to the TD group. See Table 1 for VABS-II group means.

Despite the ID group having significantly lower FSIQs than the ASD group, no significant differences were observed between ASD and ID groups on any domain of the VABS-II. In sum, DLS were equally impacted in the ASD and ID groups, with average scores falling in the moderately low range for both groups. Chi-square tests of independence revealed no associations between group status and race (White vs. Other); $X^2(2) = 4.5$, $p = 0.10$.

### Pearson Correlations between FSIQ and DLS

A significant positive correlation was observed between FSIQ and VABS-II DLS scores in the ID ($r = 0.37$, $p = 0.04$) and ASD ($r = 0.35$, $p = 0.02$) groups. There was no correlation between FSIQ and VABS-II DLS scores in the TD group. Figure 2 displays scatterplots of the relation between FSIQ and VABS-II DLS for each group, further illustrating the difficulties in DLS in ASD youth. Despite the positive correlation, DLS are quite impacted in ASD youth across all levels of FSIQ scores. Within the ASD population, 24.4% fell within at least the Adequate Range (86 - 114) of scores for DLS compared to 88.1% of TDs. Thus, 75.6% of the ASD sample fell below the Adequate Range on the VABS-II DLS.

### Variance in DLS Across Groups

Tests of multicollinearity were conducted between continuous independent variables within each group. Average variance inflation factor (VIF) scores for FSIQ, CBCL Internalizing Problems, CBCL Externalizing Problems, SSIS Social Skills, and mother's highest grade completed were fairly close to one for each group, suggesting multicollinearity was not a concern (TD: Tolerance = 0.7, VIF = 1.5; ID: Tolerance = 0.8, VIF = 1.3; ASD: Tolerance = 0.7, VIF = 1.6) (Daoud, 2017; Mansfield & Helms, 1982). A multiple linear regression was conducted to determine whether FSIQ, CBCL Internalizing Problems, CBCL Externalizing Problems, SSIS Social Skills, mother's highest grade completed, and child race contributed to the variance in VABS-II DLS within each group. Though the SSIS was completed at the 15-year timepoint, it was included in the regression model used to predict 13-year VABS-II DLS scores, in order to include a standardized measure of social functioning.

Results of the multiple linear regression in the ASD group indicated that the model explained 32.6% of the variance in VABS-II DLS and significantly predicted VABS-II DLS in the ASD group, $F(6,38) = 3.06$, $p < 0.02$. While the overall model was predictive, only the CBCL Externalizing Problems ($B = -0.06$, $\beta = -0.43$, $p = 0.04$) was a significant individual predictor of VABS-II DLS. For every standard deviation unit increase in CBCL Externalizing Problems, VABS-II DLS scores decrease by 0.43 standard deviation units, holding all other variables constant. Refer to Table 2 for a summary of the model.

The model did not significantly predict VABS-II DLS in the TD or ID groups.

## Discussion

This investigation provides support for the second "hit" of the "two-hit" model of ASD, characterized by challenges acquiring adaptive behaviors during adolescence, a developmental period defined by social-emotional demands. Young adolescents with ASD were not attaining adequate levels of adaptive behaviors during this transition period, which is likely to put them at greater risk for low adaptive behaviors in adulthood. Among the youth in this study, global adaptive behaviors, including DLS, were equally impacted in ASD and ID groups compared to age-matched TD peers. Though the ASD group was comprised of a full range of IQs, their adaptive skills were still far below age-expected values, suggesting IQ does not consistently relate to adaptive behaviors in this population. Additionally, despite previous literature showing relative strengths in DLS in individuals with ASD, the present scores did not differ significantly between the ASD and ID groups. In fact, three-fourths of the ASD sample fell below age-expected DLS behaviors. Thus, findings in this study of young adolescents corroborate the well-documented global adaptive behavior difficulties in ASD in addition to challenges with DLS. In fact, higher IQ provided no additional benefit or buffer in the domain of adaptive skills, as IQ was not a significant predictor of DLS and thus it appears that cognitive ability is less salient in DLS when externalizing behaviors are taken into account. Related findings using the same sample were reported by Baker and Blacher (2020), whereby youth with ASD and co-morbid ID did not differ from youth with ASD only on levels of behavior disorders, social skills, social acceptance and even student-teacher relationships.

In our sample, higher rates of externalizing behaviors accounted for a sizeable proportion of variance in DLS scores for youth in early adolescence. This suggests that the presence of externalizing behaviors and ASD has the potential of bringing about cascading impacts, such that externalizing problems can exacerbate overall social and adaptive difficulties and hinder daily functioning (Shea et al., 2018; Simonoff et al., 2008), as well as increase caregiver stress (Bauminger et al., 2010). In studies of individuals with ASD and ADHD, adaptive skills are more impacted, particularly DLS, compared to individuals with only ASD (Rao & Landa, 2013; Sikora et al., 2012). Children with ADHD and ASD have overlapping symptoms and (to some degree) shared genetic influences (Ronald et al., 2008). Externalizing problem behaviors are common in both disorders, indicating shared behavioral presentations may be related to executive functioning, especially inhibition, shifting, and monitoring skills (Pugliese et al., 2016). Though additional work is needed to draw cogent inferences among adaptive behaviors, symptom overlap, and executive functioning in ADHD and ASD, externalizing behaviors may influence a second “hit” during adolescence.

Given the broad impact that externalizing behaviors have on the lives of individuals with autism and their families, it is not surprising that they also influence the attainment of independent living skills in adolescence. Externalizing behaviors are disruptive to the entire family system and may limit opportunities for adolescents to gain independence based on caregiver restrictions. For instance, heightened levels of aggression may result in limited access to certain areas of the home, including the kitchen, which may impede the adolescent with ASD from learning how to cook safely. Additionally, sensory issues that are expressed through externalizing behaviors may prevent adolescents from effectively dressing themselves.

Caregivers can learn to both scaffold and restrict the level of DLS the adolescent performs, such that parent-youth interactions shape the development and attainment of these skills. If scaffolding and the instruction of adaptive behaviors become time-consuming, parents might experience unintended restrictions to supporting the development of DLS (e.g., it might be faster for the parent to complete the task rather than coaching the child to complete it). The presence of externalizing problem behaviors in children with disabilities can increase parent stress (Baker et al., 2002, 2003), particularly in children who have ASD (Eisenhower et al., 2005). Additionally, mother-child relationship quality is strengthened with the abatement of social communication challenges and reductions in repetitive behaviors (Smith et al., 2008). Taken together, children who present with externalizing symptoms may receive less praise or may experience less positive interactions with their caregivers and thus encouragement of independent tasks or direct instruction of DLS may occur less across time. Attachment styles, parenting techniques, and parent-youth interactions should also be examined to further understand the variance of DLS in the ASD population. In addition to considering the impact of parent-youth interactions on opportunities to practice DLS in the home, sensory issues must also be considered. Identifying sensory profiles, including sensory avoidance and sensory-seeking behaviors, can elucidate how individuals with ASD interact and operate within their environments (Ausderau et al., 2016) and may also inform acquisition of DLS and reactions to environmental demands in all children (Little et al., 2017).

Fortunately, adaptive behaviors are amenable to intervention. In a sample of children with ASD with comorbid anxiety disorders, cognitive behavioral therapy techniques with a parent-training component increased DLS; also, caregivers reported decreased parent-intrusiveness in daily tasks (Drahota et al., 2011). Additionally, in older youth with ASD and comorbid ID, improvement in DLS during adolescence is possible, with a slow rate of further improvement occurring through the early 20s (Smith et al., 2012). Incorporating adaptive training into existing interventions can serve to advance adaptive behaviors and DLS skills, in particular. Occupational therapy may be ideal for individuals for whom sensory issues and motor skills make it particularly challenging to perform self-care skills, such as personal hygiene tasks (National Autism Center, 2015). Another approach to improving adaptive skills is Naturalistic Teaching Strategies, which utilize materials in the environment and naturally-occurring activities as opportunities to increase adaptive skills (National Autism Center, 2015). Evidence from single-case design studies targeting adaptive behaviors show promising outcomes in individuals with ASD, both with ID (Bennett & Dukes, 2014) and without ID (Palmen et al., 2012). Results ranged from employment attainment to cooking skills. Duncan and colleagues have developed *Surviving and Thriving in the Real World* (STRW), a manualized group intervention targeting DLS in ASD (Duncan et al., 2018). Early results of STRW outcomes were quite encouraging, as teens who participated in a feasibility study gained an average of 2 years' worth of DLS across the 12-week intervention period (Duncan et al., 2018). It is especially important to address externalizing problems in conjunction with bolstering adaptive skills. Including a parent component along with child-centered intervention, even in adolescence, may also serve to further promote independence. Thus, targeting adaptive skills in intervention during both childhood and adolescence can set the stage for adulthood and future independence.

Some limitations exist in the current investigation. One would be the relatively small sample size, although it was large enough for some important and significant differences. The major limitation is that the study pertains only to early adolescence. It is conceivable that different results would be obtained if older adolescents or young adults were studied. Additionally, other measures of social domains may have further elucidated the effect of social behaviors on adaptive behavior.

## Conclusion

In sum, Daily Living Skills are below age-expected levels in young adolescents with ASD. Externalizing problem behaviors contributed to the variance in DLS, indicating that greater externalizing problem behaviors result in lower DLS. Incorporating adaptive skills training into current interventions may serve to prepare adolescents and families for the transition to adulthood and independence. Future investigations should consider the presence of co-occurring disorders to further explore adaptive behaviors and DLS in ASD.

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## Highlights

- Teens with ID or ASD have similar levels of adaptive behavior
- Increased externalizing problem behaviors result in lower DLS in ASDs
- Interventions should include DLS training to promote independence in ASD teens

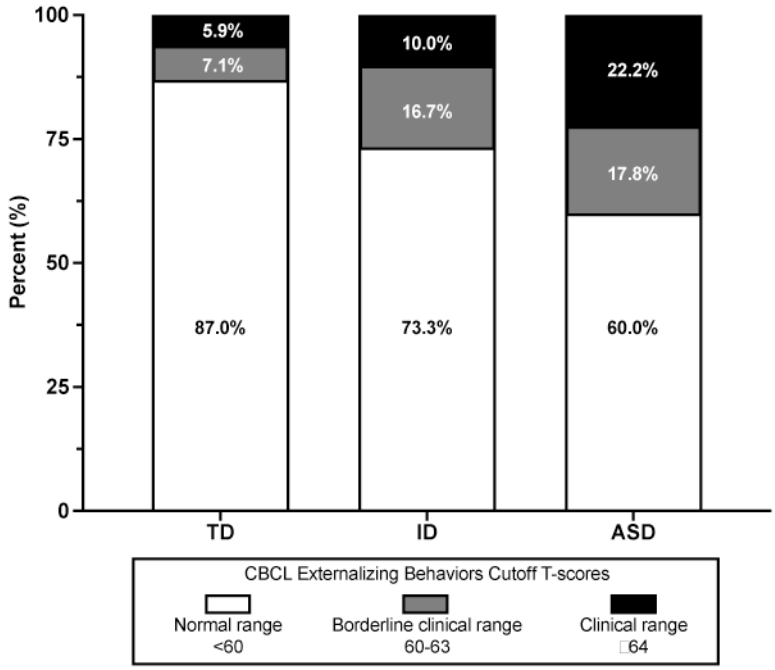


**Figure 1.**

Percent of participants who fell within the Normal range, Borderline clinical range, and Clinical range on the Child Behavior Checklist for Ages 6–18 (CBCL) Externalizing Behaviors T-score for TD, ID, and ASD groups.

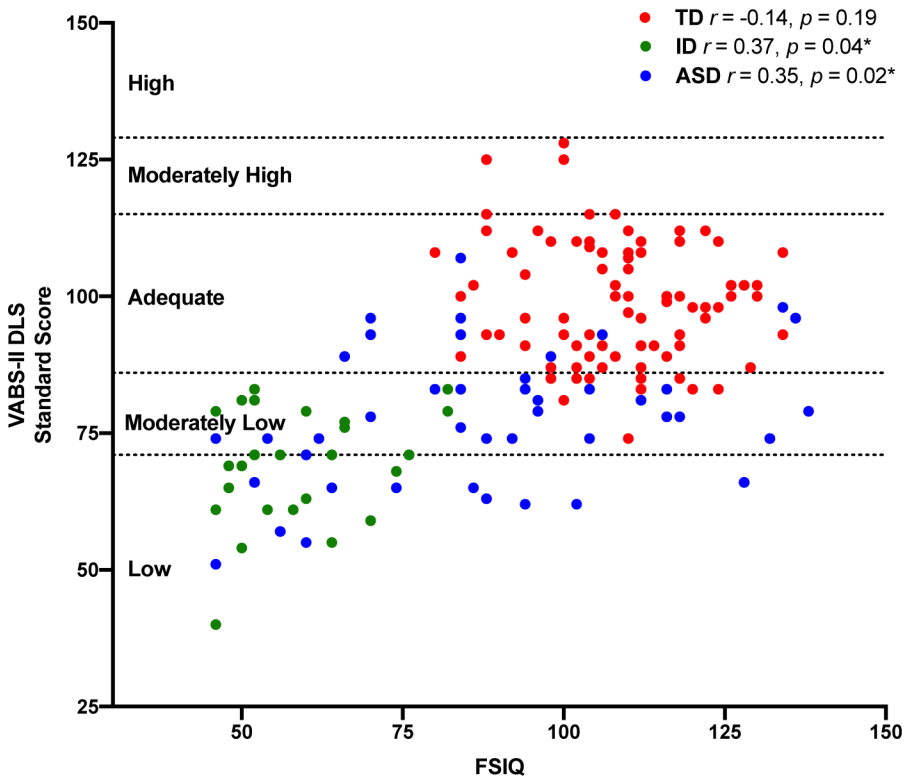


**Figure 2.**

Pearson correlations between full-scale IQ (FSIQ) and Vineland Adaptive Behavior Scales, 2nd Edition (VABS-II) Daily Living Skills (DLS) for TD, ID, and ASD groups. The dotted lines represent qualitative descriptors of VABS-II DLS, where scores below 71 fall in the Low range, scores between 71 to 85 fall in the Moderately Low range, scores between 86 to 114 fall in the Adequate range, scores between 115 to 129 fall in the Moderately High range, and scores above 129 fall in the High range.

## Table 1

Descriptive characteristics and group differences between TD, ID, and ASD groups.

| Variables | TD *M*(*SD*) n = 84 *52% Male* | ID *M*(*SD*) n = 30 *60% Male* | ASD *M*(*SD*) n = 45 *78% Male* | F | p | TD vs. ID | TD vs. ASD | ID vs. ASD |
|---|---|---|---|---|---|---|---|---|
| VABS-II Adaptive Behavior Composite *Standard Score* | 97.3 (9.3) | 73.8 (11.5) | 75.1 (10.7) | 99.0 | <0.001 | <0.001 | <0.001 | ns |
| VABS-II Daily Living Skills *Standard Score* | 98.8 (11.0) | 73.6 (14.5) | 78.2 (12.5) | 68.8 | <0.001 | <0.001 | <0.001 | ns |
| VABS-II Socialization *Standard Score* | 101.9 (10.8) | 80.5 (14.8) | 76.5 (14.5) | 70.0 | <0.001 | <0.001 | <0.001 | ns |
| VABS-II Communication *Standard Score* | 92.5 (9.9) | 72.9 (10.8) | 75.6 (12.2) | 56.0 | <0.001 | <0.001 | <0.001 | ns |
| WISC-IV Full Scale *Standard Score* | 108.5 (12.4) | 61.0 (12.0) | 90.2 (25.3) | 88.0 | <0.001 | <0.001 | <0.001 | <0.001 |
| CBCL Internalizing *T-score* | 47.8 (10.5) | 52.7 (10.1) | 61.4 (10.2) | 25.6 | <0.001 | ns | <0.001 | <0.001 |
| CBCL Externalizing *T-score* | 46.9 (9.9) | 53.8 (9.5) | 56.0 (9.5) | 14.7 | <0.001 | <0.01 | <0.001 | ns |
| SSIS Social Skills *Standard Score* | 98.7 (14.7) | 90.2 (13.1) | 81.2 (14.8) | 21.7 | <0.001 | <0.05 | <0.001 | <0.05 |
| Mother's Highest Grade Completed | 15.9 (2.4) | 14.3 (3.0) | 15.2 (2.3) | 5.1 | <0.01 | <0.01 | ns | ns |
| Family Income | | | | | | | | |
| < $35,000 | 13 | 10 | 9 | | | | | |
| $35,001 – $95,000 | 34 | 10 | 23 | | | | | |
| > $95,001 | 34 | 10 | 13 | | | | | |
| Adolescent Race | | | | | | | | |
| White | 52 | 12 | 27 | | | | | |
| Black | 5 | 5 | 3 | | | | | |
| Latino | 10 | 9 | 6 | | | | | |
| Mixed & Other | 17 | 4 | 8 | | | | | |

*Note*. TD = typically developing, ID = intellectual disability, ASD = autism spectrum disorder; VABS-II = Vineland Adaptive Behavior Scales, 2nd Edition; WISC-IV = Wechsler Intelligence Scale for Children, 4th Edition; CBCL = Child Behavior Checklist for Ages 6–18; SSIS = Social Skills Improvement System. Income data is missing from 3 TD families.

**Table 2**

Summary of Multiple Linear Regression Analyses for Variables Predicting VABS-II DLS in the ASD sample (n = 45).

| Variable | *B* | *SE B* | *β* | *t* | *p* |
|---|---|---|---|---|---|
| *Intercept* | 74.46 | 22.62 | --- | 3.29 | 0.00 |
| *WISC-IV Full Scale IQ* | 0.13 | 0.07 | 0.26 | 1.79 | 0.08 |
| *CBCL Internalizing Problems* | 0.17 | 0.21 | 0.14 | 0.80 | 0.43 |
| *CBCL Externalizing Problems* | −0.57 | 0.27 | −0.43 | −2.10 | 0.04* |
| *SSIS Social Skills* | 0.06 | 0.16 | 0.07 | 0.36 | 0.72 |
| *Maternal Education* | 0.75 | 0.81 | 0.14 | 0.93 | 0.36 |
| *Race* | −4.18 | 3.67 | −0.17 | −1.14 | 0.26 |