**Published in final edited form as:**
Munsell, E.G.S., Orsmond, G.I., Fulford, D. & Coster, W.J. (2021). Metacognition mediates the effect of social communication and internalizing behaviors on self-management of daily life tasks for diploma-track autistic youth. *Journal of Autism and Developmental Disorders.* Advance online publication. https://doi.org/10.1007/s10803-021-05306-z

# Metacognition mediates the effect of social communication and internalizing behaviors on self-management of daily life tasks for diploma-track autistic youth

Elizabeth G.S. Munsell[1], Gael I. Orsmond, Daniel Fulford, and Wendy J. Coster
Department of Occupational Therapy, College of Health & Rehabilitation Sciences: Sargent College, Boston University.
[1] emunsell@bu.edu

**Abstract**
Social communication and executive functioning challenges as well as co-occurring anxiety/depression may make acquiring the skills needed to manage daily life tasks difficult for diploma-track autistic youth, thus limiting their participation in adult roles. This study describes the associations between executive function, social communication skills, and internalizing behaviors on task management in academically capable autistic adolescents ($n$= 46) using multiple regression with mediator analysis. The three predictors and youth age explained a moderate amount of variance in task management. Metacognition mediated the effect of social communication skills and internalizing behaviors on task management. Relations between underlying factors that influence self-management of daily life tasks are complex, supporting the need for multifaceted assessment and intervention approaches for academically capable autistic youth.

*Keywords*: transition, executive functioning, adaptive behavior, daily living skills, autism

The transition from high school to adulthood traditionally involves youth taking on new roles in the contexts of employment or education. To do so successfully, youth must not only have necessary academic skills, but also the ability to manage the life tasks essential to meeting societal expectations in their new roles. Managing daily life tasks includes organizing activities into effective sequences, monitoring task performance, and making necessary adjustments to carry out tasks, all while adapting to changing contexts for task performance (Kao et al., 2015). Examples of these daily tasks include planning and following a weekly schedule, managing routine health appointments, paying bills on time, and informing one's employer that they will be late or absent. For many youth, taking on the responsibility for daily life tasks begins in early childhood and naturally and gradually shifts from caregivers to the youth over a period of years, with a significant portion of the shift culminating in late adolescence (Kao et al., 2021; Rogoff, 2003). Self-management of essential life tasks required for adult roles is typically learned through informal learning experiences throughout childhood and this learning continues as young adults undertake new roles in employment and education (Rogoff, 2003).

Difficulty acquiring the skills needed to manage life tasks creates challenges to achieving employment, education, and independent living outcomes (Anderson et al., 2018). Accordingly, difficulty managing life tasks may partially explain the observed discrepancy in academic abilities and poor "traditional" outcomes for academically capable autistic[1] youth who graduate with a regular high school diploma (diploma-track autistic youth). Diploma-track autistic youth are at risk of not achieving traditional adult outcomes commensurate with their potential, such as completion of a post-secondary education degree or gainful employment, and have poor outcomes in the areas of relationships, independent living, and mental health (Howlin & Magiati, 2017; Roux et al., 2015).

Self-management of daily life tasks has been identified in the qualitative and quantitative literature as a potential explanation for the challenges autistic youth may face upon entering adulthood roles. In a qualitative study of the experiences of autistic youth and their parents during the transition to adulthood authors summarized this challenge: "The unpredictability of transitioning into new environments was particularly stressful for many of the adolescent participants. Caregivers and adolescents reported difficulties with youth adapting to the changes of entering adulthood and managing multiple responsibilities." (First et al., 2016, p. 227). In other qualitative accounts, parents of autistic youth shared that youth need services and supports to learn life skills in addition to education and employment skills (Anderson et al., 2018). For example, parents wanted counselors or job coaches to facilitate their youth's ability to manage daily life tasks such as communicating with employers about medical needs, paying bills, managing laundry, or grocery shopping and meal preparation (Anderson et al., 2018; First et al., 2016; Morrison et al., 2009). Indeed, challenges with daily living skills among autistic youth have been well established and deficits increase with age compared to typically developing peers (Bal et al., 2015; Duncan & Bishop, 2015).

There are likely many underlying factors that influence an autistic individual's acquisition of the ability to self-manage life tasks including their profile of autistic characteristics, co-occurring conditions, educational experiences, societal expectations, and birth order, as well as influences from parenting approaches and societal expectations. In the present study we focus on three factors that are hypothesized to be associated with self-management of daily life tasks: social communication skills, internalizing behaviors, and executive functioning. Impairments in social communication skills are part of the DSM-5 diagnostic criteria for autism spectrum disorder (American Psychiatric Association, 2013). Autistic individuals may demonstrate reduced social-emotional reciprocity, differences in nonverbal communication used for social interaction, and/or difficulties adjusting behavior to suit various social contexts. Internalizing behaviors, such as withdrawal, anxiety, and depression commonly co-occur in adolescents and young adults with autism (Bauminger et al., 2010). Incidence rates for anxiety and depression among autistic young adults is greater than 50% (Kirsch et al., 2020).

Lastly, autistic individuals often demonstrate challenges with executive functioning (EF; American Psychiatric Association, 2013; Hill, 2004; O'Hearn, Asato, Ordaz, & Luna, 2008). Executive functions (i.e., higher order cognitive processes, including working memory, planning, flexibility, and organization, that support problem-solving and behavioral regulation; Diamond, 2013) play a key role in initiation, time management, organization, and problem solving needed to manage daily life tasks (Hume et al., 2014; Tarazi et al., 2007). Studies of EF in autistic youth differentiate between lab-based measures of EF and rating scale measures of EF in which EF abilities are assessed within the context of real-world scenarios (Soto et al., 2020). While findings from lab-based measures of EF in autistic youth are somewhat conflicting (Kenworthy,

Yerys, Anthony, & Wallace, 2008; Wallace et al., 2016), studies that have used measures of EF as they are implemented in everyday, real-world settings (such as the Behavior Rating Inventory of Executive Function (BRIEF; Gioia, Isquith, Guy, & Kenworthy, 2000; Granader et al., 2014) consistently show that autistic youth experience EF challenges. These challenges persist after controlling for the impact of intelligence quotient (Gardiner & Iarocci, 2018; Gilotty, Kenworthy, Sirian, Black, & Wagner, 2002; Pugliese et al., 2015; Wallace et al., 2016). Furthermore, Rosenthal et al. (2013) reported that the discrepancy in metacognitive EFs (i.e., planning, initiating, using working memory, organizing and monitoring task performance) in autistic youth compared to their peers widens as they enter adolescence. Impairments in metacognitive EFs make it difficult for youth to negotiate common situations they face when engaging in daily tasks such as planning and sequencing multi-step actions or adjusting their plan when something unexpected happens (Gardiner & Iarocci, 2018; Hume et al., 2014; Pugliese et al., 2015).

Prior research has explored the relations between different combinations of EF, social communication skills, internalizing behaviors and daily functioning. Poor metacognition has been shown to be negatively related to daily functioning in autistic youth (Pugliese et al., 2016; Wallace et al., 2016). In particular, metacognitive behaviors were predictive of current (Pugliese et al., 2015) and future adaptive behavior in autistic youth after controlling for age and intelligence quotient (Pugliese et al., 2016). Wallace et al. (2016) found that metacognition was associated with adaptive behavior in autistic adults. Notably, this relationship was partially mediated by ADHD symptoms. Social communication skills and internalizing behaviors have also been associated with decreased ability to self-manage daily life tasks by autistic youth (Hill, Gray, Kamps, & Varela, 2015; Kraper, Kenworthy, Popal, Martin, & Wallace, 2017). Kraper and colleagues (2017) found that higher levels of anxiety and poor social functioning were related to adaptive behavior challenges for transition-aged autistic youth without intellectual disability. Likewise, Duncan and Bishop (2015) found social communication was significantly associated with daily living skills in autistic adolescents without intellectual disability. Interestingly, internalizing behaviors were not significantly associated with daily living skills in this sample.

There also is evidence that poor social communication skills and internalizing behaviors are associated with EF in autistic youth (Andersen et al., 2015; Bertollo et al., 2020; Gardiner & Iarocci, 2018; Hollocks et al., 2014; Pugliese et al., 2016, 2015; Wallace et al., 2016). While the literature provides little empirical guidance on the directions of these associations, one theory is that EF (specifically metacognition) impacts social communication skills via deficits in theory of mind in autistic individuals (Baraka, El-Dessouky, El-Wahed, & Allam Amer, 2019; Hughes & Leekam, 2004; Leung, Vogan, Powell, Anagnostou, & Taylor, 2016). In addition, the attentional control theory of anxiety postulates that anxiety results, in part, from reduced cognitive flexibility and ability to shift attention (Eysenck, Derakshan, Santos, & Calvo, 2007). Executive functioning theory in autism suggests that characteristics of autism arise from EF deficits (Hill, 2004), as autistic individuals “have problems with exerting effortful control when they need to deal with novel, complex, or ambiguous situations in everyday life” (Goldstein, Naglieri, Princiotta, & Otero, 2014, p. 122). The relations between these underlying factors and self-management of daily life tasks are clearly complex. Accordingly, in this study we will explore the relations between social communication skills, internalizing behaviors, EF, and self-management of daily life tasks together to better understand how the factors interrelate to influence youth’s behavior.

Most of the existing research in this area uses traditional measures of adaptive behavior as a proxy for daily functioning (e.g., Duncan & Bishop, 2015; Pugliese et al., 2016, 2015; Wallace et al., 2016). The construct of adaptive behavior is defined as "conceptual, social and practical skills performed by people in their everyday lives" (AAIDD, 2010, p. 4). Traditional measures operationalizing adaptive behavior encompass many skills and abilities, ranging from discrete functional skills to complex tasks taking place within varying contexts (Gleason & Coster, 2012). As such, the design of measures of adaptive behavior that are widely used in research make it difficult to distinguish task-level challenges from problems acquiring discrete skills (Gleason & Coster, 2012) and limits our ability to focus an evaluation specifically on the area of suspected deficit for diploma-track autistic youth: the youth's performance of the complex self-management tasks needed to meet the responsibilities of adult roles.

Measures that focus specifically on the ability to self-manage daily life tasks provide a more targeted approach to understanding the areas of challenge for many diploma-track autistic youth. For example, the authors of the Pediatric Evaluation of Disability Inventory - Computer Adaptive Test (PEDI-CAT; Haley, Coster, Dumas, Fragala-Pinkham, & Moed, 2012) conceptualized this distinction in the design of the measure. The Responsibility domain of the PEDI-CAT captures the construct of self-management of daily life tasks separately from more discrete daily activities, social/cognitive, and mobility skills domains. The four distinct content domains were supported by factor analysis in a mixed sample of 2,205 young people (ages 0-21) with and without disabilities (Haley et al., 2011). The specific focus of the PEDI Responsibility domain (PEDI:R) on managing complex life tasks allows us to build on and extend what is already known from studies using traditional adaptive behavior measures by refining our investigation of where autistic youth experience activity performance difficulties.

Drawing on the aforementioned body of work using adaptive behavior measures, theories of how youth learn to manage daily life tasks (Rogoff, 2003), and a task analysis of the underlying requirements for carrying out the tasks needed to meet the responsibilities of adult roles, we hypothesized that social communication skills, executive functioning, and internalizing behaviors would impact one's ability to self-manage daily life tasks. For example, executive functions support one's ability to plan, follow through, and problem solve challenges that arise during complex task sequences such as those needed to manage life tasks. Internalizing behaviors are theorized to impact executive functioning and daily functioning via attentional control theory (Eysenck, Derakshan, Santos, & Calvo, 2007) and are associated with poorer outcomes in adulthood for autistic individuals (Gotham, Brunwasser, & Lord, 2015). Lastly, social communication skills are relevant both for learning the skills needed to carry out daily life tasks (i.e., youth learn new skills through social learning and guided participation by adults in their environment; Bandura, 1977; Rogoff, 2003) and when interacting with others in the community in order to execute the tasks needed to self-manage adulthood responsibilities.

Finally, many previous investigations in this area have focused on autistic youth or young adults across the full autism spectrum. In this study we explore the specific sub population of autistic youth who are on track to graduate with regular high school diplomas. This population is potentially unique in that graduation with a high school diploma may carry the expectation that these youth will fully participate in typical adult environments (at work, post-secondary education, or living independently). As such, the demands for self-management of daily life tasks in adulthood may be higher in this group, making it increasingly important to understand potential contributing factors to the development of these abilities.

The present study had three aims: (a) demonstrate the variability in ability to self-manage daily life tasks (SMDLT) in diploma-track autistic youth; (b) test the associations between EF, social communication skills, and internalizing behaviors and SMDLT (measured by the PEDI:R) in this population; and (c) explore if EF mediates the associations of social communication skills and internalizing behaviors on SMDLT in this population.

## Methods

### Participants

Autistic youth and parent dyads ($n$ = 46) were recruited for the study through (1) schools and school districts providing special education services to high school students with autism, (2) directly through parents via local and regional parent autism advocacy and support groups using emailed letters and informational flyers or postings on internet sites and listservs, and (3) through community groups providing services for high school students with autism. Inclusion criteria were: current high school student (age 14-20 years old) with prior diagnosis of autism by a professional and current or past receipt of special education services under the autism disability category (Individuals with Disabilities Education Act, 2004), and expectation of graduation with a regular high school diploma, per parent report. History of symptoms consistent with an autism diagnosis were verified by a Lifetime form of Social Communication Questionnaire (Rutter, Bailey, & Lord, 2003) score of 15 or higher (administered during a phone screen). Exclusion criteria were: expectation of graduation with a high school completion certificate, intellectual disability, or major physical limitation, per parent report. Individualized Education Programs (IEPs) were used to confirm that youth met criteria for 40 participants (87%). IEPs were not available for six participants (13%). Three families did not provide permission for the research team to contact the school for a copy of the student's IEP, two students did not have an IEP, and in one instance the research team was unable to get in contact with the student's school in order to obtain their IEP.

Demographic characteristics of parents and youth are reported in Table 1. Most parents and youth identified as white, lived in suburban communities, and most parents (80%) had at least a bachelor's degree. Autistic youth were primarily male (76%) and most had co-occurring conditions per parent report, including anxiety disorder (76%), ADD/ADHD (67%), depression (46%), and learning disability (41%).

### Data collection procedure

Ethical approval for the study was obtained by the Institutional Review Board at Boston University. All youth and parents provided informed consent (or assent for youth younger than 18 years old) prior to completing study procedures. Parents and youth provided data on youth's internalizing behaviors, social communication skills, and EF through a combination of assessments administered online or mailed paper forms. After completing the mailed and online assessments, the parents completed an assessment of youth's ability to self-manage daily life tasks that was administered over the phone using online screen share.

### Measures

Youth and parent demographic characteristics including age, gender, race and ethnicity, community type, parent level of education, and youth co-occurring conditions were collected via online survey in addition to the following four measures.

***Pediatric Evaluation of Disability Inventory – Computer Adaptive Test – ASD: Responsibility domain*; PEDI:R (Haley et al., 2012)**

The PEDI:R is a parent-report scale measuring youth's ability to organize and manage daily life tasks, including planning, flexibility, and ability to respond to environmental and social cues and generate strategies to achieve goals. The Responsibility domain includes items such as *Informing home, school, or work when he or she will be late or absent; locating needed services or supports (e.g. finding a community program or repair business); tracking spending and managing money; maintaining cleanliness and upkeep of living space;* and *making healthy choices to maintain health and well-being*. Items are rated on a five-point scale quantifying the extent to which an individual relies on environmental supports or help from others to carry out complex tasks (from 'adult/caregiver takes full responsibility for the task' to 'child takes full responsibility for the task'). This rating scale provides more nuanced information about how that individual uses supports to enable functioning in their typical daily contexts (Dunn, Coster, Orsmond, et al., 2009; Kao et al., 2015; Kramer, Coster, Kao, Snow, & Orsmond, 2012). T-scores range from 0-100 ($M$=50, $SD$=10) with high scores indicating that youth takes more responsibility for managing their daily life tasks compared to same age peers. The PEDI has been validated specifically for use with adolescents with autism (Kramer et al., 2012). Using the PEDI:R in a study of 125 youth with autism without intellectual disability, 46% of the sample fell in the significantly delayed range on the PEDI:R and an additional 40% of youth were in the borderline delayed range (Munsell & Coster, 2020). Notably, 61% of youth age 18 and older were significantly delayed, compared to 38% of youth age 14-17, indicating that older youth experience a greater discrepancy in ability to self-manage daily life tasks compared to peers.

***Behavior Rating Inventory of Executive Function, Adult (Gioia et al., 2000) and Behavior Rating Inventory of Executive Function, Second Edition (Gioia, Isquith, Guy, & Kenworthy, 2015): Metacognition Index; BRIEF:MI***

The BRIEF is a parent report scale measuring executive functioning in everyday contexts. The metacognition index (MI) consists of five subscales: initiate, working memory, plan/organize, task monitor, and organization of materials. Items are rated on a three-point scale of the extent to which a behavior has been a problem in the past month (never, sometimes, often). T-scores range from 0-100 ($M$=50, $SD$=10) with high scores indicating more executive function problems. The BRIEF has good internal consistency with alpha coefficients ranging from .80 to .98 for the clinical scales and the index scores (Roth et al., 2005). Evidence of convergent and discriminant validity has been reported in many populations including autism (Gioia et al., 2000). Parents of youth under the age of 17 in this study received the BRIEF-2, all other participants completed the BRIEF-Adult version.

***Adult Self Report* (Achenbach & Rescorla, 2003) and *Youth Self Report* (Achenbach & Rescorla, 2001)*: Internalizing behavior subscale; IB***

The internalizing behavior subscale (IB) of the Adult and Youth Self Report measures is a self-report scale measuring youth's internalizing symptoms. It consists of three subscales: anxiety/depression, withdrawn behavior, and somatic complaints. Items are rated on a three-point scale on the extent to which behaviors describe themselves (not true, somewhat true, very true). T-scores range from 0-100 ($M$=50, $SD$=10) with high scores indicating more internalizing behaviors. The Adult and Youth Self Report measures have good internal consistency, with alphas above .70 (Achenbach & Rescorla, 2003), and have been shown to be valid measures of

emotional and behavioral disorders in autistic individuals (Pandolfi et al., 2011). Youth under the age of 17 in this study received the Youth Self Report, all other participants completed the Adult Self Report.

***Communication Checklist – Adult; CCA* (Whitehouse & Bishop, 2009)**

The CCA is designed for adults (ages 17+) with developmental disabilities including individuals with subtle communication difficulties, such as autism and specific language impairment (Whitehouse, Coon, Miller, Salisbury, & Bishop, 2010). It is a parent-report scale measuring aspects of youth's social communication skills including social engagement, pragmatic skills, and structural language. Seventy items are scored on a three-point scale of frequency of behavior (from 'less than once a week or never' to 'several times a day or always'). Raw scores range from 0-140 with higher scores indicating more social communication problems. Raw scores were used in this analysis in order to capture the full extent of variability in CCA scores across participants.

**Data analysis**

All statistical analyses were conducted using SPSS Statistics, Version 27 (IBM Corp., 2020). Descriptive analyses of mean, range, or frequencies were calculated to describe participant and student characteristics and PEDI:R scores. Pearson's correlations were performed to assess the bivariate relationships between the dependent variable (PEDI:R) and four independent variables (CCA, IB, MI, youth age). All variables met the skew and kurtosis criteria for normal distribution and thus were treated as continuous variables. Results of the correlation analyses informed mediation models.

***Regression analyses***

Multiple linear regression analysis was performed to evaluate the associations between the dependent variable (ability to self-manage daily life tasks; PEDI:R T-score) and independent variables. Four independent variables were entered in one step into the regression analysis: youth age, communication ability (CCA raw score), metacognition (MI T-score), and internalizing behaviors (IB T-score).

***Mediation analyses***

Mediation analyses can expose instances where the relationship between the independent and dependent variable is influenced through a third, mediator variable (Baron and Kenny, 1986). We used Baron and Kenny's (1986) approach to testing mediation through a series of linear regression analyses (Figure 1) using the PROCESS macro for SPSS, version 3.5.3 (Hayes, 2012).

First, we tested for significant associations between the independent variable (e.g., social communication) and self-management of daily life tasks (path c) and the independent variable and metacognition (path a). Then we estimated path b by testing the association between metacognition and self-management of daily life tasks, controlling for the independent variable. Finally, path c' was compared to path c to determine the extent of mediation. In light of our small sample size, our analysis focused on effect sizes and confidence intervals. We also tested the robustness of the mediation estimation using Preacher and Hayes (2008) bootstrap procedure.

## Results

### Descriptive analyses of self-management of daily life tasks (SMDLT)

Overall, autistic youth performed below age-based normative scores on PEDI:R. A T-score of 50 is considered average for age. T-scores for the sample ranged from 15 - 44 with a mean T-score of 30.87 (*SD* = 7.15). Thirty-seven percent of the sample fell in the significantly delayed range (T-score <30). The remaining youth were in the borderline delayed range. Notably, there was a significant negative correlation between T-scores and age ($r$= -.45, $p$= .002), indicating that older youth had larger discrepancies in performance compared to peers.

### Correlation analyses

Table 2 shows the full correlation matrix for PEDI:R and four independent variables. All independent variables had significant negative correlations of moderate magnitude with PEDI:R. In addition, social communication and internalizing behaviors were correlated with metacognition. Higher metacognition (MI) was significantly correlated with better social communication (CCA; $r$ = .50, $p$ < .001) and less severe internalizing behaviors (IB; $r$ = .41, $p$ = .008).

### Regression analysis

Table 3 shows the regression analysis results. Youth age, internalizing behaviors, metacognition, and social communication skills explained 49% of the variance in PEDI:R ($R^2$ = .49, *SE* = 5.27, $p$ < .001) with only metacognition explaining a significant amount of unique variance in PEDI:R ($\beta$ = -.27, *SE* = .09, $p$ = .006).

### Mediation analysis

The results of the correlation and regression analyses suggested that metacognition may mediate the effect of social communication on PEDI:R and also the relationship between internalizing behaviors and PEDI:R. The results of the mediation analyses supported these hypotheses.

#### *Metacognition mediates the effect of social communication on SMDLT*

Results indicated that social communication was a significant predictor of both PEDI:R ($\beta$ = -.09, *SE* = .03, 95% CI [-.15, -.02], $p$ = .013) and metacognition ($\beta$ = .19, *SE* = .05, 95% CI [.08, .30], $p$ = .001). After controlling for metacognition, social communication was no longer a significant predictor of PEDI:R ($\beta$ = -.03, *SE* = .03, 95% CI [-.10, .04], $p$ = .343). Approximately 46% of the variance in PEDI:R was accounted for by the predictors (Table 4). The indirect effect was tested using Preacher and Hayes (2008) bootstrapping procedure. Over 5,000 trials, the bootstrap estimated indirect effect was significant ($\beta$ = -.05, *SE* = .02, 95% CI [-.10, -.02]). Social communication skills directly accounted for approximately 38% of variance in PEDI:R, while 62% of the effect of social communication skills on PEDI:R was mediated through metacognition.

#### *Metacognition mediates the effect of internalizing behaviors on SMDLT*

Results indicated that internalizing behaviors were a significant predictor of PEDI:R ($\beta$ = -.24, *SE* = .09, 95% CI [-.41, -.06], $p$ = .011) and that internalizing behaviors were a significant predictor of metacognition ($\beta$ = .40, *SE* = .15, 95% CI [.10, .70], $p$ = .010). Internalizing

behaviors were no longer a significant predictor of PEDI:R after controlling for the mediator, metacognition ($\beta$ = -.11, *SE* = .08, 95% CI [-.28, .06], $p$ = .187). Approximately 48% of the variance in PEDI:R was accounted for by the predictors (Table 5).

Over 5,000 trials, the bootstrap estimated indirect effect was significant ($\beta$ = -.13, *SE* = .06, 95% CI [-.28, -.04]). Internalizing behaviors directly accounted for approximately 47% of variance in PEDI:R, while 53% of the effect of internalizing behaviors on PEDI:R was mediated through metacognition.

## Discussion

In this study we demonstrated the complex relations among three underlying factors that influence the ability to self-manage daily life tasks in autistic youth. Together, metacognitive executive functioning, social communication skills, internalizing behavior, and youth age predicted 49% of the variability in daily task management, with metacognition explaining significantly more unique variance in self-management of tasks after controlling for the other factors. Results of the mediation analysis suggested that metacognition mediates the association of internalizing behaviors (indirect effect: 47%) and social communication skills (indirect effect: 62%) on self-management of tasks.

Our findings build on existing evidence of daily functioning challenges in autistic youth from studies using traditional adaptive behavior measures (Bal et al., 2015; Duncan & Bishop, 2015). Unlike measures of adaptive behavior that combine discrete functional skills and complex task management in a single scale, the PEDI:R focuses specifically on youth's ability to take over the decision making, problem solving, and organization needed to carry out complex daily life tasks in real life contexts (Kao et al., 2020). Youth in our sample performed well below the age-expected level of responsibility on the PEDI:R, indicating that, overall, autistic youth were not yet not assuming a level of responsibility comparable to their peers. Similar to the pattern seen in adaptive behavior (Duncan & Bishop, 2015), the discrepancy in level of self-management in typically developing youth compared to autistic youth was greater in older adolescents. These findings focus attention on a key area of difficulty for diploma-track autistic youth: This group remains significantly more dependent on external supports (e.g., help from their parent/caregiver) to manage daily life compared to same age peers. Future research using the PEDI:R or similar measures that specifically focus on self-management of complex daily tasks rather than more global adaptive behavior measures may be beneficial in describing areas of challenge and as a potential intervention target/outcome measure for diploma-track autistic youth (Coster, 2013).

In previous investigations of these factors in autistic youth without intellectual disability, researchers have explored associations between executive functioning, social communication skills, and internalizing behaviors using executive functioning as an outcome or have included a subset of these factors to predict adaptive behavior (Duncan & Bishop, 2015; Kraper et al., 2017; Pugliese et al., 2016, 2015; Wallace et al., 2016). However, it is likely that many autistic youth display features of all three of these underlying factors due to the high incidence of anxiety and depression and executive dysfunction in this population. To our knowledge, this is the first study that explores the combined associations of internalizing behavior, social communication skills, and executive functioning on daily functioning (i.e., self-management of daily life tasks) in diploma-track autistic youth. In our analyses, the three factors collectively explained a moderate amount of variance in the PEDI:R outcome in our sample; however, only metacognition significantly explained any additional unique variance in PEDI:R score. This finding suggests

that each of these factors may play an important role in the ability to consistently self-manage daily tasks and may be present to different degrees in autistic youth, giving rise to variations in performance of complex task management. Different profiles of strengths and weaknesses in executive functioning, internalizing behaviors, and social communication may influence youth's ability to manage daily life.

In this study we also explored the mediation effect of executive functioning on self-management of daily life tasks. The partial mediation of executive functioning on the association between social communication skills and internalizing behaviors on task management emphasizes the influence that strong executive functioning skills may have on mitigating other challenges that contribute to poor daily task management. All three factors clearly play an important role in the development of daily task management. However, youth with higher levels of executive functioning may be able to call on their strengths in planning, task initiation, task monitoring, and flexibility to compensate for internalizing behaviors related to anxiety or depression, or social communication skill deficits in order to take on more responsibility for managing daily tasks.

It is well established that autistic youth, including those without intellectual disability, have differing profiles of autistic characteristics and, as a result, individualized approaches to intervention and assessment are considered best practice (Masi, Demayo, Glozier, & Guastella, 2017). The results of our analyses reflect the heterogeneity seen across autistic youth by showing that multiple factors play a role in demonstrating consistent ability to self-manage daily tasks. Consequently, it is necessary to carry out a comprehensive assessment of youth's strengths and weaknesses prior to engaging them in any type of intervention aimed at improving daily functioning or an underlying factor. Identifying individual variations can direct clinicians towards interventions that address youths' specific needs and make optimal use of their strengths rather than using a "one size fits all" approach to improving daily functioning in this population.

Furthermore, given the complex relations between social communication skills, internalizing behavior, and executive functioning and self-management of daily life tasks, it is likely that interventions addressing only one of these factors may not be universally effective for diploma-track autistic youth. Rather, multifaceted interventions that address the potential weaknesses across social communication, executive functioning, and internalizing behavior using an integrated approach are needed. For example, Unstuck and on Target (UOT) (Cannon et al., 2011) is an executive function intervention for youth with autism in which youth learn strategies to accommodate for flexibility and other executive functioning challenges (Cannon et al., 2011). UOT uses a multi-contextual approach in which strategy teaching is embedded during typical daily activities in real life contexts at school and home. Notably, UOT addresses social communication skills and behavioral challenges through the development of cognitive flexibility. In a study comparing UOT to a traditional social skills training intervention, the UOT group demonstrated greater improvement in classroom performance compared to the social skills training group (Kenworthy et al., 2014). A modified version of Cognitive Behavior Therapy (CBT; Sze & Wood, 2008) has also been used with good effect to mitigate depression and anxiety as well as improve self-help skills and independence in daily routines in autistic children (Drahota, Wood, Sze, & Van Dyke, 2011). CBT could be incorporated into existing executive functioning interventions to address self-management of daily life tasks for autistic youth who have high levels of internalizing behaviors.

## Limitations and future directions

Our results provide a new perspective on the role of executive function, social communication skills, and internalizing behaviors on a specific area of challenge for diploma-track autistic youth: the ability to self-mange daily life tasks. However, these results are limited in their generalizability due to the small, relatively homogeneous study sample. Most of the participants identified as white, non-Hispanic/Latinx, and are from families with highly educated parents. The transfer of responsibility for daily life tasks takes place within the social environment and valued skills are determined by shared cultural beliefs about what constitutes "responsibility" in adulthood (Rogoff, 2003). Thus, autistic youth from different backgrounds may demonstrate different patterns of influences on responsibility development compared to the youth in this sample. Future work could investigate the role of cultural and social environment in relation to the model described in this study. In addition, due to our small sample size we were unable to carry out a subgroup analysis according to co-occurring conditions. As co-occurring conditions are common in this population (Bauminger et al., 2010; Kirsch et al., 2020), this could be a future direction for research. Furthermore, while the tools used to measure social communication and daily task management demonstrate strong psychometric properties for this population, both measures are based on parent report. Future work employing multiple measures of these variables could further validate our findings. Lastly, although mediation analysis implies a directional relationship among variables (Kraemer, Wilson, Fairburn, & Agras, 2002), our statistical findings are correlational and cross sectional, limiting our ability to draw definitive conclusions from our results. A longitudinal study design using a specific measure of complex daily task performance would help us further disentangle the relations among factors influencing self-management of daily life tasks.

**Acknowledgments:** This study was part of Elizabeth Munsell's dissertation at Boston University. This research was supported by the Institute of Education Sciences, U.S. Department of Education, through Grant R324A160113 to Gael Orsmond. The opinions expressed are those of the authors and do not represent views of the Institute or the U.S. Department of Education.

**Author Contributions:** All authors contributed to the development of study methods. EGSM completed data analysis and led manuscript writing. All authors participated in data analysis interpretation and manuscript review and editing. All authors approved the manuscript to be submitted and published.

References

AAIDD. (2010). *Intellectual disability: Definition, classification, and systems of supports* (11th ed.). Washington, DC: American Association on Intellectual and Developmental Disabilities.

Achenbach, T. M., & Rescorla, L. A. (2001). *Manual for the ASEBA school-age forms & profiles*. Burlington, VT: University of Vermont, Research Center for Children, Youth, & Families.

Achenbach, T. M., & Rescorla, L. A. (2003). *Manual for the ASEBA adult forms & profiles*. Burlington, VT: University of Vermont, Research Center for Children, Youth, & Families.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders: DSM-5* (5th Ed.). Arlington, VA: American Psychiatric Association.

Andersen, P. N., Skogli, E. W., Hovik, K. T., Egeland, J., & Øie, M. (2015). Associations among symptoms of autism, symptoms of depression and executive functions in children with high-functioning autism: A 2 year follow-up study. *Journal of Autism and Developmental Disorders*, *45*(8), 2497–2507. https://doi.org/10.1007/s10803-015-2415-8

Anderson, K., Sosnowy, C., Kuo, A. A., & Shattuck, P. T. (2018). Transition of individuals with autism to adulthood: A review of qualitative studies. *Pediatrics*, *141*, S318–S327. https://doi.org/10.1542/peds.2016-4300I

Bal, V. H., Kim, S.-H., Cheong, D., & Lord, C. (2015). Daily living skills in individuals with autism spectrum disorder from 2 to 21 years of age. *Autism*, *19*(7), 774–784. https://doi.org/10.1177/1362361315575840

Bandura, A., & Walters, R. H. (1977). *Social learning theory* (Vol. 1). Prentice Hall: Englewood Cliffs.

Baraka, M., El-Dessouky, H. M., El-Wahed, E. E., & Allam Amer, S. S. (2019). Theory of mind: Its development and its relation to communication disorders: A systematic review. *Menoufia Medical Journal*, *32*, 25–30. https://doi.org/10.4103/mmj.mmj

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic and statistical considerations. *Journal of Personality and Social Psychology*, *51*(6), 1173–1182.

Bauminger, N., Solomon, M., & Rogers, S. J. (2010). Externalizing and internalizing behaviors in ASD. *Autism Research*, *3*(3), 101–112. https://doi.org/10.1002/aur.131

Bertollo, J. R., Strang, J. F., Anthony, L. G., Kenworthy, L., Wallace, G. L., & Yerys, B. E. (2020). Adaptive behavior in youth with autism spectrum disorder: The role of flexibility. *Journal of Autism and Developmental Disorders*, *50*(1), 42–50. https://doi.org/10.1007/s10803-019-04220-9

Cannon, L., Kenworthy, L., Alexander, K. C., Werner, M. A., & Anthony, L. G. (2011). *Unstuck and on target!: An executive function curriculum to improve flexibility for children with autism spectrum disorders*. Baltimore: Paul H. Brookes.

Coster, W. J. (2013). Making the best match: selecting outcome measures for clinical trials and outcome studies. *The American Journal of Occupational Therapy*, *67*(2), 162–170. https://doi.org/10.5014/ajot.2013.006015

Diamond, A. (2013). Executive functions. *Annual Review of Psychology*, *64*(1), 135–168. https://doi.org/10.1146/annurev-psych-113011-143750

Drahota, A., Wood, J. J., Sze, K. M., & Van Dyke, M. (2011). Effects of cognitive behavioral therapy on daily living skills in children with high-functioning autism and concurrent anxiety disorders. *Journal of Autism and Developmental Disorders*, *41*(3), 257–265. https://doi.org/10.1007/s10803-010-1037-4

Duncan, A. W., & Bishop, S. L. (2015). Understanding the gap between cognitive abilities and daily living skills in adolescents with autism spectrum disorders with average intelligence. *Autism*, *19*(1), 64–72. https://doi.org/10.1177/1362361313510068

Dunn, L., Coster, W. J., Orsmond, G. I., & Cohn, E. S. (2009). Household task participation of children with and without attentional problems. *Physical and Occupational Therapy in Pediatrics*, *29*(3), 258–273. https://doi.org/10.1080/01942630903008350

Eysenck, M. W., Derakshan, N., Santos, R., & Calvo, M. G. (2007). Anxiety and cognitive performance: Attentional control theory. *Emotion*, *7*(2), 336–353. https://doi.org/10.1037/1528-3542.7.2.336

First, J., Cheak-Zamora, N. C., & Teti, M. (2016). A qualitative study of stress and coping when transitioning to adulthood with autism spectrum disorder. *Journal of Family Social Work*, *19*(3), 220–236. https://doi.org/10.1080/10522158.2016.1185074

Gardiner, E., & Iarocci, G. (2018). Everyday executive function predicts adaptive and internalizing behavior among children with and without autism spectrum disorder. *Autism Research*, *11*(2), 284–295. https://doi.org/10.1002/aur.1877

Gilotty, L., Kenworthy, L., Sirian, L., Black, D. O., & Wagner, A. E. (2002). Adaptive skills and executive function in autism spectrum disorders. *Child Neuropsychology*, *8*(4), 241–248.

Gioia, G. A., Isquith, P. K., Guy, S. C., & Kenworthy, L. (2000). *Behavior Rating Inventory of Executive Function*. Odessa, FL: Psychological Assessment Resources.

Gioia, G. A., Isquith, P. K., Guy, S. C., & Kenworthy, L. (2015). *Behavior Rating Inventory of Executive Function, Second Edition (BRIEF2)*. WPS Publishing.

Gleason, K., & Coster, W. (2012). An ICF-CY-based content analysis of the Vineland Adaptive Behavior Scales-II. *Journal of Intellectual and Developmental Disability*, *37*(4), 285–293. https://doi.org/10.3109/13668250.2012.720675

Goldstein, Sam, Naglieri, J. A., Princiotta, D., & Otero, T. M. (2014). Introduction: A history of EF as a theoretical and clinical construct. In S Goldstein & J. A. Naglieri (Eds.), *Handbook of Executive Functioning* (pp. 1–12). New York: Springer. https://doi.org/10.1007/978-1-4614-8106-5

Gotham, K., Brunwasser, S. M., & Lord, C. (2015). Depressive and anxiety symptom trajectories from school age through young adulthood in samples with autism spectrum disorder and developmental delay. *Journal of the American Academy of Child & Adolescent Psychiatry*, *54*(5), 369-376.

Granader, Y., Wallace, G. L., Hardy, K. K., Yerys, B. E., Lawson, R. A., Rosenthal, M., … Kenworthy, L. (2014). Characterizing the factor structure of parent reported executive function in autism spectrum disorders: The impact of cognitive inflexibility. *Journal of Autism and Developmental Disorders*, *44*(12), 3056–3062. https://doi.org/10.1007/s10803-014-2169-8

Haley, S. M., Coster, W. J., Dumas, H. M., Fragala-Pinkham, M. A., Kramer, J., Ni, P., … Ludlow, L. H. (2011). Accuracy and precision of the Pediatric Evaluation of Disability Inventory computer-adaptive tests (PEDI-CAT). *Developmental Medicine and Child Neurology*, *53*(12), 1100–1106. https://doi.org/10.1111/j.1469-8749.2011.04107.x

Haley, S. M., Coster, W. J., Dumas, H. M., Fragala-Pinkham, M. A., & Moed, R. (2012). *PEDI-CAT: Development, standardization, and administration manual*. Boston: CRECare.

Hayes, A. F. (2012). *PROCESS: A versatile computational tool for observed variable mediation, moderation, and conditional process modeling 1*.

Hill, E. L. (2004). Executive dysfunction in autism. *Trends in Cognitive Sciences*, *8*(1), 26–32. https://doi.org/10.1016/j.tics.2003.11.003

Hill, T. L., Gray, S. A. O., Kamps, J. L., & Varela, R. E. (2015). Age and adaptive functioning in children and adolescents with ASD: The effects of intellectual functioning and ASD symptom severity. *Journal of Autism and Developmental Disorders*, *45*(12), 4074–4083. https://doi.org/10.1007/s10803-015-2522-6

Hollocks, M. J., Jones, C. R. G., Pickles, A., Baird, G., Happé, F., Charman, T., & Simonoff, E. (2014). The association between social cognition and executive functioning and symptoms of anxiety and depression in adolescents with autism spectrum disorders. *Autism Research*, *7*(2), 216–228. https://doi.org/10.1002/aur.1361

Howlin, P., & Magiati, I. (2017). Autism spectrum disorder: Outcomes in adulthood. *Current Opinion in Psychiatry*, *30*(2), 69–76. https://doi.org/10.1097/YCO.0000000000000308

Hughes, C., & Leekam, S. (2004). What are the links between theory of mind and social relations? *Social Development*, *13*(4), 590–619.

Hume, K., Boyd, B. A., Hamm, J. V., & Kucharczyk, S. (2014). Supporting independence in adolescents on the autism spectrum. *Remedial and Special Education*, *35*(2), 102–113. https://doi.org/10.1177/0741932513514617

IBM Corp. (2020). IBM SPSS Statistics for Windows, Version 27.0. Armonk, NY: IBM Corp.

Individuals with Disabilities Education Act, Pub. L. No. 1400 (2004). 20 U.S.C.

Kao, Y.-C., Coster, W. J., Cohn, E. S., & Orsmond, G. I. (2021). Preparation for adulthood: Shifting responsibility for management of daily tasks from parents to their children. *American Journal of Occupational Therapy*, *2*(75), 7502205050p1-7502205050p11. https://doi.org/https://doi.org/10.5014/ajot.2020.041723

Kao, Y.-C., Kramer, J. M., Liljenquist, K., & Coster, W. J. (2015). Association between impairment, function, and daily life task management in children and adolescents with autism. *Developmental Medicine & Child Neurology*, *57*(1), 68–74. https://doi.org/10.1111/dmcn.12562

Kao, Y.-C., Kramer, J. M., Liljenquist, K., Tian, F., & Coster, W. J. (2012). Comparing the functional performance of children and youth with autism, developmental disabilities, and without disabilities using the revised Pediatric Evaluation of Disability Inventory (PEDI) Item Banks. *American Journal of Occupational Therapy*, *66*(5), 607–616. https://doi.org/10.5014/ajot.2012.004218.Comparing

Kao, Y.-C., Orsmond, G. I., Cohn, E. S., & Coster, W. J. (2020). Variables associated with shift of responsibility for daily tasks. *American Journal of Occupational Therapy*, *74*(6), 7406205070p1-7406205070p10.

Kenny, L., Hattersley, C., Molins, B., Buckley, C., Povey, C., & Pellicano, E. (2016). Which terms should be used to describe autism? Perspectives from the UK autism community. *Autism*, *20*(4), 442–462. https://doi.org/10.1177/1362361315588200

Kenworthy, L., Anthony, L. G., Naiman, D. Q., Cannon, L., Wills, M. C., Luong-Tran, C., … Wallace, G. L. (2014). Randomized controlled effectiveness trial of executive function intervention for children on the autism spectrum. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *55*(4), 374–383. https://doi.org/10.1111/jcpp.12161

Kenworthy, L., Yerys, B. E., Anthony, L. G., & Wallace, G. L. (2008). Understanding executive control in autism spectrum disorders in the lab and in the real world. *Neuropsychology Review*, *18*(4), 320–338. https://doi.org/10.1007/s11065-008-9077-7

Kirsch, A. C., Huebner, A. R. S., Mehta, S. Q., Howie, F. R., Weaver, A. L., Myers, S. M., … Katusic, S. K. (2020). Association of comorbid mood and anxiety disorders with autism spectrum disorder. *JAMA Pediatrics*, *174*(1), 63–70. https://doi.org/10.1001/jamapediatrics.2019.4368

Kraemer, H. C., Wilson, G. T., Fairburn, C. G., & Agras, W. S. (2002). Mediators and moderators of treatment effects in randomized clinical trials. *Archives of General Psychiatry*, *59*(10), 877–883. https://doi.org/10.1001/archpsyc.59.10.877

Kramer, J. M., Coster, W. J., Kao, Y.-C., Snow, A., & Orsmond, G. I. (2012). A new approach to the measurement of adaptive behavior: Development of the PEDI-CAT for children and youth with autism spectrum disorders. *Physical & Occupational Therapy In Pediatrics*, *32*(1), 34–47. https://doi.org/10.3109/01942638.2011.606260

Kraper, C. K., Kenworthy, L., Popal, H., Martin, A., & Wallace, G. L. (2017). The gap between adaptive behavior and intelligence in autism persists into young adulthood and is linked to psychiatric co-morbidities. *Journal of Autism and Developmental Disorders*, *47*(10), 3007–3017. https://doi.org/10.1007/s10803-017-3213-2

Leung, R. C., Vogan, V. M., Powell, T. L., Anagnostou, E., & Taylor, M. J. (2016). The role of executive functions in social impairment in autism spectrum disorder. *Child Neuropsychology*, *22*(3), 336–344. https://doi.org/10.1080/09297049.2015.1005066

Masi, A., Demayo, M. M., Glozier, N., & Guastella, A. J. (2017). An overview of autism spectrum disorder, heterogeneity and treatment options. *Neuroscience Bulletin*, *33*(2), 183–193. https://doi.org/10.1007/s12264-017-0100-y

Morrison, J. Q., Sansosti, F. J., & Hadley, W. M. (2009). Parent perceptions of the anticipated needs and expectations for support for their college-bound students with Asperger's syndrome. *Journal of Postsecondary Education and Disability*, *22*, 78–87.

Munsell, E. G. S., & Coster, W. J. (2020). Self-management of daily life tasks for adolescents with autism spectrum disorder without intellectual disability. *American Journal of Occupational Therapy*, *74*(4_Supplement_1), 7411500080p1-7411500080p1.

O'Hearn, K., Asato, M., Ordaz, S., & Luna, B. (2008). Neurodevelopment and executive function in autism. *Development and Psychopathology*, *20*(4), 1103–1132. https://doi.org/10.1017/S0954579408000527

Preacher, K. J., Hayes, A. F., & Preacher, K. J. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, *40*(3), 879–891. https://doi.org/10.3758/BRM.40.3.879

Pugliese, C. E., Anthony, L. G., Strang, J. F., Dudley, K., Wallace, G. L., Naiman, D. Q., & Kenworthy, L. (2016). Longitudinal examination of adaptive behavior in autism spectrum disorders: Influence of executive function. *Journal of Autism and Developmental Disorders*, *46*(2), 467–477. https://doi.org/10.1007/s10803-015-2584-5

Pugliese, C. E., Anthony, L., Strang, J. F., Dudley, K., Wallace, G. L., & Kenworthy, L. (2015). Increasing adaptive behavior skill deficits from childhood to adolescence in autism spectrum disorder: Role of executive function. *Journal of Autism and Developmental Disorders*, *45*(6), 1579–1587. https://doi.org/10.1002/nbm.3369.Three

Rogoff, B. (2003). *The cultural nature of human development*. New York: Oxford University Press.

Rosenthal, M., Wallace, G. L., Lawson, R., Wills, M. C., Yerys, B. E., & Kenworthy, L. (2013). Impairments in real world executive function increase from childhood to adolescence in autism spectrum disorders. *Neuropsychology*, *27*(1), 13–18. https://doi.org/10.1037/a0031299

Roux, A. M., Shattuck, P. T., Rast, J. E., Rava, J. A., & Anderson, K. A. (2015). *National autism indicators report: Transition into young adulthood*. Philadelphia: Life Course Outcomes Research Program, A.J. Drexel Autism Institute, Drexel University.

Rutter, M., Bailey, A., & Lord, C. (2003). *The Social Communication Questionnaire: Manual*. Western Psychological Services.

Soto, E. F., Kofler, M. J., Singh, L. J., Wells, E. L., Irwin, L. N., Groves, N. B., & Miller, C. E. (2020). Executive functioning rating scales: Ecologically valid or construct invalid? *Neuropsychology*, *34*(6), 605–619. https://doi.org/10.1037/neu0000681

Sze, K. M., & Wood, J. J. (2008). Enhancing CBT for the treatment of autism spectrum disorders and concurrent anxiety. *Behavioural and Cognitive Psychotherapy*, *36*(4), 403–409. https://doi.org/10.1017/S1352465808004384

Tarazi, R. A., Mahone, E. M., & Zabel, T. A. (2007). Self-care independence in children with neurological disorders: An interactional model of adaptive demands and executive dysfunction. *Rehabilitation Psychology*, *52*(2), 196–205. https://doi.org/10.1037/0090-5550.52.2.196

Wallace, G. L., Kenworthy, L., Pugliese, C. E., Haroon, P. S., White, E. I., Brodsky, E., & Martin, A. (2016). Real-world executive functions in adults with autism spectrum disorder: Profiles of impairment and associations with adaptive functioning and co-morbid anxiety and depression. *Journal of Autism and Developmental Disorders*, *46*, 1071–1083. https://doi.org/10.1007/s10803-015-2655-7

Whitehouse, A. J. O., & Bishop, D. V. M. (2009). *Communication Checklist - Adult*. UK: Pearson.

Whitehouse, A. J. O., Coon, H., Miller, J., Salisbury, B., & Bishop, D. V. M. (2010). Narrowing the broader autism phenotype: A study using the Communication Checklist-Adult Version (CC-A). *Autism*, *14*(6), 1362–3613. https://doi.org/10.1177/1362361310382107

Footnotes

[1]Identity first language used per Kenny et al. (2016)

**Table 1**

*Demographic characteristics of students and parents*

| **Parents** | *% (n)* |
|---|---|
| Age, *M* | *M* = 48.9 (*SD* = 5.32) |
| Gender, female | 97.8% (45) |
| Race | |
| White | 84.8% (39) |
| Two or more races | 8.7% (4) |
| Asian | 6.5% (3) |
| Hispanic/Latinx | 4.3% (2) |
| Highest level of education completed | |
| High school graduate | 2.2% (1) |
| Some college or two year college degree | 17.4% (8) |
| Four year college degree | 37.0% (17) |
| Graduate degree | 43.5% (20) |
| Relationship to child | |
| Biological mother | 95.7% (44) |
| Adoptive mother | 2.2% (1) |
| Biological father | 2.2% (1) |
| Community | |
| Suburban | 73.9% (34) |
| Urban | 23.9% (11) |
| Rural | 6.5% (3) |
| **Students** | *% (n)* |
| Age, *M* | *M* = 17.75 (*SD* = 1.00) |
| Gender, male | 76.1% (35) |
| Race[a] | |
| White | 78.3% (36) |
| Two or more races | 10.9% (5) |
| Asian | 8.7% (4) |
| Native Hawaiian or other Pacific Islander | 2.2% (1) |
| Hispanic/Latinx | 6.5% (3) |
| Co-occurring conditions | |
| Anxiety disorder | 76.1% (35) |
| ADD/ADHD | 67.4% (31) |
| Depression | 45.7% (21) |
| Learning disability | 41.3% (19) |
| Obsessive-compulsive disorder | 15.2% (7) |
| Bipolar disorder | 10.9% (5) |
| Oppositional defiant disorder | 6.5% (3) |

**Table 2**

*Pearson correlations between variables*

| | Self-management of daily life tasks | Age | Internalizing behaviors | Metacognition |
|---|---|---|---|---|
| Age | -.449** | | | |
| Internalizing behaviors | -.440** | .086 | | |
| Metacognition | -.571** | .206 | .413** | |
| Social communication | -.400** | .152 | .269 | .501** |

** $p < 0.01$ (2-tailed)

**Table 3**

*Regression of independent variables on self-management of daily life tasks*

| | *β* | *SE* | Std. *β* | 95% CI | | *p* |
|---|---|---|---|---|---|---|
| | | | | *LL* | *UL* | |
| Intercept | 88.01 | 17.66 | | 52.16 | 123.85 | <.001 |
| IB | -.11 | .08 | -.17 | -.27 | .06 | .214 |
| MI | -.27 | .09 | -.44 | -.46 | -.08 | .006 |
| CCA | -.04 | .04 | -.15 | -.11 | .04 | .317 |
| Age | -1.73 | .98 | -.22 | -3.72 | .23 | .086 |

Dependent Variable: PEDI:R T-score

**Table 4**

*Analysis of mediation with social communication (CCA)*

| Model[a] | B | SE | Lower 95% CI | Upper 95% CI | Effect size | *p* |
|---|---|---|---|---|---|---|
| STEP 1 *(dependent variable: PEDI:R)* | | | | | $R^2$ = .320 | |
| (constant) | 86.17 | 15.93 | 54.00 | 118.33 | | <.001 |
| CCA | -.09 | .03 | -.15 | -.02 | | .013 |
| Age | -2.82 | .91 | -4.65 | -.99 | | .003 |
| STEP 2 *(dependent variable: MI)* | | | | | $R^2$ = .268 | |
| (constant) | 28.07 | 26.07 | -24.59 | 80.73 | | .288 |
| CCA | .19 | .05 | .08 | .30 | | .001 |
| Age | 1.46 | 1.48 | -1.54 | 4.46 | | .332 |
| STEP 3 *(dependent variable: PEDI:R)* | | | | | $R^2$ = .458 | |
| (constant) | 93.90 | 14.59 | 64.40 | 123.34 | | <.001 |
| MI | -.28 | .09 | -.45 | -.10 | | .003 |
| CCA | -.03 | .03 | -.10 | .04 | | .343 |
| Age | -2.42 | .83 | -4.10 | -.75 | | .006 |

[a] n = 44 for the analysis due to missing data

**Table 5**

*Analysis of mediation with internalizing behaviors (IB)*

| Model[a] | B | SE | Lower 95% CI | Upper 95% CI | Effect size | *p* |
|---|---|---|---|---|---|---|
| STEP 1 *(dependent variable: PEDI:R)* | | | | | $R^2$ = .273 | |
| (constant) | 91.43 | 20.00 | 50.91 | 131.95 | | <.001 |
| IB | -.24 | .09 | -.41 | -.06 | | .011 |
| Age | -2.58 | 1.10 | -4.81 | -.35 | | .025 |
| STEP 2 *(dependent variable: MI)* | | | | | $R^2$ = .200 | |
| (constant) | 1.72 | 33.57 | -66.29 | 69.74 | | .960 |
| IB | .40 | .15 | .10 | .70 | | .010 |
| Age | 2.16 | 1.85 | -1.59 | 5.90 | | .250 |
| STEP 3 *(dependent variable: PEDI:R)* | | | | | $R^2$ = .475 | |
| (constant) | 91.97 | 17.23 | 57.03 | 126.91 | | <.001 |
| MI | -.31 | .08 | -.49 | -.14 | | .001 |
| IB | -.11 | .08 | -.28 | .06 | | .187 |
| Age | -1.90 | .96 | -3.86 | .06 | | .057 |

[a] n = 40 for the analysis due to missing data

**Figure 1**

*Mediation Model*

*Notes.* (a) direct effect of social communication on self-management of daily life tasks. (b) illustration of a mediated pathway; social communication has an indirect effect on self-management of daily life tasks through metacognition (Baron & Kenny, 1986)